Unit – 1
Rational Numbers
Exercise – 1.1

Q1. Which of the following are rational numbers?

a. $\frac{3}{4}$ b. 4

c. $\frac{6}{0}$ d. $\frac{-9}{8}$

e. $\frac{7}{-2}$ f. $\frac{66}{1}$

Sol. Here $\frac{3}{4}, 4, \frac{-9}{8}, \frac{7}{-2}$ *and* $\frac{66}{1}$ are rational numbers. While $\frac{6}{0}$ is not a number.

Q2. Tell the place value of each digit of the given numbers.

a. 5,487,234

Sol. 5,487,234
Place value of 5 is =5,000,000
Place value of 4 = 400,000
Place value of 8 = 80,000
Place value of 7 = 7,000
Place value of 2 = 200
Place value of 3 = 30
Place value of 4 =4

b. 782,398

Sol.782,398
Place value of 7 = 700,000
Place value of 8 = 80,000
Place value of 2 = 2,000
Place value of 3 = 300
Place value of 9 = 90
Place value of 8 =8

c. 1,572,009

Sol.1,572,009
Place value of 1 is =1,000,000
Place value of 5 = 500,000
Place value of 7 = 70,000
Place value of 2 = 2,000
Place value of 9 =9

d. 4.186

Sol.4.186
Place value of 4 is =4
Place value of 1 = 0.1
Place value of 8 = 0.08
Place value of 6 = 0.006

e. 8.200

Sol.8.200
Place value of 8 is =8
Place value of 2 =0.2

f. 0.7694

Sol.0.7694
Place value of 7 is =0.7
Place value of 6 = 0.06
Place value of 9 = 0.009
Place value of 4 = 0.0004

Exercise – 1.2

Q1. Round off these numbers to the nearest 10, 100 and 1000.

a. 53,152

Sol.53,152
Round off to nearest 10 = 53,150
Round off to nearest 100 = 53,200
Round off to nearest 1000 = 53,000

b. 898,430

Sol.898,430
Round off to nearest 10 = 898,430
Round off to nearest 100 = 898,400
Round off to nearest 1000 = 898,000

c. 7,431,897

Sol.7,431,897
Round off to nearest 10 = 7,431,900
Round off to nearest 100 = 7,431,900
Round off to nearest 1000 = 7,432,000

d. 1,399,267

Sol.1,399,267
Round off to nearest 10 = 1,399,270
Round off to nearest 100 = 1,399,200
Round off to nearest 1000 = 1,399,000

Q2. Calculate the following. Then estimate by rounding off the numbers to check if the answer is reasonable.

a. 6258 + 3422

Sol.6258 + 3422
6258 + 3422 = 9680
Now estimate to check if our calculation is reasonable or not.
Round off 6258 to nearest hundred ≈ 6200

Round off 3422 to nearest hundred ≈ 3400
So, 6258 + 3422 ≈ 6200 + 3400 = 9600
So our answer is reasonable.

b. 11,852 + 48,412

Sol.11,852 + 48,412
11,852 + 48,412 = 60,264
Now estimate to check if our calculation is reasonable or not.
Round off 11,852 to nearest thousand ≈ 12,000
Round off 48,412 to nearest thousand ≈ 48,000
So, 11,852 + 48,412 ≈ 12,000 + 48,000 = 60,000
So our answer is reasonable.

c. 15,203 – 10,545

Sol.15,203 – 10,545
15,203 – 10,545 = 4,658
Now estimate to check if our calculation is reasonable or not.
Round off 15,203 to nearest thousand ≈ 15,000
Round off 10,545 to nearest thousand ≈ 11,000
So, 15,203 – 10,545 ≈ 15,000 – 11,000 = 4,000
So our answer is not reasonable.

d. 49,396 – 22,415

Sol.49,396 – 22,415
49,396 – 22,415 = 26,981
Now estimate to check if our calculation is reasonable or not.
Round off 49,396 to nearest thousand ≈ 49,000
Round off 22,415 to nearest thousand ≈ 22,000
So, 49,396 – 22,415 ≈ 49,000 – 22,000 = 27,000
So our answer is reasonable.

e. 624 × 23

Sol.624 × 23
624 × 23 = 14,352
Now estimate to check if our calculation is reasonable or not.
Round off 624 to nearest hundred ≈ 600
Round off 23 to nearest ten ≈ 20
So, 624 × 23 ≈ 600 × 20 = 12,000
So our answer is not reasonable.

f. 988 × 18

Sol.988 × 18
988 × 18 = 17,784
Now estimate to check if our calculation is reasonable or not.
Round off 988 to nearest hundred ≈ 1,000.
Round off 18 to nearest ten ≈ 20
So,988 × 18 ≈ 1,000 × 20 = 20,000
So our answer is not reasonable.

g. 13,216 ÷ 56

Sol.13,216 ÷ 56
13,216 ÷ 56 = 236
Now estimate to check if our calculation is reasonable or not.
Round off 13,216 to nearest thousand ≈ 13,000
Round off 56 to nearest ten ≈ 60
So, 13,216 ÷ 56 ≈ 13,000 ÷ 60 = 216.6
So our answer is not reasonable.

h. 32,436 ÷ 34

Sol.32,436 ÷ 34
32,436 ÷ 34 = 954
Now estimate to check if our calculation is reasonable or not.
Round off 32,436 to nearest thousand ≈ 32,000
Round off 34 to nearest ten ≈ 30
So, 32,436 ÷ 34 ≈ 32,000 ÷ 30 = 1,066.6
So our answer is not reasonable.

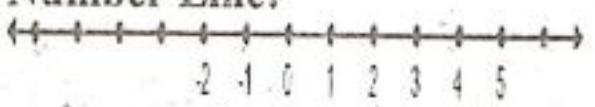
Exercise – 1.3

Q1. Represent the following integers on the number line.

i. -2 *to* $+5$

Sol. -2 *to* $+5$

Number Line:



ii. -8 *to* 0

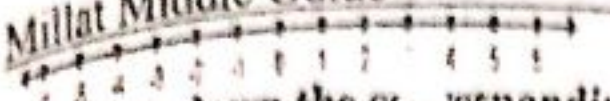
Sol. -8 *to* 0

Number Line:

iii. -5 *to* $+5$

Sol. -5 *to* $+5$

Number Line:



Q2. Write down the corresponding positive or negative numbers of the following.

i. -2 *ii.* $+5$ *iii.* $+10$

iv. -7 *v.* -23

Sol. The corresponding positive or negative numbers of the given values are:

i. $+2$ *ii.* -5 *iii.* -10

iv. $+7$ *v.* $+23$

Q3. Write down the numerical value of the following integers.

$+2,+7,0,-1,-7,+5,-5,$

$-15,+13,+12,-14$

Sol. The numerical value or absolute value of the given numbers is given as:

$|+2|=2,|+7|=7,|0|=0$

$|-1|=1,|-7|=7,|+5|=5$

$|-5|=5,|-15|=15,|+13|=13$

$|+12|=12,|-14|=14$

These numbers are: 2, 7, 0, 1, 7, 5, 5, 15, 13, 12 and 14.

Q4. Arrange the absolute or numerical values of the following integers in ascending and descending order.

a. $+18,+9,0,+1,+5,+20$

Sol. $+18,+9,0,+1,+5,+20$

Absolute values are:

$|+18|=18,|+9=9|,|0|=0$

$|+1|=1,|+5|=5,|+20|=20$

Ascending order: 0, 1, 5, 9, 18, 20

Descending order: 20, 18, 9, 5, 1, 0

b. $+18,+10,-1,+1,0,+20$

Sol. $+18,+10,-1,+1,0,+20$

Absolute values are:

$|+18|=18,|+10=10|,|-1|=1$

$|+1|=1,|0|=0,|+20|=20$

Ascending order: 0, 1, 10, 18, 20

Descending order: 20, 18, 10, 1, 0

c. $-15,0,-10,-3,-1,+3$

Sol. $-15,0,-10,-3,-1,+3$

Absolute values are:

$|-15|=15,|0|=0,|-10|=10$

$|-3|=3,|-1|=1,|+3|=3$

Ascending order: 0, 1, 3, 10, 15

Descending order: 15, 10, 3, 1, 0

d. $-10,-1,+1,+15,+10,-7$

Sol. $-10,-1,+1,+15,+10,-7$

Absolute values are:

$|-10|=10,|-1|=1,|+1|=1$

$|+15|=15,|+10|=10,|-7|=7$

Ascending order: 1, 7, 10, 15

Descending order: 15, 10, 7, 1

e. $+17,+20,-17,+1,-5,+5,$
$+19,+13,-13,-11$

Sol. $+17,+20,-17,+1,-5,+5,$
$+19,+13,-13,-11$

Absolute values are:

$|+17|=17,|+20|=20$

$|-17|=17,|+1|=1,|-5|=5$

$|+5|=5,|+19|=19,|+13|=13$

$|-13|=13,|-11|=11$

Ascending order: 1, 5, 11, 13, 17, 19, 20

Descending order: 20, 19, 17, 13, 11, 5, 1

Q5. Junaid paid a loan of Rs.30 from his pocket money. How can this be presented (with positive or negative)

Sol. Rs.30 is reduced from junaid's pocket money to this can be represented as -30

Q6. Hammad got Rs.200 on Eid-ul-Fitr. How can this be represented?

Sol. As Hammad has Rs.200 now. So this can be represented as $+200$

Q7. If $+6$ represents 6 m above sea level, what does -6 represent?

Sol.As +6 represents 6 m above sea level, then -6 represent 6 m below the see level.

Q8. If -10 represents 10 left from zero on the number line, what does +5 represent?

Sol. As -10 represents 10 left from zero on the number line, then +10 will represent 10 right to the zero on number line.

Q9. If -20 represents a loss of Rs.20 on an article, what does +50 represent?

Sol. As -20 represents a loss of Rs.20 on an article, so +20 represent a gain of Rs.20 on an article.

Q10. If +40 represents the clockwise turn of an aircraft, what does -30 represent?

Sol. As +40 represents the clockwise turn of an aircraft, then -30 represent the anti-clockwise turn of an aircraft.

Exercise – 1.4

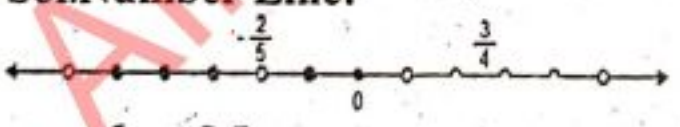
Q1. Represent the following rational numbers on a number line.

a. $\frac{3}{4}$

Sol.Number Line:

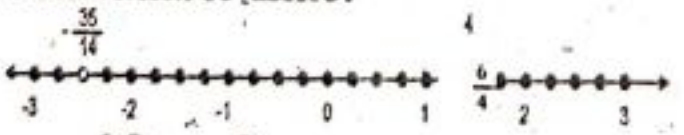
b. $-\frac{2}{5}$

Sol.Number Line:



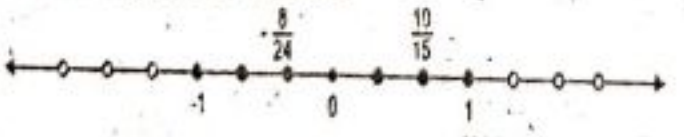
c. $\frac{6}{4}, -\frac{35}{14}$

Sol.Number Line:



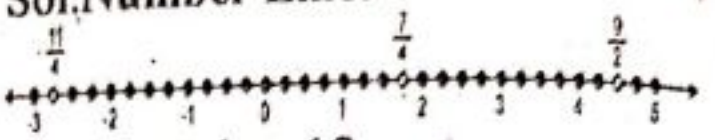
d. $\frac{10}{15}, -\frac{8}{24}$

Sol.Number Line:



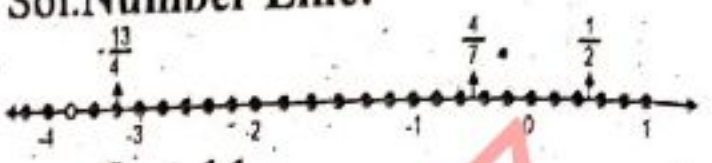
e. $\frac{7}{4}, \frac{9}{2}, -\frac{11}{4}$

Sol.Number Line:



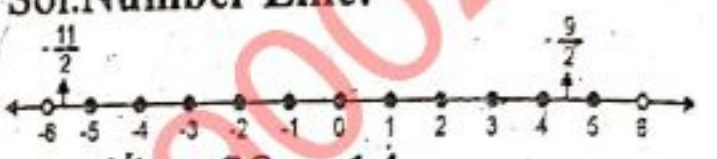
f. $\frac{1}{2}, -\frac{4}{7}, -\frac{13}{4}$

Sol.Number Line:



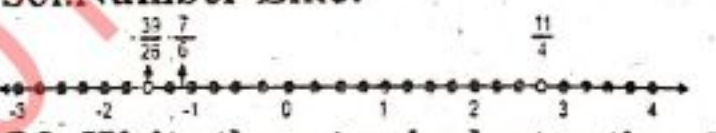
g. $\frac{9}{2}, -\frac{11}{2}$

Sol.Number Line:



h. $\frac{11}{4}, -\frac{39}{26}, -\frac{14}{12}$

Sol.Number Line:



Q2. Write three equivalent rational numbers for each of the following.

a. $\frac{2}{3}$ **b.** $\frac{7}{24}$ **c.** $\frac{4}{9}$ **d.** $\frac{11}{14}$

e. $\frac{13}{25}$ **f.** $\frac{5}{17}$ **g.** $\frac{1}{6}$ **h.** $\frac{6}{29}$

Sol. Equivalent fractions of $\frac{2}{3}$ are:

$$\frac{2\times 2}{3\times 2}=\frac{4}{6}$$

$$\frac{2\times 3}{3\times 3}=\frac{6}{9} \text{ and } \frac{2\times 4}{3\times 4}=\frac{8}{12}$$

Equivalent fractions of $\frac{7}{24}$ are:

$$\frac{7\times 2}{24\times 2}=\frac{14}{48}$$

$$\frac{7\times 3}{24\times 3}=\frac{21}{72} \text{ are } \frac{7\times 4}{24\times 4}=\frac{28}{96}$$

Equivalent fractions of $\frac{4}{9}$ are:

$\frac{4\times2}{9\times2}=\frac{8}{18}$

$\frac{4\times3}{9\times3}=\frac{12}{27}$ and $\frac{4\times4}{9\times4}=\frac{16}{36}$

Equivalent fractions of $\frac{11}{14}$ are:

$\frac{11\times2}{14\times2}=\frac{22}{28}$

$\frac{11\times3}{14\times3}=\frac{33}{42}$ and $\frac{11\times4}{14\times4}=\frac{44}{56}$

Equivalent fractions of $\frac{13}{25}$ are:

$\frac{13\times2}{25\times2}=\frac{26}{50}$

$\frac{13\times3}{25\times3}=\frac{39}{75}$ and $\frac{13\times4}{25\times4}=\frac{52}{100}$

Equivalent fractions of $\frac{5}{17}$ are:

$\frac{5\times2}{17\times2}=\frac{10}{34}$

$\frac{5\times3}{17\times3}=\frac{15}{51}$ and $\frac{5\times4}{17\times4}=\frac{20}{68}$

Equivalent fractions of $\frac{1}{6}$ are:

$\frac{1\times2}{6\times2}=\frac{2}{12}$

$\frac{1\times3}{6\times3}=\frac{3}{18}$ and $\frac{1\times4}{6\times4}=\frac{4}{24}$

Equivalent fractions of $\frac{6}{29}$ are:

$\frac{6\times2}{29\times2}=\frac{12}{58}$

$\frac{6\times3}{29\times3}=\frac{18}{87}$ and $\frac{6\times4}{29\times4}=\frac{24}{116}$

Q3. Find the reciprocal of the following.

a. $\frac{9}{10}$ *b.* $\frac{7}{-15}$ *c.* $\frac{-2}{25}$

d. $\frac{3}{31}$ *e.* $-\frac{13}{37}$

Sol. Replace the numerator by the denominator and the denominator by the numerator.

Reciprocal of $\frac{9}{10}$ is $\frac{10}{9}$

Reciprocal of $\frac{7}{-15}$ is $\frac{-15}{7}$

Reciprocal of $\frac{-2}{25}$ is $\frac{25}{-2}$

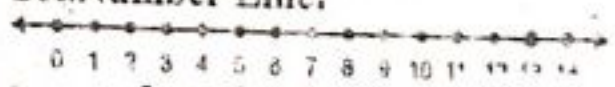
Reciprocal of $\frac{3}{31}$ is $\frac{31}{3}$

Reciprocal of $-\frac{13}{37}$ is $-\frac{37}{13}$

Q4. Represent the following on a number line.

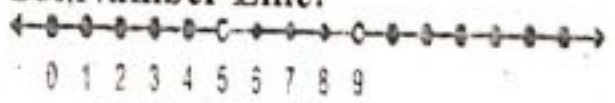
a. >7

Sol.Number Line:



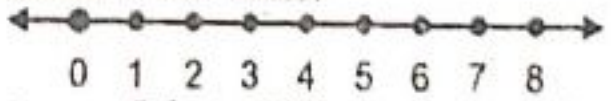
b. >3 *and* <9

Sol.Number Line:



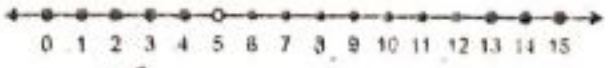
c. ≥ 1 *but* ≤ 6

Sol.Number Line:



d. >5 *but* ≤ 12

Sol.Number Line:



e. ≤ 6

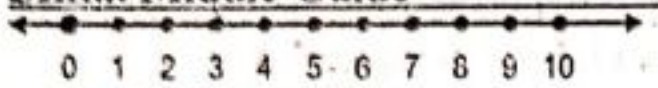
Sol.Number Line:

f. ≥ 2 *and* <10

Sol.Number Line:

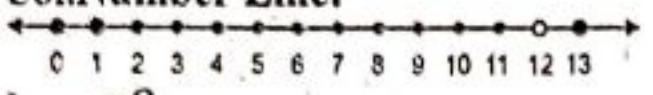
g. ≤ 7 *but* ≥ 1

Sol.Number Line:



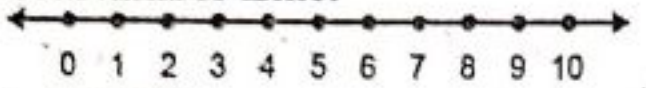
h. < 12 *but* ≥ 5

Sol.Number Line:



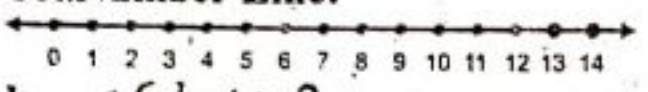
i. < 9

Sol.Number Line:



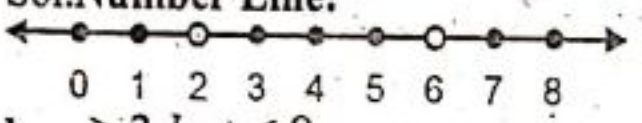
j. ≥ 12

Sol.Number Line:



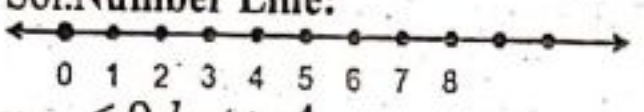
k. < 6 *but* > 2

Sol.Number Line:



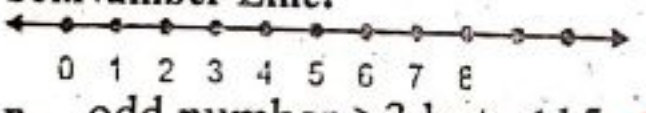
l. ≥ 3 *but* ≤ 8

Sol.Number Line:



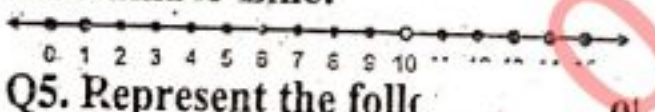
m. ≤ 9 *but* > 4

Sol.Number Line:



n. odd number >3 but ≤15

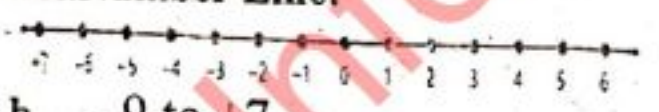
Sol.Number Line:



Q5. Represent the follc integers on a number line. ol

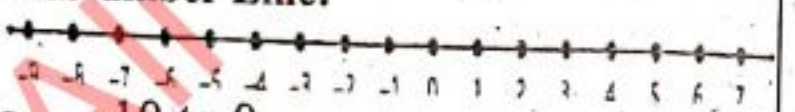
a. −7 to +6

Sol.Number Line:



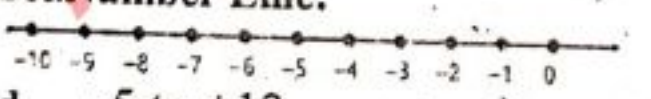
b. −9 to +7

Sol.Number Line:



c. −10 to 0

Sol.Number Line:

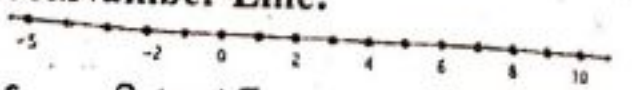


d. −5 to +13

Sol.Number Line:

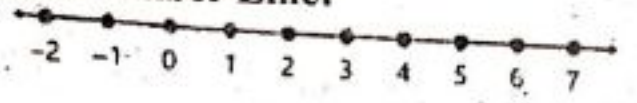
e. −5 to +10

Sol.Number Line:



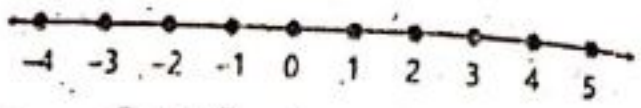
f. −2 to +7

Sol.Number Line:



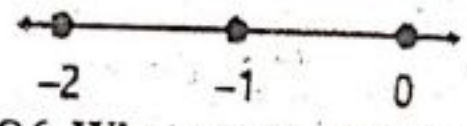
g. −4 to +5

Sol.Number Line:

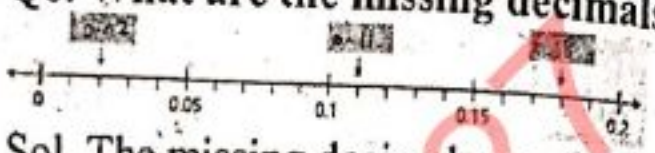


h. −2 to 0

Sol.Number Line:



Q6. What are the missing decimals?

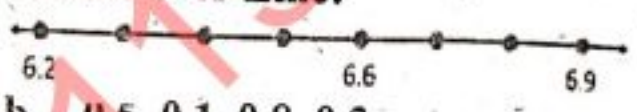


Sol. The missing decimals are: 0.02, 0.11, 0.18

Q7. Represent the following decimals on a number line.

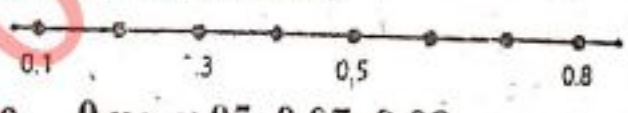
a. 6.2, 6.9, 6.6

Sol.Number Line:



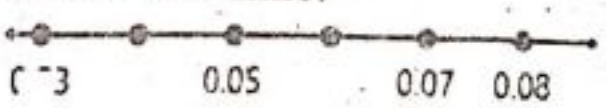
b. 0.5, 0.1, 0.8, 0.3

Sol.Number Line:



c. 0.03, 0.05, 0.07, 0.08

Sol.Number Line:



Exercise – 1.5

Q1. Express these improper fractions as mixed numbers in their simplest forms.

a. $\frac{18}{4}$

Sol. $\frac{18}{4}$

To convert into mixed fractions.

$$4\overline{)18}\quad \begin{matrix}4\\ \\ 2\end{matrix}\qquad \underline{16}$$

$4\frac{2}{4}$ *or* $4\frac{1}{2}$ **Ans.**

b. $\frac{12}{9}$

Sol. $\frac{12}{9}$

To convert into mixed fractions.

$9\overline{)12}$ $1\frac{3}{9}$ *or* $1\frac{1}{3}$ **Ans.**

$\frac{9}{3}$

c. $\frac{26}{10}$

Sol. $\frac{26}{10}$

To convert into mixed fractions.

$10\overline{)26}$ $\frac{2}{6}$

$\frac{20}{6}$

$10\frac{2}{6}$ *or* $10\frac{1}{3}$ **Ans.**

Q2. Write each of these mixed numbers as improper fractions.

a. $1\frac{3}{5}$

Sol. $1\frac{3}{5}$

To convert into improper fraction:

$\frac{5\times1+3}{5}=\frac{8}{5}$ **Ans.**

b. $3\frac{5}{6}$

Sol. $3\frac{5}{6}$

To convert into improper fraction:

$\frac{6\times3+5}{6}=\frac{23}{6}$ **Ans.**

c. $1\frac{7}{9}$

Sol. $1\frac{7}{9}$

To convert into improper fraction:

$\frac{9\times1+7}{9}=\frac{16}{9}$ **Ans.**

d. $3\frac{3}{4}$

Sol. $3\frac{3}{4}$

To convert into improper fraction:

$\frac{4\times3+3}{4}=\frac{15}{4}$ **Ans.**

Exercise – 1.6

Q1. Compare and write <, > or =.

a. 50,856 ; 26,700

Sol. 50,856 > 26,700

b. 111,245 ; 10,987

Sol. 111,245 > 10,987

c. 1,236 ; 9,999

Sol. 1,236 < 9,999

d. 5,680 ; 5,688

Sol. 5,680 < 5,688

Q2. Arrange these numbers in ascending and descending order.

a. 10,820 ; 1,820 ; 35,236 ; 66,102 ; 90,526

Sol. 10,820 ; 1,820 ; 35,236 ; 66,102 ; 90,526

Ascending order: 1,820 ; 10,820 ; 35,236 ; 66,102 ; 90,526

Descending order: 90,526 ; 66,102 ; 35,236 ; 10,820 ; 1,820.

b. 9,002 ; 10,364 ; 8,305 ; 19,634 ; 20,465

Sol. 9,002 ; 10,364 ; 8,305 ; 19,634 ; 20,465

Ascending order: 8,305 ; 9,002 ; 10,364 ; 19,634 ; 20,465

Descending order: 20,465 ; 19,634 ; 10,364 ; 9,002 ; 8,305.

c. 264,666 ; 264,023 ; 82,023 ; 31,666 ; 81,023

Sol. 264,666 ; 264,023 ; 82,023 ; 31,666 ; 81,023

Ascending order: 31,666 ; 81,023 ; 82,023 ; 264,023 ; 264,666

Descending order: 264,666 ; 264,023 ; 82,023 ; 81,023 ; 31,666

Q3. Which is greater? Give reason.

a. -666 or -6666

Sol. -666 or -6666

As a greater integer with a negative sign is smaller than a smaller integer with a negative sign. So -666 is greater.

b. -2340 or -234

Sol. -2340 or -234

As a greater integer with a negative sign is smaller than a smaller integer with a negative sign. So -234 is greater.

c. -10000 or -1000

Sol. -10000 or -1000

As a greater integer with a negative sign is smaller than a smaller integer with a negative sign. So -1000 is greater.

d. -55 or -555

Sol. -55 or -555

As a greater integer with a negative sign is smaller than a smaller integer with a negative sign. So -55 is greater.

Q4. Arrange the following integers in ascending and descending order.

a. $-5,+4,-13,-1,0,3,7$

Sol. $-5,+4,-13,-1,0,3,7$

Ascending order:

$-13,-5,-1,0,3,+4,7$

Descending order:

$7,+4,3,0,-1,-5,-13$

b. $-5,-3,+3,+2,+11,-12$

Sol. $-5,-3,+3,+2,+11,-12$

Ascending order:

$-12,-5,-3,+2,+3,+11$

Descending order:

$+11,+3,+2,-3,-5,-12$

c. $-33,-12,0,+11,+9,+5,-16$

Sol. $-33,-12,0,+11,+9,+5,-16$

Ascending order:

$-33,-16,-12,0,+5,+9,+11$

Descending order:

$+11,+9,+5,0,-12,-16,-33$

d. $-12,0,+17,+11,+6,-8,-5$

Sol. $-12,0,+17,+11,+6,-8,-5$

Ascending order:

$-12,-8,-5,0,+6,+11,+17$

Descending order:

$+17,+11,+6,0,-5,-8,-12$

e. $-3,0,+1,+8,+7,-5,-4,+9$

Sol. $-3,0,+1,+8,+7,-5,-4,+9$

Ascending order:

$-5,-4,-3,0,+1,+7,+8,+9$

Descending order:

$+9,+8,+7,+1,0,-3,-4,-5$

f. $-15,-11,0,+23,+24$
$+27,-14$

Sol. $-15,-11,0,+23,+24$
$+27,-14$

Ascending order:

$-15,-14,-11,0,+23,+24,+27$

Descending order:

$+27,+24,+23,0,-11,-14,-15$

Q5. Compare and write <, > or =.

a. $\frac{4}{7}, \frac{1}{3}$

Sol. $\frac{4}{7}, \frac{1}{3}$

First making the denominator same.

$\frac{4\times3}{7\times3}, \frac{1\times7}{3\times7} = \frac{12}{21}, \frac{7}{21}$

Now compare the numerator

As 12 is greater than 7. So,

$\frac{12}{21} > \frac{7}{21} \Rightarrow \frac{4}{7} > \frac{1}{3}$ **Ans.**

b. $-\frac{1}{2}, \frac{5}{11}$

Sol. $-\frac{1}{2}, \frac{5}{11}$

Every positive number is greater than the negative number. So,

$\Rightarrow -\frac{1}{2} < \frac{5}{11}$ **Ans.**

c. $\frac{9}{4}, -\frac{11}{2}$

Sol. $\frac{9}{4}, -\frac{11}{2}$

Every positive number is greater than the negative number. So,

$\Rightarrow \frac{9}{4} > -\frac{11}{2}$ **Ans.**

d. $-\frac{3}{4}, -\frac{7}{4}$

Sol. $-\frac{3}{4}, -\frac{7}{4}$

Denominator are same.

Now compare the numerator

As – 3 is greater than – 7. So,

$\Rightarrow -\frac{3}{4} > -\frac{7}{4}$ **Ans.**

e. $\frac{4}{9}, -\frac{19}{4}$

Sol. $\frac{4}{9}, -\frac{19}{4}$

Every positive number is greater than the negative number. So,

$\Rightarrow \frac{4}{9} > -\frac{19}{4}$ **Ans.**

f. $\frac{1}{7}, \frac{7}{2}$

Sol. $\frac{1}{7}, \frac{7}{2}$

First making the denominator same.

$\frac{1\times2}{7\times2}, \frac{7\times7}{2\times7} = \frac{2}{14}, \frac{49}{14}$

Now compare the numerator

As 49 is greater than 2. So,

$\frac{2}{14} < \frac{49}{14} \Rightarrow \frac{1}{7} < \frac{7}{2}$ **Ans.**

g. $\frac{-6}{7}, \frac{-9}{8}$

Sol. $\frac{-6}{7}, \frac{-9}{8}$

First making the denominator same.

$\frac{-6\times8}{7\times8}, \frac{-9\times7}{8\times7} = \frac{-48}{56}, \frac{-63}{56}$

Now compare the numerator

As – 48 is greater than – 63. So,

$\frac{-48}{56} > \frac{-63}{56} \Rightarrow \frac{-6}{7} > \frac{-9}{8}$ **Ans.**

h. $\frac{11}{13}, \frac{-7}{13}$

Sol. $\frac{11}{13}, \frac{-7}{13}$

Every positive number is greater than the negative number. So,

$\Rightarrow \frac{11}{13} > \frac{-7}{13}$ **Ans.**

i. $-\frac{6}{15}, -\frac{13}{2}$

Sol. $-\frac{6}{15}, -\frac{13}{2}$

First making the denominator same.

$\frac{-6\times2}{15\times2}, \frac{-13\times15}{2\times15} = \frac{-12}{30}, \frac{-195}{30}$

Now compare the numerator

As – 12 is greater than – 195. So,

$\frac{-12}{30} > \frac{-195}{30} \Rightarrow -\frac{6}{15} > -\frac{13}{2}$ **Ans.**

j. $\frac{-2}{5}, \frac{-1}{2}$

Sol. $\frac{-2}{5}, \frac{-1}{2}$

First making the denominator same.

$$\frac{-2\times2}{5\times2}, \frac{-1\times5}{2\times5} = \frac{-4}{10}, \frac{-5}{10}$$

Now compare the numerator

As – 4 is greater than – 5. So,

$$\frac{-4}{10} > \frac{-5}{10} \Rightarrow \frac{-2}{5} > \frac{-1}{2}$$ **Ans.**

Q6. Arrange the following rational numbers in ascending and descending order.

a. $\frac{4}{7}, \frac{3}{8}, \frac{9}{11}$

Sol. $\frac{4}{7}, \frac{3}{8}, \frac{9}{11}$

First making the denominator same.

$$\frac{4\times88}{7\times88}, \frac{3\times77}{8\times77}, \frac{9\times56}{11\times56}$$

$$\frac{352}{616}, \frac{231}{616}, \frac{504}{616}$$

Now compare the numerator

As 504> 352 > 231. So,

$$\frac{504}{616} > \frac{352}{616} > \frac{231}{616}$$

Ascending order:

$$\frac{9}{11} > \frac{4}{7} > \frac{3}{8}$$

Descending order:

$$\frac{3}{8} < \frac{4}{7} < \frac{9}{11}$$

b. $\frac{5}{9}, \frac{7}{13}, \frac{-9}{8}$

Sol. $\frac{5}{9}, \frac{7}{13}, \frac{-9}{8}$

First making the denominator same.

$$\frac{5\times13}{9\times13}, \frac{7\times9}{13\times9}, \frac{-9}{8}$$

$$\frac{65}{117}, \frac{63}{117}, \frac{-9}{8}$$

Now compare the numerator

As 65 > 63 > - 9. So,

$$\frac{65}{117} > \frac{63}{117} > \frac{-9}{8}$$

Ascending order:

$$\frac{5}{9} > \frac{7}{13} > \frac{-9}{8}$$

Descending order:

$$\frac{-9}{8} < \frac{7}{13} < \frac{5}{9}$$

c. $\frac{20}{21}, \frac{23}{42}, -\frac{25}{7}$

Sol. $\frac{20}{21}, \frac{23}{42}, -\frac{25}{7}$

First making the denominator same.

$$\frac{20\times2}{21\times2}, \frac{23}{42}, -\frac{25\times6}{7\times6}$$

$$\frac{40}{42}, \frac{23}{42}, -\frac{150}{42}$$

Now compare the numerator

As 40> 23 > -150. So,

Ascending order:

$$\frac{20}{21} > \frac{23}{42} > -\frac{25}{7}$$

Descending order:

$$-\frac{25}{7} < \frac{23}{42} < \frac{20}{21}$$

d. $-\frac{7}{3}, \frac{6}{14}, -\frac{4}{12}$

Sol. $-\frac{7}{3}, \frac{6}{14}, -\frac{4}{12}$

As positive fraction is greater than every negative fraction.

So we compare the negative fractions only.

First making the denominator same.

$-\frac{7\times4}{3\times4}, \frac{6}{14}, -\frac{4}{12}$

$\frac{-28}{12}, \frac{6}{14}, \frac{-4}{12}$

Now compare the numerator

As 6> -4 > -28. So,

$\frac{6}{14} > \frac{-4}{12} > \frac{-28}{12}$

$\frac{6}{14} > -\frac{4}{12} > -\frac{7}{3}$

Ascending order:

Descending order:

$-\frac{7}{3} < -\frac{4}{12} < \frac{6}{14}$

e. $\frac{4}{3}, \frac{8}{12}, \frac{7}{15}, -\frac{2}{7}$

Sol. $\frac{4}{3}, \frac{8}{12}, \frac{7}{15}, -\frac{2}{7}$

$\frac{-2}{7}$ is the smallest.

so we will compare $\frac{4}{3}, \frac{8}{12}, \frac{7}{15}$

First making the denominator same.

$\frac{4\times20}{3\times20}, \frac{8\times5}{12\times5}, \frac{7\times4}{15\times4}$

$\frac{80}{60}, \frac{40}{60}, \frac{28}{60}$

Now compare the numerator

As 80 >40 > 28. So,

$\frac{80}{60} > \frac{40}{60} > \frac{28}{60}$

$\frac{4}{3} > \frac{8}{12} > \frac{7}{15} > \frac{-2}{7}$

Ascending order:

Descending order:

$\frac{-2}{7} < \frac{7}{15} < \frac{8}{12} < \frac{4}{3}$

f. $\frac{6}{8}, \frac{5}{21}, -\frac{13}{16}, \frac{15}{17}$

Sol. $\frac{6}{8}, \frac{5}{21}, -\frac{13}{16}, \frac{15}{17}$

As $\frac{-13}{16}$ is smallest

so we will compare $\frac{6}{8}, \frac{5}{21}, \frac{15}{17}$

First making the denominator same.

$\frac{6\times357}{8\times357}, \frac{5\times136}{21\times136}, \frac{15\times168}{17\times168}$

$\frac{2142}{2856}, \frac{680}{2856}, \frac{2520}{2856}$

Now compare the numerator

As 2520> 2242 > 680. So,

$\frac{2520}{2856} > \frac{2142}{2856} > \frac{680}{2856}$

$\frac{15}{17} > \frac{6}{8} > \frac{5}{21} > -\frac{13}{16}$

Ascending order:

$\frac{15}{17} > \frac{6}{8} > \frac{5}{21} > -\frac{13}{16}$

Descending order:

$-\frac{13}{16} < \frac{5}{21} < \frac{6}{8} < \frac{15}{17}$

g. $\frac{2}{3}, \frac{5}{7}, -\frac{9}{11}, \frac{10}{13}$

Sol. $\frac{2}{3}, \frac{5}{7}, -\frac{9}{11}, \frac{10}{13}$

As $\frac{-9}{11}$ is smallest

so we will compare $\frac{2}{3}, \frac{5}{7}, \frac{10}{13}$

First making the denominator same.

$\frac{2\times91}{3\times91}, \frac{5\times39}{7\times39}, \frac{10\times21}{13\times21}$

$\frac{182}{273}, \frac{195}{273}, \frac{210}{273}$

Now compare the numerator

As 210>195> 182. So,

$\frac{210}{273} > \frac{195}{273} > \frac{182}{273}$

$\frac{10}{13} > \frac{5}{7} > \frac{2}{3} > \frac{-9}{11}$

Ascending order: $\frac{10}{13} > \frac{5}{7} > \frac{2}{3} > \frac{-9}{11}$

Descending order: $\frac{-9}{11} < \frac{2}{3} < \frac{5}{7} < \frac{10}{13}$

h. $\frac{21}{23}, \frac{7}{46}, \frac{2}{69}$

Sol. $\frac{21}{23}, \frac{7}{46}, \frac{2}{69}$

First making the denominator same.

$\frac{21\times 6}{23\times 6}, \frac{7\times 3}{46\times 3}, \frac{2\times 2}{69\times 2}$

$\frac{126}{138}, \frac{21}{138}, \frac{4}{138}$

Now compare the numerator

As 126> 21>4. So,

$\frac{126}{138} > \frac{21}{138} > \frac{4}{138}$

$\frac{21}{23} > \frac{7}{46} > \frac{2}{69}$

Ascending order: $\frac{21}{23} > \frac{7}{46} > \frac{2}{69}$

Descending order: $\frac{2}{69} < \frac{7}{46} < \frac{21}{23}$

Q7. Tick the smaller number in each of the following.

a. 1.23, 1.22, 1.20

Sol.1.23, 1.22, 1.20

The smaller number is 1.20

b. 9.62, 9.09, 9.68, 9.10

Sol.9.62, 9.09, 9.68, 9.10

The smaller number is 9.09

c. 0.234, 0.23, 0.324, 0.214

Sol.0.234, 0.23, 0.324, 0.214

The smaller number is 0.214

Q8. Arrange the decimal numbers in ascending and descending order.

a. 8.5, 8.56, 8.503

Sol.8.5, 8.56, 8.503

Ascending order:

8.5, 8.503, 8.56

Descending order:

8.56, 8.503, 8.5

b. 0.231, 0.001, 0.01

Sol.0.231, 0.001, 0.01

Ascending order:

0.001, 0.01, 0.231

Descending order:

0.231, 0.01, 0.001

c. 5.112, 5.013, 5.002

Sol.5.112, 5.013, 5.002

Ascending order:

5.002, 5.013, 5.112

Descending order:

5.112, 5.013, 5.002

Review Exercise – 1

Q1. Choose the right answer.

a. The number $\frac{a}{b}$ where a, b are integers, is a rational number if b is _____.

i. Zero
ii. Not zero
iii. Less than zero
iv. One

b. A rational number is a number that can be represented in the form of _____.

i. Geometry
ii. Fraction
iii. Circle
iv. LCM

c. The neutral integers is:

i. 1
ii. −1
iii. 0
iv. 5

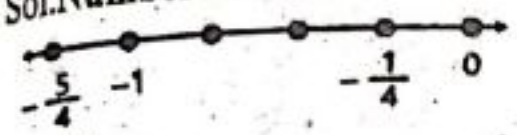
d. Rational numbers with same denominator are called _____ rational numbers.
i. Equivalent
ii. Proper
iii. Like
iv. Unlike

e. Round off 54.231 to the nearest whole number is:
i. 54
ii. 55
iii. 542
iv. 553

Q2. Express the following on a number line.

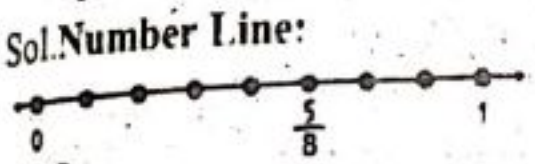
a. $-\frac{5}{4}$

Sol. Number Line:



b. $\frac{8}{5}$

Sol. Number Line:

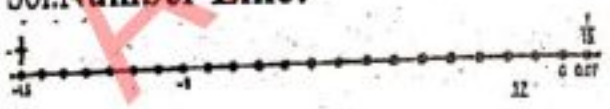


c. $\frac{15}{2}, -\frac{7}{4}$

Sol. Number Line:

d. $\frac{1}{15}, -\frac{3}{2}$

Sol. Number Line:

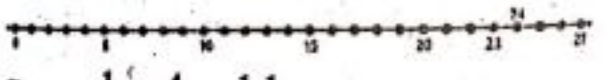


e. $\frac{17}{3}, -\frac{18}{2}$

Sol. Number Line:

f. 23, 24, 27

Sol. Number Line:

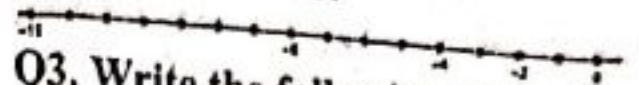


g. $-1, -4, -11$

Sol. Number Line:

h. $-2, -8, -15$

Sol. Number Line:



Q3. Write the following rational numbers in reduced form.

a. $\frac{54}{24}$

Sol. In reduced form:

$\frac{54 \div 2}{24 \div 2} = \frac{27}{12}$ Ans.

b. $\frac{5}{30}$

Sol. In reduced form:

$\frac{5 \div 5}{30 \div 5} = \frac{1}{6}$ Ans.

c. $\frac{14}{84}$

Sol. In reduced form:

$\frac{14 \div 14}{84 \div 14} = \frac{1}{6}$ Ans.

d. $\frac{77}{98}$

Sol. In reduced form:

$\frac{77 \div 7}{98 \div 7} = \frac{11}{14}$ Ans.

e, $\frac{6}{102}$

Sol. In reduced form:

$\frac{6 \div 6}{102 \div 6} = \frac{1}{17}$ Ans.

Q4. Write the three equivalent rational numbers of the following rational numbers.

a. $\frac{4}{5}$ *b.* $\frac{9}{11}$ *c.* $\frac{6}{23}$ *d.* $\frac{7}{8}$

e. $\frac{19}{25}$ *f.* $\frac{51}{67}$

Sol. Equivalent fraction of

a. $\frac{4}{5}$ are $\frac{4\times2}{5\times2}=\frac{8}{10}$

$\frac{4\times3}{5\times3}=\frac{12}{15}$ and $\frac{4\times4}{5\times4}=\frac{16}{20}$

Equivalent fraction of

b. $\frac{9}{11}$ are $\frac{9\times2}{11\times2}=\frac{18}{22}$

$\frac{9\times3}{11\times3}=\frac{27}{33}$ and $\frac{9\times4}{11\times4}=\frac{36}{44}$

Equivalent fraction of

c. $\frac{6}{23}$ are $\frac{6\times2}{23\times2}=\frac{12}{46}$

$\frac{6\times3}{23\times3}=\frac{18}{69}$ and $\frac{6\times4}{23\times4}=\frac{24}{92}$

Equivalent fraction of

d. $\frac{7}{8}$ are $\frac{7\times2}{8\times2}=\frac{14}{16}$

$\frac{7\times3}{8\times3}=\frac{21}{24}$ and $\frac{7\times4}{8\times4}=\frac{28}{32}$

Equivalent fraction of

e. $\frac{19}{25}$ are $\frac{19\times2}{25\times2}=\frac{38}{50}$

$\frac{19\times3}{25\times3}=\frac{57}{75}$ and $\frac{19\times4}{25\times4}=\frac{76}{100}$

Equivalent fraction of

f. $\frac{51}{67}$ are $\frac{51\times2}{67\times2}=\frac{102}{134}$

$\frac{51\times3}{67\times3}=\frac{152}{201}$ and $\frac{51\times4}{67\times4}=\frac{204}{268}$

Q5. Compare and write <, > or =

a. $\frac{23}{17},\frac{21}{35}$

Sol. $\frac{23}{17},\frac{21}{35}$

First making the denominator same.

$\frac{23\times35}{17\times35},\frac{21\times17}{35\times17}$

$\frac{805}{595},\frac{357}{595}$

As 805 > 357 so

$\frac{805}{595}>\frac{357}{595}$

$\Rightarrow\frac{23}{17}>\frac{21}{35}$ **Ans.**

b. $\frac{1}{-2},\frac{3}{5}$

Sol. $\frac{1}{-2},\frac{3}{5}$

Every positive fraction is greater than every negative fraction. So,

$\frac{3}{5}>\frac{1}{-2}$ **Ans.**

c. 34, 78

Sol.34, 78

78 > 34 **Ans.**

d. $-5,-7$

Sol. $-5,-7$

$-5>-7$ **Ans.**

e. 17.1, 1.5

Sol.17.1, 1.5

1.7.5 > 1.5 **Ans.**

Q6. Compare and order the rational numbers in ascending and descending order.

a. $\frac{14}{17},\frac{17}{34},\frac{5}{51}$

Sol. $\frac{14}{17},\frac{17}{34},\frac{5}{51}$

First making the denominator same.

$\frac{14\times6}{17\times6},\frac{17\times3}{34\times3},\frac{5\times2}{51\times2}$

$\frac{84}{102},\frac{51}{102},\frac{10}{102}$

As 84 > 51 > 10 so,

$\frac{84}{102} > \frac{51}{102} > \frac{10}{102}$

$\Rightarrow \frac{14}{17} > \frac{17}{34} > \frac{5}{51}$ **Ans.**

b. $\frac{3}{5}, -\frac{7}{20}, -\frac{4}{21}$

Sol. $\frac{3}{5}, -\frac{7}{20}, -\frac{4}{21}$

Every positive fraction is greater than every negative fraction so,

we will compare $-\frac{7}{20}, -\frac{4}{21}$

First we make the denominator same.

$\frac{-7\times21}{20\times21}, \frac{-4\times20}{21\times20}$

$\frac{-147}{420}, \frac{-80}{420}$ *As* $-80 > -147$

$\frac{-80}{420} > \frac{-147}{420} \Rightarrow -\frac{4}{21} > -\frac{7}{20}$

$-\frac{4}{21} > -\frac{7}{20} > \frac{3}{5}$

Ascending order: $-\frac{4}{21} > -\frac{7}{20} > \frac{3}{5}$

$\frac{3}{5} < -\frac{7}{20} < -\frac{4}{21}$

Descending order:

c. +21, +13, 0 +25

Sol. +21, +13, 0 +25

Ascending order:

0, +13, +21, +25

Descending order:

+25, +21, +13, 0

d. 65, 39, 84, 56

Sol. 65, 39, 84, 56.

Ascending order:

39, 56, 65, 84

Descending order:

84, 65, 56, 39

Unit – 2
Laws of Operations
Exercise – 2.1

Q1. Add the following.

a. $\frac{3}{4}$ and $\frac{4}{5}$

Sol. $\frac{3}{4}$ and $\frac{4}{5}$

First making the denominator same

$\Rightarrow \frac{3\times5}{4\times5} + \frac{4\times4}{5\times4} = \frac{15}{20} + \frac{16}{20}$

$\Rightarrow \frac{15+16}{4\times5} = \frac{31}{20}$ **Ans.**

b. $-\frac{7}{11}$ and $\frac{13}{14}$

Sol. $-\frac{7}{11}$ and $\frac{13}{14}$

First making the denominator same.

$\Rightarrow \frac{-7\times14}{11\times14} + \frac{13\times11}{14\times11} = \frac{-84}{154} + \frac{143}{154}$

$\Rightarrow \frac{-98+143}{154} = \frac{45}{154}$ **Ans.**

c. $-\frac{4}{9}, \frac{7}{12}$ and $-\frac{3}{8}$

Sol. $-\frac{4}{9}, \frac{7}{12}$ and $-\frac{3}{8}$

First make the denominator same.

$\Rightarrow \frac{-4\times8}{9\times8} + \frac{7\times6}{12\times6} + \frac{-3\times9}{8\times9}$

$\Rightarrow \frac{-32}{72} + \frac{42}{72} + \frac{-27}{72}$

$\Rightarrow \frac{-32+42-27}{72} = \frac{-17}{72}$ **Ans.**

d. $-\frac{3}{5}, -\frac{7}{10}$ and $\frac{4}{15}$

Sol. $-\frac{3}{5}, -\frac{7}{10}$ and $\frac{4}{15}$

First make the denominator same.

$\Rightarrow \frac{-3\times6}{5\times6} + \frac{-7\times3}{10\times3} + \frac{4\times2}{15\times2}$

$$\Rightarrow \frac{-18}{30}+\frac{-21}{30}+\frac{8}{30}$$

$$\Rightarrow \frac{-18-21+8}{30}=\frac{-31}{30}\ \textbf{Ans.}$$

e. $\frac{2}{9}$ *and* $-\frac{4}{15}$

Sol. $\frac{2}{9}$ *and* $-\frac{4}{15}$

First make the denominator same.

$$\Rightarrow \frac{2\times 5}{9\times 5}+\frac{-4\times 3}{15\times 3}$$

$$\Rightarrow \frac{10}{45}+\frac{-12}{45}$$

$$\Rightarrow \frac{10-12}{45}=\frac{-2}{45}\ \textbf{Ans.}$$

f. $-\frac{6}{7}$ *and* $\frac{9}{13}$

Sol. $-\frac{6}{7}$ *and* $\frac{9}{13}$

First make the denominator same.

$$\Rightarrow \frac{-6\times 13}{7\times 13}+\frac{9\times 7}{13\times 7}$$

$$\Rightarrow \frac{-78}{91}+\frac{63}{91}=\frac{-78+63}{91}$$

$$\Rightarrow \frac{-15}{91}\ \textbf{Ans.}$$

g. $\frac{12}{15}$ *and* $-\frac{13}{17}$

Sol. $\frac{12}{15}$ *and* $-\frac{13}{17}$

First make the denominator same

$$\Rightarrow \frac{12\times 17}{15\times 17}+\frac{-13\times 15}{17\times 15}$$

$$\Rightarrow \frac{204}{255}+\frac{-195}{255}$$

$$\Rightarrow \frac{204-195}{255}=\frac{9}{255}\ \textbf{Ans.}$$

h. $\frac{4}{13}, \frac{6}{11}$, *and* $-\frac{3}{22}$

Sol. $\frac{4}{13}, \frac{6}{11}$, *and* $-\frac{3}{22}$

First make the denominator same.

$$\Rightarrow \frac{4\times 242}{13\times 242}+\frac{6\times 286}{11\times 286}+\frac{-3\times 143}{22\times 143}$$

$$\Rightarrow \frac{968}{3146}+\frac{1716}{3146}+\frac{-429}{3146}$$

$$\Rightarrow \frac{968+1716-429}{3146}=\frac{2255}{3146}\ \textbf{Ans.}$$

i. $-\frac{1}{7}, \frac{1}{9}$ *and* $\frac{1}{5}$

Sol. $-\frac{1}{7}, \frac{1}{9}$ *and* $\frac{1}{5}$

First make the denominator same.

$$\Rightarrow \frac{-1\times 45}{7\times 45}+\frac{1\times 35}{9\times 35}+\frac{1\times 63}{5\times 63}$$

$$\Rightarrow \frac{-45}{315}+\frac{35}{315}+\frac{63}{315}$$

$$\Rightarrow \frac{-45+35+63}{315}=\frac{53}{315}\ \textbf{Ans.}$$

Q2. Subtract the following.

a. $\frac{1}{2}$ *from* $\frac{3}{5}$

Sol. $\frac{1}{2}$ *from* $\frac{3}{5}$

$$\Rightarrow \frac{3}{5}-\frac{1}{2}$$

First make the denominator same.

$\Rightarrow \frac{3\times2}{5\times2}-\frac{1\times5}{2\times5}=\frac{6}{10}-\frac{5}{10}$

$\Rightarrow \frac{6-5}{10}=\frac{1}{10}$ **Ans.**

b. $-\frac{7}{10}$ *from* $-\frac{9}{10}$

Sol. $-\frac{7}{10}$ *from* $-\frac{9}{10}$

$-\frac{9}{10}-\frac{-7}{10}$

Taking LCM

$\Rightarrow -\frac{9}{10}-\frac{-7}{10}=\frac{-9-(-7)}{10}$

$\Rightarrow \frac{-9+7}{10}=\frac{-2}{10}$ *or* $\frac{-1}{5}$ **Ans.**

c. $-\frac{4}{9}$ *from* $\frac{2}{27}$

Sol. $-\frac{4}{9}$ *from* $\frac{2}{27}$

$\Rightarrow \frac{2}{27}-\frac{-4}{9}$

First make the denominator same.

$\Rightarrow \frac{2}{27}-\frac{-4\times3}{9\times3}=\frac{2}{27}-\frac{-12}{27}$

$\Rightarrow \frac{2-(-12)}{27}=\frac{2+12}{27}=\frac{14}{27}$ **Ans.**

d. $\frac{5}{17}$ *from* $-\frac{3}{34}$

Sol. $\frac{5}{17}$ *from* $-\frac{3}{34}$

$\Rightarrow \frac{-3}{34}-\frac{5}{17}$

First make the denominator same.

$\Rightarrow \frac{-3}{34}-\frac{5\times2}{17\times2}=\frac{-3}{34}-\frac{10}{34}$

$\Rightarrow \frac{-3+10}{34}=\frac{7}{34}$ **Ans.**

e. $-\frac{7}{11}$ *from* $-\frac{1}{3}$

Sol. $-\frac{7}{11}$ *from* $-\frac{1}{3}$

$\Rightarrow \frac{-1}{3}-\frac{-7}{11}$

First make the denominator same.

$\Rightarrow \frac{-1\times11}{3\times11}-\frac{-7\times3}{11\times3}$

$\Rightarrow \frac{-11}{33}-\frac{-21}{33}$

$\Rightarrow \frac{-11-(-21)}{33}$

$\Rightarrow \frac{-11+21}{33}=\frac{10}{33}$ **Ans.**

f. $-\frac{6}{13}$ *from* $\frac{5}{14}$

Sol. $-\frac{6}{13}$ *from* $\frac{5}{14}$

$\Rightarrow \frac{5}{14}-\frac{-6}{13}$

First make the denominator same.

$\Rightarrow \frac{5\times13}{14\times13}-\frac{-6\times14}{13\times14}$

$\Rightarrow \frac{65}{182}-\frac{-84}{182}=\frac{65-(-84)}{182}$

$\Rightarrow \frac{65+84}{182}=\frac{149}{182}$ **Ans.**

g. $\frac{9}{10}$ *from* $-\frac{1}{10}$

Sol. $\frac{9}{10}$ *from* $-\frac{1}{10}$

$\Rightarrow \frac{-1}{10}-\frac{9}{10}$

Taking LCM

$$\Rightarrow \frac{-1}{10}-\frac{9}{10}=\frac{-1-9}{10}$$

$$\Rightarrow \frac{-10}{10} \text{ or } -1 \text{ Ans.}$$

h. $\frac{6}{7}$ *from* $\frac{2}{21}$

Sol. $\frac{6}{7}$ *from* $\frac{2}{21}$

$$\Rightarrow \frac{2}{21}-\frac{6}{7}$$

First make the denominator same.

$$\Rightarrow \frac{2}{21}-\frac{6\times 3}{7\times 3}=\frac{2}{21}-\frac{18}{21}$$

$$\Rightarrow \frac{2-18}{21}=\frac{-16}{21} \text{ Ans.}$$

i. $\frac{8}{13}$ *from* $\frac{7}{11}$

Sol. $\frac{8}{13}$ *from* $\frac{7}{11}$

$$\Rightarrow \frac{7}{11}-\frac{8}{13}$$

First make the denominator same.

$$\Rightarrow \frac{7\times 13}{11\times 13}-\frac{8\times 11}{13\times 11}=\frac{91}{143}-\frac{88}{143}$$

$$\Rightarrow \frac{91-88}{143}=\frac{3}{143} \text{ Ans.}$$

Exercise – 2.2

Q1. Find the additive inverse of the following rationalnumbers.

a. $\frac{4}{5}$ *b.* $\frac{-13}{6}$ *c.* $\frac{9}{-19}$

d. $\frac{6}{23}$ *e.* $\frac{-31}{97}$

Sol. The additive inverse of $\frac{4}{5}$ is $-\frac{4}{5}$.

The additive inverse of $\frac{-13}{6}$ is $\frac{13}{6}$.

The additive inverse of $\frac{9}{-19}$ is $\frac{9}{19}$.

The additive inverse of $\frac{6}{23}$ is $-\frac{6}{23}$.

The additive inverse of $\frac{-31}{97}$ is $\frac{31}{97}$.

Q2. Verify the following.

a. $\frac{-13}{14}+\frac{15}{28}=\frac{15}{28}+\frac{-13}{14}$

Sol. $\frac{-13}{14}+\frac{15}{28}=\frac{15}{28}+\frac{-13}{14}$

$$LHS=\frac{-13}{14}+\frac{15}{28}$$

$$\Rightarrow \frac{-13\times 2}{14\times 2}+\frac{15}{28}$$

$$\Rightarrow \frac{-26}{28}+\frac{15}{28}=\frac{-26+15}{28}$$

$$LHS \Rightarrow \frac{-11}{28}$$

Now

$$RHS=\frac{15}{28}+\frac{-13}{14}$$

$$\Rightarrow \frac{15}{28}+\frac{-13\times 2}{14\times 2}$$

$$\Rightarrow \frac{15}{28}+\frac{-26}{28}=\frac{15-26}{28}$$

$$RHS \Rightarrow \frac{-11}{28}$$

LHS = RHS

$\frac{-13}{14}+\frac{15}{28}=\frac{15}{28}+\frac{-13}{14}$ verified.

b. $\frac{7}{15}+\frac{-6}{17}=\frac{-6}{17}+\frac{7}{15}$

Sol. $\frac{7}{15}+\frac{-6}{17}=\frac{-6}{17}+\frac{7}{15}$

$LHS=\frac{7}{15}+\frac{-6}{17}$

$\Rightarrow\frac{7\times17}{15\times17}+\frac{-6\times15}{17\times15}$

$\Rightarrow\frac{119}{255}+\frac{-90}{255}=\frac{119-90}{255}$

$LHS\Rightarrow\frac{29}{255}$

Now

$RHS=\frac{-6}{17}+\frac{7}{15}$

$\Rightarrow\frac{-6\times15}{17\times15}+\frac{7\times17}{15\times17}$

$\Rightarrow\frac{-90}{255}+\frac{119}{255}=\frac{-90+119}{255}$

$LHS\Rightarrow\frac{29}{255}$

Thus

$\frac{7}{15}+\frac{-6}{17}=\frac{-6}{17}+\frac{7}{15}$ verified.

c. $\left(\frac{9}{20}+\frac{14}{19}\right)+\frac{1}{7}=\frac{9}{20}+\left(\frac{14}{19}+\frac{1}{7}\right)$

Sol. $\left(\frac{9}{20}+\frac{14}{19}\right)+\frac{1}{7}=\frac{9}{20}+\left(\frac{14}{19}+\frac{1}{7}\right)$

$LHS=\left(\frac{9}{20}+\frac{14}{19}\right)+\frac{1}{7}$

$\Rightarrow\left(\frac{9\times19}{20\times19}+\frac{14\times20}{19\times20}\right)+\frac{1}{7}$

$\Rightarrow\left(\frac{171}{380}+\frac{280}{380}\right)+\frac{1}{7}$

$\Rightarrow\left(\frac{171+280}{380}\right)+\frac{1}{7}=\frac{451}{380}+\frac{1}{7}$

$\Rightarrow\frac{451\times7}{380\times7}+\frac{1\times380}{7\times380}$

$\Rightarrow\frac{3157}{2660}+\frac{380}{2660}=\frac{3157+380}{2660}$

$LHS\Rightarrow\frac{3537}{2660}$

Now

$RHS=\frac{9}{20}+\left(\frac{14}{19}+\frac{1}{7}\right)$

$\Rightarrow\frac{9}{20}+\left(\frac{14\times7}{19\times7}+\frac{1\times19}{7\times19}\right)$

$\Rightarrow\frac{9}{20}+\left(\frac{98}{133}+\frac{19}{133}\right)$

$\Rightarrow\frac{9}{20}+\left(\frac{98+19}{133}\right)$

$\Rightarrow\frac{9}{20}+\frac{117}{133}$

$\Rightarrow\frac{9\times133}{20\times133}+\frac{117\times20}{133\times20}$

$\Rightarrow\frac{1197}{2660}+\frac{2340}{2660}$

LHS=RHS

$\Rightarrow\frac{1197+2340}{2660}$

$RHS\Rightarrow\frac{3537}{2660}$

Thus LHS = RHS

$\left(\frac{9}{20}+\frac{14}{19}\right)+\frac{1}{7}$

$=\frac{9}{20}+\left(\frac{14}{19}+\frac{1}{7}\right)$ verified

d. $\left(\frac{-3}{10}+\frac{11}{13}\right)+\frac{-5}{11}=\frac{-3}{10}+\left(\frac{11}{13}+\frac{-5}{11}\right)$

Sol. $\left(\frac{-3}{10}+\frac{11}{13}\right)+\frac{-5}{11}=\frac{-3}{10}+\left(\frac{11}{13}+\frac{-5}{11}\right)$

$LHS=\left(\frac{-3}{10}+\frac{11}{13}\right)+\frac{-5}{11}$

$$\Rightarrow \left(\frac{-3\times13}{10\times13}+\frac{11\times10}{13\times10}\right)+\frac{-5}{11}$$

$$\Rightarrow \left(\frac{-39}{130}+\frac{110}{130}\right)+\frac{-5}{11}$$

$$\Rightarrow \frac{-39+110}{130}+\frac{-5}{11}$$

$$\Rightarrow \frac{71}{130}+\frac{-5}{11}$$

$$\Rightarrow \frac{71\times11}{130\times11}+\frac{-5\times130}{11\times130}$$

$$\Rightarrow \frac{781}{1430}+\frac{-650}{1430}$$

$$\Rightarrow \frac{781-650}{1430}$$

$$LHS \Rightarrow \frac{131}{1430}$$

Now

$$RHS = \frac{-3}{10}+\left(\frac{11}{13}+\frac{-5}{11}\right)$$

$$\Rightarrow \frac{-3}{10}+\left(\frac{11\times11}{13\times11}+\frac{-5\times13}{11\times13}\right)$$

$$\Rightarrow \frac{-3}{10}+\left(\frac{121}{143}+\frac{-65}{143}\right)$$

$$\Rightarrow \frac{-3}{10}+\left(\frac{121-65}{143}\right)$$

$$\Rightarrow \frac{-3}{10}+\frac{56}{143}$$

$$\Rightarrow \frac{-3\times143}{10\times143}+\frac{56\times10}{143\times10}$$

$$\Rightarrow \frac{-429}{1430}+\frac{560}{1430}$$

$$\Rightarrow \frac{-429+560}{1430}$$

$$RHS \Rightarrow \frac{131}{1430}$$

Thu

LHS = RHS

$\left(\frac{-3}{10}+\frac{11}{13}\right)+\frac{-5}{11}=\frac{-3}{10}+\left(\frac{11}{13}+\frac{-5}{11}\right)$ verified

e. $\frac{2}{-3}+\left(\frac{7}{-9}+\frac{2}{-13}\right)=\left(\frac{2}{-3}+\frac{7}{-9}\right)+\frac{2}{-13}$

Sol. $\frac{2}{-3}+\left(\frac{7}{-9}+\frac{2}{-13}\right)=\left(\frac{2}{-3}+\frac{7}{-9}\right)+\frac{2}{-13}$

$$LHS = \frac{2}{-3}+\left(\frac{7}{-9}+\frac{2}{-13}\right)$$

$$\Rightarrow \frac{-2}{3}+\left(\frac{-7\times13}{9\times13}+\frac{-2\times9}{13\times9}\right)$$

$$\Rightarrow \frac{-2}{3}+\left(\frac{-91}{117}+\frac{-18}{117}\right)$$

$$\Rightarrow \frac{-2}{3}+\left(\frac{-91+(-18)}{117}\right)$$

$$\Rightarrow \frac{-2}{3}+\frac{-109}{117}$$

$$\Rightarrow \frac{-2\times117}{3\times117}+\frac{-109\times3}{117\times3}$$

$$\Rightarrow \frac{-234}{351}+\frac{-327}{351}$$

$$\Rightarrow \frac{-234+(-327)}{351}$$

$$LHS \Rightarrow \frac{-561}{351}$$

Now

$$RHS = \left(\frac{2}{-3}+\frac{7}{-9}\right)+\frac{2}{-13}$$

$$\Rightarrow \left(\frac{-2\times9}{3\times9}+\frac{-7\times3}{9\times3}\right)+\frac{-2}{13}$$

$$\Rightarrow \left(\frac{-18}{27}+\frac{-21}{27}\right)+\frac{-2}{13}$$

$$\Rightarrow \left(\frac{-18+(-21)}{27}\right)+\frac{-2}{13}$$

$$\Rightarrow \frac{-39}{27}+\frac{-2}{13}$$

$$\Rightarrow \frac{-39\times 13}{27\times 13}+\frac{-2\times 27}{13\times 27}$$

$$\Rightarrow \frac{-507}{351}+\frac{-54}{351}$$

$$\Rightarrow \frac{-507+(-54)}{351}$$

$$RHS \Rightarrow \frac{-561}{351}$$

Thus

$$\frac{2}{-3}+\left(\frac{7}{-9}+\frac{2}{-13}\right)$$

$$=\left(\frac{2}{-3}+\frac{7}{-9}\right)+\frac{2}{-13}$$ verified

f. $\left(\frac{-1}{4}+\frac{1}{6}\right)+\frac{-1}{8}=\frac{-1}{4}+\left(\frac{1}{6}+\frac{-1}{8}\right)$

Sol. $\left(\frac{-1}{4}+\frac{1}{6}\right)+\frac{-1}{8}=\frac{-1}{4}+\left(\frac{1}{6}+\frac{-1}{8}\right)$

$$LHS=\left(\frac{-1}{4}+\frac{1}{6}\right)+\frac{-1}{8}$$

$$\Rightarrow \left(\frac{-1\times 6}{4\times 6}+\frac{1\times 4}{6\times 4}\right)+\frac{-1}{8}$$

$$\Rightarrow \left(\frac{-6}{24}+\frac{4}{24}\right)+\frac{-1}{8}$$

$$\Rightarrow \frac{-6+4}{24}+\frac{-1}{8}$$

$$\Rightarrow \frac{-2}{24}+\frac{-1}{8}=\frac{-2}{24}+\frac{-1\times 3}{8\times 3}$$

$$\Rightarrow \frac{-2}{24}+\frac{-3}{24}=\frac{-2-3}{24}$$

$$LHS=\frac{-5}{24}$$

$$RHS=\frac{-1}{4}+\left(\frac{1}{6}+\frac{-1}{8}\right)$$

$$\Rightarrow \frac{-1}{4}+\left(\frac{1\times 4}{6\times 4}+\frac{-1\times 3}{8\times 3}\right)$$

$$\Rightarrow \frac{-1}{4}+\left(\frac{4}{24}+\frac{-3}{24}\right)$$

$$\Rightarrow \frac{-1}{4}+\frac{4-3}{24}$$

$$\Rightarrow \frac{-1}{4}+\frac{1}{24}=\frac{-1\times 6}{4\times 6}+\frac{1}{24}$$

$$\Rightarrow \frac{-6}{24}+\frac{1}{24}=\frac{-6+1}{24}$$

LHS = RHS

$$RHS \Rightarrow \frac{-5}{24}$$

Thus LHS = RHS

$$\left(\frac{-1}{4}+\frac{1}{6}\right)+\frac{-1}{8}=\frac{-1}{4}+\left(\frac{1}{6}+\frac{-1}{8}\right)$$ verified.

Exercise – 2.3

Q1. Multiply the following.

a. $\frac{1}{4}$ *and* $\frac{7}{8}$

Sol. Multiply $\frac{1}{4}$ *and* $\frac{7}{8}$

$$\Rightarrow \frac{1}{4}\times\frac{7}{8}=\frac{1\times 7}{4\times 8}=\frac{7}{32}$$ **Ans.**

b. $-\frac{9}{20}$ *and* $-\frac{13}{14}$

Sol. Multiply $-\frac{9}{20}$ *and* $-\frac{13}{14}$

$$\Rightarrow \frac{-9}{20}\times\frac{-13}{14}=\frac{-9\times(-13)}{20\times 14}$$

$$\Rightarrow \frac{117}{280}$$ **Ans.**

c. $-\frac{4}{9},\frac{11}{12}$ *and* $-\frac{3}{8}$

Sol. Multiply $-\frac{4}{9},\frac{11}{12}$ *and* $-\frac{3}{8}$

$$\Rightarrow \frac{\cancel{-4}^{1}}{\cancel{9}_{3}} \times \frac{11}{12} \times \frac{\cancel{-3}^{1}}{\cancel{8}_{2}} = \frac{-1}{3} \times \frac{11}{12} \times \frac{-1}{2}$$

$$\Rightarrow \frac{-1 \times 11 \times (-1)}{3 \times 12 \times 2} = \frac{11}{72} \textbf{ Ans.}$$

d. $\frac{5}{8}, \frac{1}{16}$ *and* $\frac{3}{7}$

Sol. Multiply $\frac{5}{8}, \frac{1}{16}$ *and* $\frac{3}{7}$

$$\Rightarrow \frac{5}{8} \times \frac{1}{16} \times \frac{3}{7} = \frac{5 \times 1 \times 3}{8 \times 16 \times 7}$$

$$\Rightarrow \frac{15}{896} \textbf{ Ans.}$$

e. $\frac{9}{11}, -\frac{3}{22}$ *and* $\frac{5}{33}$

Sol. Multiply $\frac{9}{11}, -\frac{3}{22}$ *and* $\frac{5}{33}$

$$\Rightarrow \frac{9}{11} \times \frac{-3}{22} \times \frac{5}{33}$$

$$\Rightarrow \frac{9 \times (-3) \times 5}{11 \times 22 \times 33} = \frac{-135}{7986} \textbf{ Ans.}$$

f. $-\frac{3}{19}$ *and* $\frac{7}{20}$

Sol. Multiply $-\frac{3}{19}$ *and* $\frac{7}{20}$

$$\Rightarrow \frac{-3}{19} \times \frac{7}{20} = \frac{-3 \times 7}{19 \times 20} = \frac{-21}{380} \textbf{ Ans.}$$

Q2. Divide the following.

a. $\frac{7}{12}$ *by* $\frac{14}{39}$

Sol. Divide $\frac{7}{12}$ *by* $\frac{14}{39}$

$$\Rightarrow \frac{7}{12} \div \frac{14}{39} = \frac{7}{12} \times \frac{39}{14}$$

$$\Rightarrow \frac{\cancel{7}^{1}}{\cancel{12}_{4}} \times \frac{\cancel{39}^{13}}{\cancel{14}_{2}} = \frac{1}{4} \times \frac{13}{2}$$

$$\Rightarrow \frac{13}{8} \textit{ or } 1\frac{5}{8} \textbf{ Ans.}$$

b. $\frac{-25}{31}$ *by* $\frac{5}{-62}$

Sol. Divide $\frac{-25}{31}$ *by* $\frac{5}{-62}$

$$\Rightarrow \frac{-25}{31} \div \frac{5}{-62} = \frac{-\cancel{25}^{5}}{\cancel{31}_{1}} \times \frac{-\cancel{62}^{2}}{\cancel{5}_{1}}$$

$$\Rightarrow \frac{-5}{1} \times \frac{-2}{1} = 10 \textbf{ Ans.}$$

c. $\frac{-1}{2}$ *by* $\frac{4}{7}$

Sol. Divide $\frac{-1}{2}$ *by* $\frac{4}{7}$

$$\Rightarrow \frac{-1}{2} \div \frac{4}{7} = \frac{-1}{2} \times \frac{7}{4}$$

$$\Rightarrow \frac{-1}{2} \times \frac{7}{4} = \frac{-7}{8} \textbf{ Ans.}$$

d. $\frac{9}{11}$ *by* $\frac{33}{35}$

Sol. Divide $\frac{9}{11}$ *by* $\frac{33}{35}$

$$\Rightarrow \frac{9}{11} \div \frac{33}{35} = \frac{\cancel{9}^{3}}{11} \times \frac{35}{\cancel{33}_{11}}$$

$$\Rightarrow \frac{3}{11} \times \frac{35}{11} = \frac{105}{121} \textbf{ Ans.}$$

e. $-\frac{19}{21}$ *by* $-\frac{21}{38}$

Sol. Divide $-\frac{19}{21}$ *by* $-\frac{21}{38}$

$$\Rightarrow \frac{-19}{21} \div \frac{-21}{38} = \frac{-19}{21} \times \frac{38}{-21}$$

$$\Rightarrow \frac{-19 \times 38}{21(-21)} = \frac{722}{441}$$ **Ans.**

f. $\frac{15}{23}$ *by* $\frac{-23}{25}$

Sol. Divide $\frac{15}{23}$ *by* $\frac{-23}{25}$

$$\Rightarrow \frac{15}{23} \div \frac{-23}{25} = \frac{15}{23} \times \frac{25}{-23}$$

$$\Rightarrow \frac{15}{23} \times \frac{25}{-23} = \frac{15 \times 25}{23(-23)}$$

$$\Rightarrow \frac{375}{529}$$ **Ans.**

g. $\frac{8}{-13}$ *by* $\frac{26}{37}$

Sol. Divide $\frac{8}{-13}$ *by* $\frac{26}{37}$

$$\Rightarrow \frac{8}{-13} \div \frac{26}{37} = \frac{8}{-13} \times \frac{-13}{8}$$

$$\Rightarrow \frac{\cancel{8}^{1}}{-13} \times \frac{-13}{\cancel{8}_{1}} = \frac{-13}{-13} = 1$$ **Ans.**

h. $-\frac{1}{7}$ *by* $-\frac{2}{15}$

Sol. Divide $-\frac{1}{7}$ *by* $-\frac{2}{15}$

$$\Rightarrow \frac{-1}{7} \div \frac{-2}{15} = \frac{-1}{7} \times \frac{15}{-2}$$

$$\Rightarrow \frac{-1 \times 15}{7(-2)} = \frac{-15}{-14} = \frac{15}{14}$$ **Ans.**

Exercise – 2.4

Q1. Find the multiplicative inverse of the following rational numbers.

a. $\frac{13}{41}$

Sol. $\frac{13}{41} \times \frac{41}{13} = 1$

As the product is equal to 1, so $\frac{41}{13}$ is the multiplicative inverse of $\frac{13}{41}$.

b. $\frac{-16}{17}$

Sol. $\frac{-16}{17} \times \frac{17}{-16} = 1$

As the product is equal to 1, so $\frac{17}{-16}$ is the multiplicative inverse of $\frac{-16}{17}$.

c. $\frac{15}{-31}$

Sol. $\frac{15}{-31} \times \frac{-31}{15} = 1$

As the product is equal to 1, so $\frac{-31}{15}$ is the multiplicative inverse of $\frac{15}{-31}$.

d. $\frac{-5}{-33}$

Sol. $\frac{-5}{-33} \times \frac{-33}{-5} = 1$

As the product is equal to 1, so $\frac{-33}{-5}$ is the multiplicative inverse of $\frac{-5}{-33}$.

e. $\frac{-97}{101}$

Sol. $\frac{-97}{101} \times \frac{101}{-97} = 1$

As the product is equal to 1, so $\frac{101}{-97}$ is the multiplicative inverse of $\frac{-97}{101}$.

Q2. Verify the commutative property of rational numbers with respect to multiplication.

a. $\frac{2}{5}\times\frac{1}{7}=\frac{1}{7}\times\frac{2}{5}$

Sol. $\frac{2}{5}\times\frac{1}{7}=\frac{1}{7}\times\frac{2}{5}$

$\Rightarrow\frac{2\times1}{5\times7}=\frac{1\times2}{7\times5}$

$\Rightarrow\frac{2}{35}=\frac{2}{35}$

Commutative property with respect to multiplication is verified.

b. $\frac{23}{34}\times\frac{32}{-35}=\frac{32}{-35}\times\frac{23}{34}$

Sol. $\frac{23}{34}\times\frac{32}{-35}=\frac{32}{-35}\times\frac{23}{34}$

$\Rightarrow\frac{23\times32}{34\times(-35)}=\frac{32\times23}{-35\times34}$

$\Rightarrow\frac{736}{-1190}=\frac{736}{-1190}$

Commutative property with respect to multiplication is verified.

c. $\frac{-11}{13}\times\frac{13}{-15}=\frac{13}{-15}\times\frac{-11}{13}$

Sol. $\frac{-11}{13}\times\frac{13}{-15}=\frac{13}{-15}\times\frac{-11}{13}$

$\Rightarrow\frac{-11\times13}{13(-15)}=\frac{13(-11)}{-15\times13}$

$\Rightarrow\frac{-143}{-195}=\frac{-143}{-195}$

Commutative property with respect to multiplication is verified.

Q3. Verify the associative property of rational numbers with respect to multiplication.

a. $\left(\frac{6}{7}\times\frac{4}{9}\right)\times\frac{1}{7}=\frac{6}{7}\times\left(\frac{4}{9}\times\frac{1}{7}\right)$

Sol. $\left(\frac{6}{7}\times\frac{4}{9}\right)\times\frac{1}{7}=\frac{6}{7}\times\left(\frac{4}{9}\times\frac{1}{7}\right)$

$\Rightarrow\left(\frac{6\times4}{7\times9}\right)\times\frac{1}{7}=\frac{6}{7}\times\left(\frac{4\times1}{9\times7}\right)$

$\Rightarrow\frac{24}{63}\times\frac{1}{7}=\frac{6}{7}\times\frac{4}{63}$

$\Rightarrow\frac{24\times1}{63\times7}=\frac{6\times4}{7\times63}$

$\Rightarrow\frac{24}{441}=\frac{24}{441}$

Associative property with respect to multiplication is verified.

b. $\left(\frac{-4}{11}\times\frac{5}{13}\right)\times\frac{-6}{17}=\frac{-4}{11}\times\left(\frac{5}{13}\times\frac{-6}{17}\right)$

Sol. $\left(\frac{-4}{11}\times\frac{5}{13}\right)\times\frac{-6}{17}=\frac{-4}{11}\times\left(\frac{5}{13}\times\frac{-6}{17}\right)$

$\Rightarrow\left(\frac{-4\times5}{11\times13}\right)\times\frac{-6}{17}=\frac{-4}{11}\times\left(\frac{5(-6)}{13\times17}\right)$

$\Rightarrow\frac{-20}{143}\times\frac{-6}{17}=\frac{-4}{11}\times\frac{-30}{221}$

$\Rightarrow\frac{-20(-6)}{143\times17}=\frac{-4(-30)}{11\times221}$

$\Rightarrow\frac{120}{2431}=\frac{120}{2431}$

Associative property with respect to multiplication is verified.

c. $\frac{1}{-7}\times\left(\frac{1}{-8}\times\frac{1}{-9}\right)=\left(\frac{1}{-7}\times\frac{1}{-8}\right)\times\frac{1}{-9}$

Sol. $\frac{1}{-7}\times\left(\frac{1}{-8}\times\frac{1}{-9}\right)=\left(\frac{1}{-7}\times\frac{1}{-8}\right)\times\frac{1}{-9}$

$$\Rightarrow \frac{1}{-7}\times\left(\frac{1\times1}{-8(-9)}\right)=\left(\frac{1\times1}{-7(-8)}\right)\times\frac{1}{-9}$$

$$\Rightarrow \frac{1}{-7}\times\frac{1}{72}=\frac{1}{56}\times\frac{1}{-9}$$

$$\Rightarrow \frac{1\times1}{-7\times72}=\frac{1\times1}{56(-9)}$$

$$\Rightarrow \frac{1}{504}=\frac{1}{504}$$

Associative property with respect to multiplication is verified.

d. $\left(\frac{3}{4}\times\frac{5}{6}\right)\times\frac{-7}{8}=\frac{3}{4}\times\left(\frac{5}{6}\times\frac{-7}{8}\right)$

Sol. $\left(\frac{3}{4}\times\frac{5}{6}\right)\times\frac{-7}{8}=\frac{3}{4}\times\left(\frac{5}{6}\times\frac{-7}{8}\right)$

$$\Rightarrow\left(\frac{3\times5}{4\times6}\right)\times\frac{-7}{8}=\frac{3}{4}\times\left(\frac{5(-7)}{6\times8}\right)$$

$$\Rightarrow \frac{15}{24}\times\frac{-7}{8}=\frac{3}{4}\times\frac{-35}{48}$$

$$\Rightarrow \frac{15(-7)}{24\times8}=\frac{3(-35)}{4\times48}$$

$$\Rightarrow \frac{-105}{192}=\frac{-105}{192}$$

Associative property with respect to multiplication is verified.

Q4. Verify the distributive property of rational numbers of multiplication.

a. $\frac{7}{8}\times\left(\frac{4}{5}+\frac{2}{3}\right)=\left(\frac{7}{8}\times\frac{4}{5}\right)+\left(\frac{7}{8}\times\frac{2}{3}\right)$

Sol. $\frac{7}{8}\times\left(\frac{4}{5}+\frac{2}{3}\right)=\left(\frac{7}{8}\times\frac{4}{5}\right)+\left(\frac{7}{8}\times\frac{2}{3}\right)$

$$\Rightarrow\frac{7}{8}\times\left(\frac{4\times3}{5\times3}+\frac{2\times5}{3\times5}\right)=\left(\frac{7\times4}{8\times5}\right)+\left(\frac{7\times2}{8\times3}\right)$$

$$\Rightarrow\frac{7}{8}\times\left(\frac{12}{15}+\frac{10}{15}\right)=\frac{28}{40}+\frac{14}{24}$$

$$\Rightarrow\frac{7}{8}\times\left(\frac{12+10}{15}\right)=\frac{28\times3}{40\times3}+\frac{14\times5}{24\times5}$$

$$\Rightarrow \frac{7}{8}\times\frac{-22}{15}=\frac{84}{120}+\frac{70}{120}$$

$$\Rightarrow \frac{7\times22}{8\times15}=\frac{84+70}{120}$$

$$\Rightarrow \frac{154}{120}=\frac{154}{120}$$

Distributive property of multiplication over addition is verified.

b. $\left(\frac{7}{-11}+\frac{-9}{13}\right)\times\frac{11}{17}=\left(\frac{7}{-11}\times\frac{11}{17}\right)+\left(\frac{-9}{13}\times\frac{11}{17}\right)$

Sol. $\left(\frac{7}{-11}+\frac{-9}{13}\right)\times\frac{11}{17}=\left(\frac{7}{-11}\times\frac{11}{17}\right)+\left(\frac{-9}{13}\times\frac{11}{17}\right)$

$$\Rightarrow\left(\frac{-7\times13}{11\times13}+\frac{-9\times11}{13\times11}\right)\times\frac{11}{17}=\frac{7\times11}{-11\times17}+\frac{-9\times11}{13\times17}$$

$$\Rightarrow\left(\frac{-91}{143}+\frac{-99}{143}\right)\times\frac{11}{17}=\frac{77}{-187}+\frac{-99}{221}$$

$$\Rightarrow\frac{-91-99}{143}\times\frac{11}{17}=\frac{77\times13}{-187\times13}+\frac{-99\times11}{221\times11}$$

$$\Rightarrow\frac{-190}{143}\times\frac{11}{17}=\frac{-1001}{2431}+\frac{-1089}{2431}$$

$$\Rightarrow\frac{-190\times11}{143\times17}=\frac{-1001-1089}{2431}$$

$$\Rightarrow \frac{-2090}{143\times17}=\frac{-2090}{2431}$$

Distributive property of multiplication over addition is verified.

c. $\left(\frac{1}{4}-\frac{1}{5}\right)\times\frac{2}{5}=\left(\frac{1}{4}\times\frac{2}{5}\right)-\left(\frac{1}{5}\times\frac{2}{5}\right)$

Sol. $\left(\frac{1}{4}-\frac{1}{5}\right)\times\frac{2}{5}=\left(\frac{1}{4}\times\frac{2}{5}\right)-\left(\frac{1}{5}\times\frac{2}{5}\right)$

$$\Rightarrow\left(\frac{1\times5}{4\times5}-\frac{1\times4}{5\times4}\right)\times\frac{2}{5}=\left(\frac{1\times2}{4\times5}\right)-\left(\frac{1\times2}{5\times5}\right)$$

$$\Rightarrow\left(\frac{5}{20}-\frac{4}{20}\right)\times\frac{2}{5}=\frac{2}{20}-\frac{2}{25}$$

$$\Rightarrow\left(\frac{5-4}{20}\right)\times\frac{2}{5}=\frac{2\times5}{20\times5}-\frac{2\times4}{25\times4}$$

$$\Rightarrow \frac{1}{20}\times\frac{2}{5}=\frac{10}{100}-\frac{8}{100}$$

$$\Rightarrow \frac{1\times 2}{20\times 5}=\frac{10-8}{100}$$

$$\Rightarrow \frac{2}{100}=\frac{2}{100}$$

Distributive property of multiplication over addition is verified.

Exercise – 2.5

Q1. The weight of an empty pot is $\frac{1}{4}$ kg. After filling with sugar, it weight $3\frac{4}{5}$ kg.

a. What is the weight of the sugar?

b. What will be the weight of the pot if it is half filled with sugar?

Sol. weight of pot $=\frac{1}{4}$ kg

Weight of pot after filling it with sugar = $3\frac{4}{5}$ kg

Weight of sugar = $3\frac{4}{5}-\frac{1}{4}$

$$\Rightarrow \frac{15+4}{5}-\frac{1}{4}=\frac{19}{5}-\frac{1}{4}$$

$$\Rightarrow \frac{19\times 4}{5\times 4}-\frac{1\times 5}{4\times 5}=\frac{76}{20}-\frac{5}{20}$$

$$\Rightarrow \frac{76-5}{20}=\frac{71}{20}$$

Convert into mixed form

$$20\overline{)71}\ 3,\ 60,\ 11 \qquad =3\frac{11}{20}\text{kg}$$

Half weight of sugar $=\frac{71}{20}\div 2$

$$\Rightarrow \frac{71}{20}\times\frac{1}{2}=\frac{71\times 1}{20\times 2}$$

$$\Rightarrow \frac{71}{40}$$

Weight of pot $=\frac{1}{4}$ kg

Weight of pot half filled with sugar = weight of pot + half weight of sugar

Weight of pot half filled with sugar

$$=\frac{71}{40}+\frac{1}{4}$$

$$\Rightarrow \frac{71}{40}+\frac{1\times 10}{4\times 10}=\frac{71}{40}+\frac{10}{40}$$

$$\Rightarrow \frac{71+10}{40}=\frac{81}{40}\text{Kg}$$

Q2. Ahtasham bought $\frac{16}{5}$ liters of honey and Talha bought $\frac{12}{7}$ liters of honey.

a. How much honey did they buy altogether?

b. How much more honey did Ahtasham buy than Talha?

Sol. Honey with Talha$=\frac{12}{7}$ litres

Honey with Ahtasham$=\frac{16}{5}$ litres

Honey bought by both of them = $\frac{12}{7}+\frac{16}{5}$

$$\Rightarrow \frac{12\times 5}{7\times 5}+\frac{16\times 7}{5\times 7}=\frac{60}{35}+\frac{112}{35}$$

$$\Rightarrow \frac{60+112}{35}=\frac{172}{35}\textit{litres}$$

Honey with Ahtasham more than Talha=

$$\frac{16}{5}-\frac{12}{7}$$

$$\Rightarrow \frac{16\times 7}{5\times 7}-\frac{12\times 5}{7\times 5}=\frac{112}{35}-\frac{60}{35}$$

$$\Rightarrow \frac{112-60}{35}=\frac{52}{35} litres$$

Q3. Hina used $2\frac{5}{9}$ m cloth to make floor cushions and $1\frac{5}{7} m$ cloth to make 2 pillows out of cloth length of 5 m.

a. How much cloth did she used?

b. How much cloth was left?

Sol. Total cloth = 5 m

Cloth for cushions= $2\frac{5}{9}$ m

Cloth for pillows = $1\frac{5}{7} m$

Cloth used = $2\frac{5}{9}+1\frac{5}{7}$

$$\Rightarrow \frac{23}{9}+\frac{12}{7}=\frac{23\times 7}{9\times 7}+\frac{12\times 9}{7\times 9}$$

$$\Rightarrow \frac{161}{63}+\frac{108}{63}=\frac{161+108}{63}$$

$$\Rightarrow \frac{269}{63} m \text{ or } 4\frac{17}{63} m$$

Cloth left = $5-4\frac{17}{63}=4\frac{17}{63} m$

Q4. $\frac{2}{5}$ of a stick is painted red, $\frac{1}{3}$ of it is painted white. The remaining part is painted blue. What part of the stick is painted blue?

Sol. Red painted = $\frac{2}{5}$

White painted = $\frac{1}{3}$

Red + white painted = $\frac{2}{5}+\frac{1}{3}$

$$\Rightarrow \frac{(2\times 3)+(1\times 5)}{5\times 3}=\frac{6+5}{15}=\frac{11}{15}$$

Remaining part = $1-\frac{11}{15}$

$$\Rightarrow \frac{1}{1}-\frac{11}{15}=\frac{(1\times 15)-(1\times 11)}{1\times 15}$$

$$\Rightarrow \frac{15-11}{15}=\frac{4}{15}$$

Remaining part

= Painted blue

So blue painted part = $\frac{4}{15}$

Q5. The perimeter of a park is 10 km. a wall is being constructed around it. If $\frac{4}{5}$ of the wall has been constructed, how much part of the wall is incomplete?

Sol.Perimeter of park = 10 km

Constructed part of wall = $\frac{4}{5}$

Remaining part of wall

= Whole wall – Constructed part

Remaining part of wall = $1-\frac{4}{5}$

$$\Rightarrow \frac{1}{1}-\frac{4}{5}=\frac{5-4}{5}=\frac{1}{5}$$ **Ans.**

Q6. Tariq sold $2\frac{2}{5} kg, 4\frac{1}{5} kg, 3\frac{2}{3} kg$ and $4\frac{1}{2} kg$ of almonds from Monday to Thursday respectively. On Friday, he sold $\frac{1}{2}$ of the previous four days total sold quantity.

a. How much almonds he sold on Friday?

b. How much almonds he sold from Monday to Thursday?

Sol.

Almonds sold from Monday to Thursday

$$= 2\frac{2}{5}kg + 4\frac{1}{5}kg + 3\frac{2}{3}kg + 4\frac{1}{2}kg$$

Total sale =

$$\frac{10+2}{5} + \frac{20+1}{5} + \frac{9+2}{3} + \frac{8+1}{2}$$

$$\Rightarrow \frac{12}{5} + \frac{21}{5} + \frac{11}{3} + \frac{9}{2}$$

$$\Rightarrow \frac{12\times6}{5\times6} + \frac{21\times6}{5\times6} + \frac{11\times10}{3\times10} + \frac{9\times15}{2\times15}$$

$$\Rightarrow \frac{72}{30} + \frac{126}{30} + \frac{110}{30} + \frac{135}{30}$$

$$\Rightarrow \frac{72+126+110+135}{30} = \frac{443}{30}$$

$$\Rightarrow \frac{443}{30}kg \text{ or } 14\frac{23}{30}kg$$

Sale on Friday = $\frac{1}{2}$ of $\frac{443}{30}$

$$\Rightarrow \frac{1}{2}\times\frac{443}{30} = \frac{443}{60}kg \text{ or } 7\frac{23}{60}kg$$

Q7. The length of Hiba's room is 6.5 m andwidth is 5.7 m. How much will it cost to carpet the room if it costs Rs.140 per m^2?

Sol. Length of room = 6.5 m

Width of room = 5.7 m

Area of room=length × width

Area of room = 6.5 × 5.7

Area of room = 37.05 m^2

Cost of carpeting per m^2=140

Cost of carpeting an area of 37.05 m^2

= 37.05 × 140 = Rs.5,187 **Ans.**

Exercise – 2.6

Q1. Simplify the following expressions using BODMAS rule. (Round off the answer to 3 decimal places where necessary)

a. $2\frac{1}{3}\div\left(3\frac{1}{3}+1\frac{2}{3}\right)$

Sol. $2\frac{1}{3}\div\left(3\frac{1}{3}+1\frac{2}{3}\right)$

$$\Rightarrow \frac{6+1}{3}\div\left(\frac{9+1}{3}+\frac{3+2}{3}\right)$$

$$\Rightarrow \frac{7}{3}\div\left(\frac{10}{3}+\frac{5}{3}\right)$$

$$\Rightarrow \frac{7}{3}\div\left(\frac{10+5}{3}\right)$$

$$\Rightarrow \frac{7}{3}\div\frac{15}{3} \Rightarrow \frac{7}{\cancel{3}}\times\frac{\cancel{3}}{15}$$

$$\Rightarrow \frac{7}{15}$$ **Ans.**

b. $2\frac{1}{5}\div\left\{4\times\left(\frac{3}{2}+\frac{7}{5}\right)\right\}-\frac{5}{29}$

Sol. $2\frac{1}{5}\div\left\{4\times\left(\frac{3}{2}+\frac{7}{5}\right)\right\}-\frac{5}{29}$

$$\Rightarrow \frac{10+1}{5}\div\left\{4\times\left(\frac{3\times5}{2\times5}+\frac{7\times2}{5\times2}\right)\right\}-\frac{5}{29}$$

$$\Rightarrow \frac{11}{5}\div\left\{4\times\left(\frac{15}{10}+\frac{14}{10}\right)\right\}-\frac{5}{29}$$

$$\Rightarrow \frac{11}{5}\div\left\{4\times\left(\frac{15+14}{10}\right)\right\}-\frac{5}{29}$$

$$\Rightarrow \frac{11}{5}\div\left\{4\times\frac{29}{10}\right\}-\frac{5}{29}$$

$$\Rightarrow \frac{11}{5}\div\frac{116}{10}-\frac{5}{29}$$

$$\Rightarrow \frac{11}{\cancel{5}_1}\times\frac{\cancel{10}^2}{116}-\frac{5}{29}$$

$$\Rightarrow \frac{22}{116}-\frac{5}{29} \Rightarrow \frac{22}{116}-\frac{5\times4}{29\times4}$$

$$\Rightarrow \frac{22}{116}-\frac{20}{116} = \frac{22-20}{116}$$

$$\Rightarrow \frac{2}{116} \text{ or } \frac{1}{58}$$ **Ans.**

c. $\frac{3}{5}\times\left[\frac{2}{3}-\left\{2\frac{3}{5}+\frac{5}{6}-\frac{29}{10}\right\}\right]$

Sol. $\frac{3}{5}\times\left[\frac{2}{3}-\left\{2\frac{3}{5}+\frac{5}{6}-\frac{29}{10}\right\}\right]$

$$\Rightarrow \frac{3}{5}\times\left[\frac{2}{3}-\left\{\frac{13}{5}+\frac{5}{6}-\frac{29}{10}\right\}\right]$$

$$\Rightarrow \frac{3}{5}\times\left[\frac{2}{3}-\left\{\frac{13\times6}{5\times6}+\frac{5\times5}{6\times5}-\frac{29\times3}{10\times3}\right\}\right]$$

$$\Rightarrow \frac{3}{5}\times\left[\frac{2}{3}-\left\{\frac{78}{30}+\frac{25}{30}-\frac{87}{30}\right\}\right]$$

$$\Rightarrow \frac{3}{5}\times\left[\frac{2}{3}-\left\{\frac{78+25-87}{30}\right\}\right]$$

$$\Rightarrow \frac{3}{5}\times\left[\frac{2}{3}-\frac{16}{30}\right] \Rightarrow \frac{3}{5}\times\left[\frac{2\times10}{3\times10}-\frac{16}{30}\right]$$

$$\Rightarrow \frac{3}{5}\times\left[\frac{20}{30}-\frac{16}{30}\right] \Rightarrow \frac{3}{5}\times\left[\frac{20-16}{30}\right]$$

$$\Rightarrow \frac{\cancel{3}^{1}}{5}\times\frac{4}{\cancel{30}_{10}}=\frac{\cancel{4}^{2}}{\cancel{50}_{25}}=\frac{2}{25}\ \textbf{Ans.}$$

d. $1\frac{7}{8}\div\left[\frac{5}{6}\times\left\{2\frac{2}{5}\times\left(\frac{4}{5}-\frac{1}{2}\right)\right\}\right]$

Sol. $1\frac{7}{8}\div\left[\frac{5}{6}\times\left\{2\frac{2}{5}\times\left(\frac{4}{5}-\frac{1}{2}\right)\right\}\right]$

$$\Rightarrow \frac{8+7}{8}\div\left[\frac{5}{6}\times\left\{\frac{10+2}{5}\times\left(\frac{4\times2}{5\times2}-\frac{1\times5}{2\times5}\right)\right\}\right]$$

$$\Rightarrow \frac{15}{8}\div\left[\frac{5}{6}\times\left\{\frac{12}{5}\times\left(\frac{8}{10}-\frac{5}{10}\right)\right\}\right]$$

$$\Rightarrow \frac{15}{8}\div\left[\frac{5}{6}\times\left\{\frac{12}{5}\times\left(\frac{8-5}{10}\right)\right\}\right]$$

$$\Rightarrow \frac{15}{8}\div\left[\frac{5}{6}\times\left\{\frac{12}{5}\times\frac{3}{10}\right\}\right]$$

$$\Rightarrow \frac{15}{8}\div\left[\frac{5}{6}\times\frac{36}{50}\right] \Rightarrow \frac{15}{8}\div\left[\frac{\cancel{5}^{1}}{\cancel{6}_{1}}\times\frac{\cancel{36}^{6}}{\cancel{50}_{10}}\right]$$

$$\Rightarrow \frac{15}{8}\div\frac{6}{10} \Rightarrow \frac{15}{8}\times\frac{10}{6}$$

$$\Rightarrow \frac{150}{48}=\frac{25}{8}\ \textbf{Ans.}$$

e. $\left(1\frac{1}{4}\right)^{2}\times\left\{\frac{6}{25}\div\frac{3}{5}+\left(\frac{1}{3}+4\frac{1}{2}-2\frac{1}{3}\right)\right\}$ **sol.**

$\left(1\frac{1}{4}\right)^{2}\times\left\{\frac{6}{25}\div\frac{3}{5}+\left(\frac{1}{3}+4\frac{1}{2}-2\frac{1}{3}\right)\right\}$

$$\Rightarrow \left(\frac{5}{4}\right)^{2}\times\left\{\frac{6}{25}\div\frac{3}{5}+\left(\frac{1}{3}+\frac{9}{2}-\frac{7}{3}\right)\right\}$$

$$\Rightarrow \left(\frac{5}{4}\right)^{2}\times\left\{\frac{6}{25}\times\frac{5}{3}+\left(\frac{1\times2}{3\times2}+\frac{9\times3}{2\times3}-\frac{7\times2}{3\times2}\right)\right\}$$

$$\Rightarrow \left(\frac{5}{4}\right)^{2}\times\left\{\frac{\cancel{6}^{2}}{\cancel{25}_{5}}\times\frac{\cancel{5}^{1}}{\cancel{3}_{1}}+\left(\frac{2}{6}+\frac{27}{6}-\frac{14}{6}\right)\right\}$$

$$\Rightarrow \left(\frac{5}{4}\right)^{2}\times\left\{\frac{2}{5}+\left(\frac{2+27-14}{6}\right)\right\}$$

$$\Rightarrow \frac{25}{16}\times\left\{\frac{2}{5}+\frac{15}{6}\right\}$$

$$\Rightarrow \frac{25}{16}\times\left\{\frac{2\times6}{5\times6}+\frac{15\times5}{6\times5}\right\}$$

$$\Rightarrow \frac{25}{16}\times\left\{\frac{12}{30}+\frac{75}{30}\right\}$$

$$\Rightarrow \frac{25}{16}\times\left\{\frac{12+75}{30}\right\}=\frac{25}{16}\times\frac{87}{30}$$

$$\Rightarrow \frac{\cancel{25}^{5}}{16}\times\frac{87}{\cancel{30}_{6}}=\frac{5}{16}\times\frac{\cancel{87}^{29}}{\cancel{6}_{2}}$$

$$\Rightarrow \frac{5\times29}{16\times2}=\frac{145}{32}\ \textbf{Ans.}$$

f. $3.3+2.02\times(50.85-32.15)$

Sol. $3.3+2.02\times(50.85-32.15)$

$\Rightarrow 3.3+2.02\times18.70$

$\Rightarrow 3.3+37.774=41.074\ \textbf{Ans.}$

g. $(3.9)^{2}+(15.89\times22.8-70.1)$

Sol. $(3.9)^{2}+(15.89\times22.8-70.1)$

$\Rightarrow (3.9)^{2}+(362.292-70.1)$

$\Rightarrow (3.9)^{2}+292.192$

$\Rightarrow 15.21+292.192=307.402\ \textbf{Ans.}$

h. $0.088\times\{3.01+2.02(2-0.75)\}$

Sol. $0.088\times\{3.01+2.02(2-0.75)\}$

$\Rightarrow 0.088\times\{3.01+2.02\times1.25\}$

$\Rightarrow 0.088\times\{3.01+2.525\}$

$\Rightarrow 0.088\times5.535=0.0487\ \textbf{Ans}$

i. $9-\{2.4285+(1.0714\div0.7142)\}$ **sol.**

$9-\{2.4285+(1.0714\div0.7142)\}$

$\Rightarrow 9-\{2.4285+1.5\}$

$\Rightarrow 9-3.9285=5.071$ Ans.

j. $5.5-\left[1.55\times\{(3.25-0.25)\times 0.572\}\right]$ sol.

$5.5-\left[1.55\times\{(3.25-0.25)\times 0.572\}\right]$

$\Rightarrow 5.5-\left[1.55\times\{3\times 0.572\}\right]$

$\Rightarrow 5.5-\left[1.55\times 1.716\right]$

$\Rightarrow 5.5-2.6598=2.840$ Ans.

Review Exercise – 2

Q1. Choose the correct option.

a) $\frac{7}{9}+\frac{1}{2}=$ ____

i. $\frac{23}{18}$ ii. $\frac{8}{18}$

iii. $\frac{20}{18}$ iv. $\frac{15}{18}$

b) $\frac{5}{13}+\frac{-7}{26}=$ ____

i. $\frac{-3}{26}$ ii. $\frac{+3}{26}$

iii. $\frac{-2}{26}$ iv. $\frac{2}{26}$

c) $\frac{-11}{15}+\frac{-2}{15}=$ ____

i. $\frac{-9}{15}$ ii. $\frac{-13}{15}$

iii. $\frac{9}{15}$ iv. $\frac{13}{15}$

d) Rational numbers with the same denominator are called ___ rational numbers.

i. non-zero ii. proper

iii. like iv. unlike

e) $\frac{14}{21}$ is an equivalent rational number of ___

i. $\frac{7}{3}$ ii. $\frac{2}{3}$

iii. $\frac{2}{21}$ iv. $\frac{3}{2}$

f) $\frac{1}{6}+\frac{-2}{5}=$ ___

i. $\frac{-7}{30}$ ii. $\frac{2}{6}$

iii. $\frac{-2}{5}$ iv. $\frac{-2}{11}$

g) Additive inverse of $\frac{5}{6}$ is ___

i. 0 ii. 1

iii. $\frac{-5}{6}$ iv. $\frac{-6}{5}$

Q2. Add the following.

a) $\frac{7}{15}$ *and* $\frac{3}{11}$

Sol. $\frac{7}{15}$ *and* $\frac{3}{11}$

$\Rightarrow \frac{7\times 11}{15\times 11}+\frac{3\times 15}{11\times 15}$

$\Rightarrow \frac{77}{165}+\frac{45}{165}=\frac{77+45}{165}$

$\Rightarrow \frac{122}{165}$ Ans.

b) $-\frac{11}{41}$ *and* $-\frac{2}{82}$

Sol. $-\frac{11}{41}$ *and* $-\frac{2}{82}$

$\Rightarrow \frac{-11}{41}+\frac{-2}{82}$

$\Rightarrow \frac{-11\times 2}{41\times 2}+\frac{-2}{82}$

$\Rightarrow \frac{-22}{82}+\frac{-2}{82}=\frac{-22-2}{82}$

$\Rightarrow \frac{-24}{82}$ Ans.

c) $-\frac{3}{17},\frac{5}{17}$ *and* $-\frac{3}{34}$

Sol. $-\frac{3}{17},\frac{5}{17}$ *and* $-\frac{3}{34}$

$\Rightarrow \frac{-3}{17}+\frac{5}{17}+\frac{-3}{34}$

$\Rightarrow \frac{-3\times 2}{17\times 2}+\frac{5\times 2}{17\times 2}+\frac{-3}{34}$

$\Rightarrow \frac{-6}{34}+\frac{10}{34}+\frac{-3}{34}$

$\Rightarrow \frac{-6+10-3}{34} = \frac{1}{34}$ **Ans.**

d) $-\frac{14}{15}, -\frac{17}{18}$ *and* $\frac{19}{20}$

Sol. $-\frac{14}{15}, -\frac{17}{18}$ *and* $\frac{19}{20}$

$\Rightarrow \frac{-14}{15} + \frac{-17}{18} + \frac{19}{20}$

$\Rightarrow \frac{-14\times12}{15\times12} + \frac{-17\times10}{18\times10} + \frac{19\times9}{20\times9}$

$\Rightarrow \frac{-168}{180} + \frac{-170}{180} + \frac{171}{180}$

$\Rightarrow \frac{-168-170+171}{180} = \frac{-167}{180}$ **Ans.**

e) $\frac{4}{27}$ *and* $-\frac{1}{24}$

Sol. $\frac{4}{27}$ *and* $-\frac{1}{24}$

$\Rightarrow \frac{4\times8}{27\times8} + \frac{-1\times9}{24\times9}$

$\Rightarrow \frac{32}{216} + \frac{-9}{216} = \frac{32-9}{216}$

$\Rightarrow \frac{23}{216}$ **Ans**

f) $\frac{11}{21}, -\frac{7}{21}$ *and* $-\frac{11}{42}$

Sol. $\frac{11}{21}, -\frac{7}{21}$ *and* $-\frac{11}{42}$

$\Rightarrow \frac{11\times2}{21\times2} + \frac{-7\times2}{21\times2} + \frac{-11}{42}$

$\Rightarrow \frac{22}{42} + \frac{-14}{42} + \frac{-11}{42}$

$\Rightarrow \frac{22-14-11}{42}$

$\Rightarrow \frac{-3}{24} = \frac{-1}{8}$ **Ans.**

Q3. Subtract the following.

a) $\frac{9}{14}$ *from* $\frac{2}{28}$

Sol. $\frac{9}{14}$ *from* $\frac{2}{28}$

$\Rightarrow \frac{2}{28} - \frac{9\times2}{14\times2}$

$\Rightarrow \frac{2}{28} - \frac{18}{28} = \frac{2-18}{28}$

$\Rightarrow \frac{-16}{28}$ *or* $\frac{-4}{7}$ **Ans.**

b) $-\frac{17}{21}$ *from* $-\frac{18}{23}$

Sol. $-\frac{17}{21}$ *from* $-\frac{18}{23}$

$\Rightarrow \frac{-18\times21}{23\times21} - \frac{-17\times23}{21\times23}$

$\Rightarrow \frac{-378}{483} - \frac{-391}{483}$

$\Rightarrow \frac{-378-(-391)}{483} = \frac{-378+391}{483}$

$\Rightarrow \frac{13}{483}$ **Ans.**

c) $-\frac{4}{9}$ *from* $\frac{2}{27}$

Sol. $-\frac{4}{9}$ *from* $\frac{2}{27}$

$\Rightarrow \frac{2}{27} - \frac{-4\times3}{9\times3} = \frac{2}{27} - \frac{-12}{27}$

$\Rightarrow \frac{2-(-12)}{27} = \frac{14}{27}$ **Ans.**

d) $\frac{5}{17}$ *from* $-\frac{3}{34}$

Sol. $\frac{5}{17}$ *from* $-\frac{3}{34}$

$\Rightarrow \frac{-3}{34} - \frac{5\times2}{17\times2} = \frac{-3}{34} - \frac{10}{34}$

$\Rightarrow \frac{-3-10}{34} = \frac{-13}{34}$ **Ans.**

e) $-\frac{51}{61}$ *from* $-\frac{2}{122}$

Sol. $-\frac{51}{61}$ *from* $-\frac{2}{122}$

$\Rightarrow \frac{-2}{122} - \frac{-51}{61}$

$\Rightarrow \frac{-2}{122} - \frac{-51\times2}{61\times2}$

$\Rightarrow \frac{-2}{122} - \frac{-102}{122} = \frac{-2-(-102)}{122}$

$\Rightarrow \frac{-2+102}{122} = \frac{100}{122}$ *or* $\frac{50}{61}$ **Ans.**

f) $-\frac{5}{42}$ *from* $\frac{1}{21}$

Sol. $-\frac{5}{42}$ *from* $\frac{1}{21}$

$\Rightarrow \frac{1}{21} - \frac{-5}{42}$

$\Rightarrow \frac{1\times 2}{21\times 2} - \frac{-5}{42} = \frac{2}{42} - \frac{-5}{42}$

$\Rightarrow \frac{2-(-5)}{42} = \frac{2+5}{42}$

$\Rightarrow \frac{7}{42}$ *or* $\frac{1}{6}$ **Ans.**

Q4. Multiply the following.

a) $\frac{11}{14}$ *and* $\frac{27}{28}$

Sol. $\frac{11}{14}$ *and* $\frac{27}{28}$

$\Rightarrow \frac{11}{14}\times\frac{27}{28} = \frac{11\times 27}{14\times 28}$

$\Rightarrow \frac{729}{392}$ **Ans.**

b) $-\frac{34}{35}$ *and* $-\frac{7}{17}$

Sol. $-\frac{34}{35}$ *and* $-\frac{7}{17}$

$\Rightarrow \frac{-34}{35}\times\frac{-7}{17}$

$\Rightarrow \frac{-\cancel{34}^{2}}{\cancel{35}_{5}}\times\frac{-7^{1}}{\cancel{17}_{1}} = \frac{2}{5}$ **Ans.**

c) $-\frac{1}{9}, \frac{5}{12}$ *and* $-\frac{2}{25}$

Sol. $-\frac{1}{9}, \frac{5}{12}$ *and* $-\frac{2}{25}$

$\Rightarrow \frac{-1}{9}\times\frac{5}{12}\times\frac{-2}{25}$

$\Rightarrow \frac{-1}{9}\times\frac{\cancel{5}^{1}}{\cancel{12}_{6}}\times\frac{-\cancel{2}^{1}}{\cancel{25}_{5}} = \frac{-1\times 1\times -1}{9\times 6\times 5}$

$\Rightarrow \frac{1}{270}$ **Ans.**

d) $-\frac{13}{15}, -\frac{13}{20}$ *and* $\frac{7}{25}$

Sol. $-\frac{13}{15}, -\frac{13}{20}$ *and* $\frac{7}{25}$

$\Rightarrow \frac{-13}{15}\times\frac{-13}{20}\times\frac{7}{25}$

$\Rightarrow \frac{-13\times(-13)\times 7}{15\times 20\times 25}$

$\Rightarrow \frac{1183}{7500}$ **Ans.**

e) $\frac{7}{88}, \frac{11}{35}$ *and* $\frac{33}{77}$

Sol. $\frac{7}{88}, \frac{11}{35}$ *and* $\frac{33}{77}$

$\Rightarrow \frac{7}{88}\times\frac{11}{35}\times\frac{33}{77}$

$\Rightarrow \frac{7}{\cancel{88}_{8}}\times\frac{\cancel{11}^{1}}{35}\times\frac{\cancel{33}^{3}}{\cancel{77}_{7}} = \frac{7\times 1\times 3}{8\times 35\times 7}$

$\Rightarrow \frac{21}{1960}$ **Ans.**

f) $\frac{98}{99}, -\frac{33}{44}$ *and* $-\frac{7}{8}$

Sol. $\frac{98}{99}, -\frac{33}{44}$ *and* $-\frac{7}{8}$

$\Rightarrow \frac{\cancel{98}^{49}}{\cancel{99}_{9}}\times\frac{-\cancel{33}^{3}}{\cancel{44}_{22}}\times\frac{-7}{8}$

$\Rightarrow \frac{49(-3)(-7)}{9\times 22\times 8} = \frac{1029}{1584}$ **Ans.**

Q5. Find the reciprocal of the following.

a) $\frac{98}{99}$ *b)* $\frac{56}{-78}$ *c)* $\frac{-3}{37}$

d) $\frac{-7}{-41}$ *e)* $\frac{-39}{71}$

Sol. Replace the numerator by the denominator and the denominator by the numerator.

Reciprocal of $\frac{98}{99}$ *is* $\frac{99}{98}$

Reciprocal of $\frac{56}{-78}$ *is* $\frac{-78}{56}$

Reciprocal of $\frac{-3}{37}$ *is* $\frac{37}{-3}$

Reciprocal of $\frac{-7}{-41}$ *is* $\frac{-41}{-7}$

Reciprocal of $\frac{-39}{71}$ *is* $\frac{71}{-39}$

Q6. Divide the following.

a) $\frac{17}{22}$ *by* $\frac{24}{51}$

Sol. $\frac{17}{22}$ *by* $\frac{24}{51}$

$\Rightarrow \frac{17}{22} \div \frac{24}{51}$

$\Rightarrow \frac{17}{22} \times \frac{51}{24} = \frac{17 \times 51}{22 \times 24}$

$\Rightarrow \frac{867}{528}$ **Ans.**

b) $\frac{-26}{37}$ *by* $\frac{74}{-75}$

Sol. $\frac{-26}{37}$ *by* $\frac{74}{-75}$

$\Rightarrow \frac{-26}{37} \div \frac{74}{-75}$

$\Rightarrow \frac{-\cancel{26}^{13}}{37} \times \frac{-75}{\cancel{74}_{37}}$

$\Rightarrow \frac{-13(-75)}{37 \times 37} = \frac{975}{1369}$ **Ans.**

c) $\frac{-1}{3}$ *by* $\frac{3}{4}$

Sol. $\frac{-1}{3}$ *by* $\frac{3}{4}$

$\Rightarrow \frac{-1}{3} \div \frac{3}{4}$

$\Rightarrow \frac{-1}{3} \times \frac{4}{3} = \frac{-4}{9}$ **Ans.**

d) $\frac{49}{51}$ *by* $\frac{13}{17}$

Sol. $\frac{49}{51}$ *by* $\frac{13}{17}$

$\Rightarrow \frac{49}{51} \div \frac{13}{17}$

$\Rightarrow \frac{49}{\cancel{51}_{3}} \times \frac{\cancel{17}^{1}}{13}$

$\Rightarrow \frac{49 \times 1}{3 \times 13} = \frac{49}{39}$ **Ans.**

e) $-\frac{23}{41}$ *by* $-\frac{21}{31}$

Sol. $-\frac{23}{41}$ *by* $-\frac{21}{31}$

$\Rightarrow \frac{-23}{41} \div \frac{-21}{31}$

$\Rightarrow \frac{-23}{41} \times \frac{31}{-21}$

$\Rightarrow \frac{(-23) \times 31}{41(-21)} = \frac{713}{861}$ **Ans.**

f) $\frac{32}{33}$ *by* $\frac{-62}{77}$

Sol. $\frac{32}{33}$ *by* $\frac{-62}{77}$

$\Rightarrow \frac{32}{33} \div \frac{-62}{77}$

$\Rightarrow \frac{\cancel{32}^{16}}{\cancel{33}_{3}} \times \frac{\cancel{77}^{7}}{\cancel{-62}_{31}}$

$\Rightarrow \frac{16 \times 7}{3(-31)} = \frac{112}{-93}$ **Ans.**

g) $\frac{1}{-13}$ *by* $\frac{26}{37}$

Sol. $\frac{1}{-13}$ *by* $\frac{26}{37}$

$\Rightarrow \frac{1}{-13} \div \frac{26}{37}$

$\Rightarrow \frac{1}{-13} \times \frac{37}{26}$

$\Rightarrow \frac{1 \times 37}{-13 \times 26} = \frac{37}{-338}$ **Ans.**

h) $-\frac{1}{9}$ *by* $-\frac{2}{81}$

Sol. $-\frac{1}{9}$ *by* $-\frac{2}{81}$

$\Rightarrow \frac{-1}{9}+\frac{-2}{81}$

$\Rightarrow \frac{-1}{9}\times\frac{81}{-2}$

$\Rightarrow \frac{-1}{9_1}\times\frac{\cancel{81}^{9}}{-2}=\frac{9}{2}$ Ans.

Q7. Find the additive inverse of the following rational numbers.

a) $\frac{77}{78}$

Sol. The additive inverse of $\frac{77}{78}$ *is* $-\frac{77}{78}$

b) $\frac{-16}{33}$

Sol. The additive inverse of $\frac{-16}{33}$ *is* $\frac{16}{33}$

c) $\frac{44}{-53}$

Sol. The additive inverse of $\frac{44}{-53}$ *is* $\frac{44}{53}$

d) $\frac{-1}{-3}$

Sol. The additive inverse of $\frac{-1}{-3}$ *is* $-\frac{1}{3}$

e) $\frac{-21}{56}$

Sol. The additive inverse of $\frac{-21}{56}$ *is* $\frac{21}{56}$

Q8. Find the multiplicative inverse of the following rational numbers.

a) $\frac{1}{31}$

Sol. $\frac{1}{31}\times\frac{31}{1}=1$

As the product is equal to 1, so $\frac{1}{31}$ is the multiplicative inverse of $\frac{31}{1}$.

b) $\frac{-6}{21}$

Sol. $\frac{-6}{21}\times\frac{21}{-6}=1$

As the product is equal to 1, so $\frac{-6}{21}$ is the multiplicative inverse of $\frac{21}{-6}$.

c) $\frac{1}{-100}$

Sol. $\frac{1}{-100}$

As the product is equal to 1, so $\frac{1}{-1000}$ is the multiplicative inverse of -1000.

d) $\frac{-4}{-133}$

Sol. $\frac{-4}{-133}\times\frac{-133}{-4}=1$

As the product is equal to 1, so $\frac{-4}{-133}$ is the multiplicative inverse of $\frac{-133}{-4}$.

e) $\frac{-17}{121}$

Sol. $\frac{-17}{121}\times\frac{121}{-17}=1$

As the product is equal to 1,

so $\frac{-17}{121}$ is the multiplicative inverse of $\frac{121}{-17}$.

Q9. Verify the commutative property of rational number under addition and multiplications.

a) $\frac{2}{3},\frac{8}{9}$

Sol. $\frac{2}{3},\frac{8}{9}$

Commutative property of addition.

$\frac{2}{3}+\frac{8}{9}=\frac{8}{9}+\frac{2}{3}$

$\frac{2\times9}{3\times9}+\frac{8\times3}{9\times3}=\frac{8\times3}{9\times3}+\frac{2\times9}{3\times9}$

$\frac{18}{27}+\frac{24}{27}=\frac{24}{27}+\frac{18}{27}$

$\frac{18+24}{27}=\frac{24+18}{27}$

$\frac{42}{27}=\frac{42}{27}$ **Verified.**

Commutative property of multiplication

$\Rightarrow \frac{2}{3}\times\frac{8}{9}=\frac{8}{9}\times\frac{2}{3}$

$\Rightarrow \frac{2\times 8}{3\times 9}=\frac{8\times 2}{9\times 3}$

$\Rightarrow \frac{16}{27}=\frac{16}{27}$ **Verified.**

b) $\frac{3}{4},\frac{5}{8}$

Sol. $\frac{3}{4},\frac{5}{8}$

Commutative property of addition.

$\Rightarrow \frac{3}{4}+\frac{5}{8}=\frac{5}{8}+\frac{3}{4}$

$\Rightarrow \frac{3\times 2}{4\times 2}+\frac{5}{8}=\frac{5}{8}+\frac{3\times 2}{4\times 2}$

$\Rightarrow \frac{6}{8}+\frac{5}{8}=\frac{5}{8}+\frac{6}{8}$

$\Rightarrow \frac{6+5}{8}=\frac{5+6}{8}$

$\Rightarrow \frac{11}{8}=\frac{11}{8}$ **Verified.**

Commutative property of multiplication

$\Rightarrow \frac{3}{4}\times\frac{5}{8}=\frac{5}{8}\times\frac{3}{4}$

$\Rightarrow \frac{3\times 5}{4\times 8}=\frac{5\times 3}{8\times 4}$

$\Rightarrow \frac{15}{32}=\frac{15}{32}$ **Verified.**

c) $\frac{11}{28},\frac{33}{44}$

Sol. $\frac{11}{28},\frac{33}{44}$

Commutative property of addition.

$\Rightarrow \frac{11}{28}+\frac{33}{44}=\frac{33}{44}+\frac{11}{28}$

$\Rightarrow \frac{11\times 11}{28\times 11}+\frac{33\times 7}{44\times 7}=\frac{33\times 7}{44\times 7}+\frac{11\times 11}{28\times 11}$

$\Rightarrow \frac{121}{308}+\frac{231}{308}=\frac{231}{308}+\frac{121}{308}$

$\Rightarrow \frac{121+231}{308}=\frac{231+121}{308}$

$\Rightarrow \frac{352}{308}=\frac{352}{308}$ **Verified.**

Commutative property of multiplication

$\Rightarrow \frac{11}{28}\times\frac{33}{44}=\frac{33}{44}\times\frac{11}{28}$

$\Rightarrow \frac{\cancel{11}^{1}}{28}\times\frac{33}{\cancel{44}_{4}}=\frac{33}{\cancel{44}_{4}}\times\frac{\cancel{11}^{1}}{28}$

$\Rightarrow \frac{1\times 33}{28\times 4}=\frac{33\times 1}{4\times 28}$

$\Rightarrow \frac{33}{112}=\frac{33}{112}$ **Verified.**

d) $\frac{11}{15},\frac{-21}{56}$

Sol. $\frac{11}{15},\frac{-21}{56}$

Commutative property of addition.

$\Rightarrow \frac{11}{15}+\frac{-21}{56}=\frac{-21}{56}+\frac{11}{15}$

$\Rightarrow \frac{11\times 56}{15\times 56}+\frac{-21\times 15}{56\times 15}=\frac{-21\times 15}{56\times 15}+\frac{11\times 56}{15\times 56}$

$\Rightarrow \frac{616}{840}+\frac{-315}{840}=\frac{-315}{840}+\frac{616}{840}$

$\Rightarrow \frac{616+(-315)}{840}=\frac{-315+616}{840}$

$\Rightarrow \frac{301}{840}=\frac{301}{840}$ **Verified.**

Commutative property of multiplication

$\Rightarrow \frac{11}{15}\times\frac{-21}{56}=\frac{-21}{56}\times\frac{11}{15}$

$\Rightarrow \frac{11}{\cancel{15}_{5}}\times\frac{-21^{7}}{56}=\frac{-21^{7}}{56}\times\frac{11}{\cancel{15}_{5}}$

$\Rightarrow \frac{-7\times 11}{56\times 5}=\frac{11\times(-7)}{5\times 56}$

$\Rightarrow \frac{-77}{280}=\frac{-77}{280}$ **Verified.**

e) $\frac{-1}{-3},\frac{-16}{33}$

Sol. $\frac{-1}{-3},\frac{-16}{33}$

Commutative property of addition.

$$\Rightarrow \frac{-1}{-3}+\frac{-16}{33}=\frac{-16}{33}+\frac{-1}{-3}$$

$$\Rightarrow \frac{1\times11}{3\times11}+\frac{-16}{33}=\frac{-16}{33}+\frac{1\times11}{3\times11}$$

$$\Rightarrow \frac{11}{33}+\frac{-16}{33}=\frac{-16}{33}+\frac{11}{33}$$

$$\Rightarrow \frac{11+(-16)}{33}=\frac{-16+11}{33}$$

$$\Rightarrow \frac{-5}{33}=\frac{-5}{33}$$ **Verified.**

Commutative property of multiplication

$$\Rightarrow \frac{1}{3}\times\frac{-16}{33}=\frac{-16}{33}\times\frac{1}{3}$$

$$\Rightarrow \frac{1(-16)}{3\times33}=\frac{-16\times1}{33\times3}$$

$$\Rightarrow \frac{-16}{99}=\frac{-16}{99}$$ **Verified.**

f) $\frac{24}{51},\frac{-39}{71}$

Sol. $\frac{24}{51},\frac{-39}{71}$

Commutative property of addition.

$$\Rightarrow \frac{24}{51}+\frac{-39}{71}=\frac{-39}{71}+\frac{24}{51}$$

$$\Rightarrow \frac{24\times71}{51\times71}+\frac{-39\times51}{71\times51}=\frac{-39\times51}{71\times51}+\frac{24\times71}{51\times71}$$

$$\Rightarrow \frac{1704}{3621}+\frac{-1989}{3621}=\frac{-1989}{3621}+\frac{1704}{3621}$$

$$\Rightarrow \frac{1704+(-1989)}{3621}=\frac{-1989+1704}{3621}$$

$$\Rightarrow \frac{-285}{3621}=\frac{-285}{3621}$$ **Verified.**

, Commutative property of multiplication

$$\Rightarrow \frac{24}{51}\times\frac{-39}{71}=\frac{-39}{71}\times\frac{24}{51}$$

$$\Rightarrow \frac{24(-39)}{51\times71}=\frac{-39\times24}{71\times51}$$

$$\Rightarrow \frac{-936}{36211}=\frac{-936}{3621}$$ **Verified.**

Q10. Verify the associative property of rational numbers under addition and multiplications.

a) $\frac{17}{2},\frac{1}{6},\frac{2}{-13}$

Sol. $\frac{17}{2},\frac{1}{6},\frac{2}{-13}$

Associative property of addition

$$\Rightarrow \left(\frac{17}{2}+\frac{1}{6}\right)+\frac{-2}{13}=\frac{17}{2}+\left(\frac{1}{6}+\frac{-2}{13}\right)$$

$$\Rightarrow \left(\frac{17\times3}{2\times3}+\frac{1}{6}\right)+\frac{-2}{13}=\frac{17}{2}+\left(\frac{1\times13}{6\times13}+\frac{-2\times6}{13\times6}\right)$$

$$\Rightarrow \left(\frac{51}{6}+\frac{1}{6}\right)+\frac{-2}{13}=\frac{17}{2}+\left(\frac{13}{78}+\frac{-12}{78}\right)$$

$$\Rightarrow \left(\frac{51+1}{6}\right)+\frac{-2}{13}=\frac{17}{2}+\left(\frac{13-12}{78}\right)$$

$$\Rightarrow \frac{52}{6}+\frac{-2}{13}=\frac{17}{2}+\frac{1}{78}$$

$$\Rightarrow \frac{52\times13}{6\times13}+\frac{-2\times6}{13\times6}=\frac{17\times39}{2\times39}+\frac{1}{78}$$

$$\Rightarrow \frac{676}{78}+\frac{-12}{78}=\frac{663}{78}+\frac{1}{78}$$

$$\Rightarrow \frac{676-12}{78}=\frac{663+1}{78}$$

$$\Rightarrow \frac{664}{78}=\frac{664}{78}$$ **Verified.**

Associative property of multiplication

$$\Rightarrow \left(\frac{17}{2}\times\frac{1}{6}\right)\times\frac{-2}{13}=\frac{17}{2}\times\left(\frac{1}{6}\times\frac{-2}{13}\right)$$

$$\Rightarrow \left(\frac{17\times1}{2\times6}\right)\times\frac{-2}{13}=\frac{17}{2}\times\left(\frac{1(-2)}{6\times13}\right)$$

$$\Rightarrow \frac{17}{12}\times\frac{-2}{13}=\frac{17}{2}\times\frac{-2}{78}$$

$$\Rightarrow \frac{17(-2)}{12\times13}=\frac{17(-2)}{2\times78}$$

$$\Rightarrow \frac{-34}{156}=\frac{-34}{156}$$ **Verified.**

b) $\frac{1}{7},\frac{-2}{77},\frac{5}{14}$

Sol. $\frac{1}{7},\frac{-2}{77},\frac{5}{14}$

Associative property of addition

$$\Rightarrow \left(\frac{1}{7}+\frac{-2}{77}\right)+\frac{5}{14}=\frac{1}{7}+\left(\frac{-2}{77}+\frac{5}{14}\right)$$

$$\Rightarrow\left(\frac{1\times11}{7\times11}+\frac{-2}{77}\right)+\frac{5}{14}=\frac{1}{7}+\left(\frac{-2\times2}{77\times2}+\frac{5\times11}{14\times11}\right)$$

$$\Rightarrow\left(\frac{11}{77}+\frac{-2}{77}\right)+\frac{5}{14}=\frac{1}{7}+\left(\frac{-4}{154}+\frac{55}{154}\right)$$

$$\Rightarrow\left(\frac{11+(-2)}{77}\right)+\frac{5}{14}=\frac{1}{7}+\left(\frac{-4+55}{154}\right)$$

$$\Rightarrow\frac{9}{77}+\frac{5}{14}=\frac{1}{7}+\frac{51}{154}$$

$$\Rightarrow\frac{9\times2}{77\times2}+\frac{5\times11}{14\times11}=\frac{1\times22}{7\times22}+\frac{51}{154}$$

$$\Rightarrow\frac{18}{154}+\frac{55}{154}=\frac{22}{154}+\frac{51}{154}$$

$$\Rightarrow\frac{18+55}{154}=\frac{22+51}{154}$$

$$\Rightarrow\frac{73}{154}=\frac{73}{154}$$ **Verified.**

Associative property of multiplication

$$\Rightarrow\left(\frac{1}{7}\times\frac{-2}{77}\right)\times\frac{5}{14}=\frac{1}{7}\times\left(\frac{-2}{77}\times\frac{5}{14}\right)$$

$$\Rightarrow\left(\frac{1(-2)}{7\times77}\right)\times\frac{5}{14}=\frac{1}{7}\times\left(\frac{-2\times5}{77\times14}\right)$$

$$\Rightarrow\frac{-2}{539}\times\frac{5}{14}=\frac{1}{7}\times\frac{-10}{1078}$$

$$\Rightarrow\frac{-2\times5}{539\times14}=\frac{1\times(-10)}{7\times1078}$$

$$\Rightarrow\frac{-10}{7546}=\frac{-10}{7546}$$ **Verified.**

c) $\frac{2}{-3},\frac{-1}{4},\frac{-21}{31}$

Sol. $\frac{2}{-3},\frac{-1}{4},\frac{-21}{31}$

Associative property of addition

$$\Rightarrow\left(\frac{-2\times4}{3\times4}+\frac{-1\times3}{4\times3}\right)+\frac{-21}{31}$$

$$=\frac{-2}{3}+\left(\frac{-1\times31}{4\times31}+\frac{-21\times4}{31\times4}\right)$$

$$\Rightarrow\left(\frac{-8}{12}+\frac{-3}{12}\right)+\frac{-21}{31}$$

$$=\frac{-2}{3}+\left(\frac{-31}{124}+\frac{-84}{124}\right)$$

$$\Rightarrow\left(\frac{-8+(-3)}{12}\right)+\frac{-21}{31}$$

$$=\frac{-2}{3}+\left(\frac{-31+(-84)}{124}\right)$$

$$\Rightarrow\frac{-11}{12}+\frac{-21}{31}=\frac{-2}{3}+\frac{-115}{124}$$

$$\Rightarrow\frac{-11\times31}{12\times31}+\frac{-21\times12}{31\times12}$$

$$=\frac{-2\times124}{3\times124}+\frac{-115\times3}{124\times3}$$

$$\Rightarrow\frac{-341}{372}+\frac{-252}{372}=\frac{-248}{372}+\frac{-345}{372}$$

$$\Rightarrow\frac{-341+(-252)}{372}=\frac{-248+(-345)}{372}$$

$$\Rightarrow\frac{-593}{372}=\frac{-593}{372}$$ **Verified.**

Associative property of multiplication

$$\Rightarrow\left(\frac{-2}{3}\times\frac{-1}{4}\right)\times\frac{-21}{31}=\frac{-2}{3}\times\left(\frac{-1}{4}\times\frac{-21}{31}\right)$$

$$\Rightarrow\left(\frac{-2(-1)}{3\times4}\right)\times\frac{-21}{31}=\frac{-2}{3}\times\left(\frac{-1(-21)}{4\times31}\right)$$

$$\Rightarrow\frac{2}{12}\times\frac{-21}{31}=\frac{-2}{3}\times\frac{21}{124}$$

$$\Rightarrow\frac{2(-21)}{12\times31}=\frac{-2\times21}{3\times124}$$

$$\Rightarrow\frac{-42}{372}=\frac{-42}{372}$$ **Verified.**

d) $\frac{5}{-44},\frac{9}{47},\frac{-1}{21}$

Sol. $\frac{5}{-44},\frac{9}{47},\frac{-1}{21}$

Associative property of addition

$$\Rightarrow\frac{-5}{44}+\left(\frac{9}{47}+\frac{-1}{21}\right)=\left(\frac{-5}{44}+\frac{9}{47}\right)+\frac{-1}{21}$$

$$\Rightarrow\frac{-5}{44}+\left(\frac{9\times21}{47\times21}+\frac{-1\times47}{21\times47}\right)$$

$$=\left(\frac{-5\times47}{44\times47}+\frac{9\times44}{47\times44}\right)+\frac{-1}{21}$$

$$\Rightarrow \frac{-5}{44}+\left(\frac{189}{987}+\frac{-47}{987}\right)$$

$$=\left(\frac{-235}{2068}+\frac{396}{2068}\right)+\frac{-1}{21}$$

$$\Rightarrow \frac{-5}{44}+\left(\frac{189+(-47)}{987}\right)$$

$$=\left(\frac{-235+396}{2068}\right)+\frac{-1}{21}$$

$$\Rightarrow \frac{-5}{44}+\frac{142}{987}=\frac{161}{2068}+\frac{-1}{21}$$

$$\Rightarrow \frac{-5\times 987}{44\times 987}+\frac{142\times 44}{987\times 44}$$

$$=\frac{161\times 21}{2068\times 21}+\frac{-1\times 2068}{21\times 2068}$$

$$\Rightarrow \frac{-4935}{43428}+\frac{6248}{43428}=\frac{3381}{43428}+\frac{-2068}{43428}$$

$$\Rightarrow \frac{-4935+6248}{43428}=\frac{3381+(-2068)}{43428}$$

$$\Rightarrow \frac{1313}{43428}=\frac{1313}{43428}$$ **Verified.**

Associative property of multiplication

$$\Rightarrow \frac{-5}{44}\times\left(\frac{9}{47}\times\frac{-1}{21}\right)=\left(\frac{-5}{44}\times\frac{9}{47}\right)\times\frac{-1}{21}$$

$$\Rightarrow \frac{-5}{44}\times\left(\frac{9(-1)}{47\times 21}\right)=\left(\frac{-5\times 9}{44\times 47}\right)\times\frac{-1}{21}$$

$$\Rightarrow \frac{-5}{44}\times\frac{-9}{987}=\frac{-45}{2068}\times\frac{-1}{21}$$

$$\Rightarrow \frac{-5(-9)}{44\times 987}=\frac{-45(-1)}{2068\times 21}$$

$$\Rightarrow \frac{45}{43428}=\frac{45}{43428}$$ **Verified.**

e) $\frac{56}{57},\frac{11}{16},\frac{-2}{12}$

Sol. $\frac{56}{57},\frac{11}{16},\frac{-2}{12}$

Associative property of addition

$$\Rightarrow \frac{56}{57}+\left(\frac{11}{16}+\frac{-2}{12}\right)=\left(\frac{56}{57}+\frac{11}{16}\right)+\frac{-2}{12}$$

$$\Rightarrow \frac{56}{57}+\left(\frac{11\times 3}{16\times 3}+\frac{-2\times 4}{12\times 4}\right)$$

$$=\left(\frac{56\times 16}{57\times 16}+\frac{11\times 57}{16\times 57}\right)+\frac{-2}{12}$$

$$\Rightarrow \frac{56}{57}+\left(\frac{33}{48}+\frac{-8}{48}\right)$$

$$=\left(\frac{896}{912}+\frac{627}{912}\right)+\frac{-2}{12}$$

$$\Rightarrow \frac{56}{57}+\left(\frac{33-8}{48}\right)=\left(\frac{896+627}{912}\right)+\frac{-2}{12}$$

$$\Rightarrow \frac{56}{57}+\frac{25}{48}=\frac{1523}{912}+\frac{-2}{12}$$

$$\Rightarrow \frac{56\times 16}{57\times 16}+\frac{25\times 19}{48\times 19}=\frac{1523}{912}+\frac{-2\times 76}{12\times 76}$$

$$\Rightarrow \frac{896}{912}+\frac{475}{912}=\frac{1523}{912}+\frac{-152}{912}$$

$$\Rightarrow \frac{896+475}{912}=\frac{1523-152}{912}$$

$$\Rightarrow \frac{1371}{912}=\frac{1371}{912}$$ **Verified.**

Associative property of multiplication

$$\Rightarrow \frac{56}{57}\times\left(\frac{11}{16}\times\frac{-2}{12}\right)=\left(\frac{56}{57}\times\frac{11}{16}\right)\times\frac{-2}{12}$$

$$\Rightarrow \frac{56}{57}\times\left(\frac{11(-2)}{16\times 12}\right)=\left(\frac{56\times 11}{57\times 16}\right)\times\frac{-2}{12}$$

$$\Rightarrow \frac{56}{57}\times\left(\frac{-22}{192}\right)=\left(\frac{616}{912}\right)\times\frac{-2}{12}$$

$$\Rightarrow \frac{56}{57}\times\frac{-22}{192}=\frac{616}{912}\times\frac{-2}{12}$$

$$\Rightarrow \frac{56(-22)}{57\times 192}=\frac{616(-2)}{912\times 12}$$

$$\Rightarrow \frac{-1232}{10944}=\frac{-1232}{10944}$$ **Verified.**

f) $\frac{-6}{7},\frac{37}{-42},\frac{3}{17}$

Sol. $\frac{-6}{7},\frac{37}{-42},\frac{3}{17}$

Associative property of addition

$$\Rightarrow\left(\frac{-6}{7}+\frac{-37}{42}\right)+\frac{3}{17}=\frac{-6}{7}+\left(\frac{-37}{42}+\frac{3}{17}\right)$$

$$\Rightarrow\left(\frac{-6\times6}{7\times6}+\frac{-37}{42}\right)+\frac{3}{17}$$

$$=\frac{-6}{7}+\left(\frac{-37\times17}{42\times17}+\frac{3\times42}{17\times42}\right)$$

$$\Rightarrow\left(\frac{-36}{42}+\frac{-37}{42}\right)+\frac{3}{17}$$

$$=\frac{-6}{7}+\left(\frac{-629}{714}+\frac{126}{714}\right)$$

$$\Rightarrow\left(\frac{-36-37}{42}\right)+\frac{3}{17}=\frac{-6}{7}+\left(\frac{-629+126}{714}\right)$$

$$\Rightarrow\frac{-73}{42}+\frac{3}{17}=\frac{-6}{7}+\frac{-503}{714}$$

$$\Rightarrow\frac{-73\times17}{42\times17}+\frac{3\times42}{17\times42}=\frac{-6\times102}{7\times102}+\frac{-503}{714}$$

$$\Rightarrow\frac{-1241}{714}+\frac{126}{714}=\frac{-612}{714}+\frac{-503}{714}$$

$$\Rightarrow\frac{-1241+126}{714}=\frac{-612-503}{714}$$

$$\Rightarrow\frac{-1115}{714}=\frac{-1115}{714}$$ **Verified.**

Associative property of multiplication

$$\Rightarrow\left(\frac{-6}{7}\times\frac{-37}{42}\right)\times\frac{3}{17}=\frac{-6}{7}\times\left(\frac{-37}{42}\times\frac{3}{17}\right)$$

$$\Rightarrow\left(\frac{-6(-37)}{7\times42}\right)\times\frac{3}{17}=\frac{-6}{7}\times\left(\frac{-37\times3}{42\times17}\right)$$

$$\Rightarrow\frac{222}{294}\times\frac{3}{17}=\frac{-6}{7}\times\frac{-111}{714}$$

$$\Rightarrow\frac{666}{4998}=\frac{666}{4998}$$ **Verified.**

Q11. Simplify the following expressions.

a) $13.65-\left[4.65+3\times\left\{18.45-(3.65\times3.75)\right\}\right]$

Sol. $13.65-\left[4.65+3\times\left\{18.45-(3.65\times3.75)\right\}\right]$

$\Rightarrow 13.65-\left[4.65+3\times\left\{18.45-13.6875\right\}\right]$

$\Rightarrow 13.65-\left[4.65+3\times4.7625\right]$

$\Rightarrow 13.65-\left[4.65+14.2875\right]$

$\Rightarrow 13.65-18.9375$

$\Rightarrow -5.2875$ Ans

b) $\left[\left\{\left(9\times\frac{1}{3}-\frac{3}{9}\right)\div\frac{5}{16}\right\}\times\frac{5}{12}+\frac{3}{4}\right]$

Sol. $\left[\left\{\left(9\times\frac{1}{3}-\frac{3}{9}\right)\div\frac{5}{16}\right\}\times\frac{5}{12}+\frac{3}{4}\right]$

$$\Rightarrow\left[\left\{\left(\frac{9}{3}-\frac{3}{9}\right)\div\frac{5}{16}\right\}\times\frac{5}{12}+\frac{3}{4}\right]$$

$$\Rightarrow\left[\left\{\left(\frac{9\times3}{3\times3}-\frac{3}{9}\right)\div\frac{5}{16}\right\}\times\frac{5}{12}+\frac{3}{4}\right]$$

$$\Rightarrow\left[\left\{\left(\frac{27}{9}-\frac{3}{9}\right)\div\frac{5}{16}\right\}\times\frac{5}{12}+\frac{3}{4}\right]$$

$$\Rightarrow\left[\left\{\left(\frac{27-9}{9}\right)\div\frac{5}{16}\right\}\times\frac{5}{12}+\frac{3}{4}\right]$$

$$\Rightarrow\left[\left\{\frac{18}{9}\div\frac{5}{16}\right\}\times\frac{5}{12}+\frac{3}{4}\right]$$

$$\Rightarrow\left[\left\{\frac{18}{9}\times\frac{16}{5}\right\}\times\frac{5}{12}+\frac{3}{4}\right]$$

$$\Rightarrow\left[\left\{\frac{18\times16}{9\times5}\right\}\times\frac{5}{12}+\frac{3}{4}\right]$$

$$\Rightarrow\left[\frac{288}{45}\times\frac{5}{12}+\frac{3}{4}\right]$$

$$\Rightarrow\left[\frac{\cancel{288}^{24}}{\cancel{45}_{9}}\times\frac{\cancel{5}^{1}}{\cancel{12}_{1}}+\frac{3}{4}\right]$$

$$\Rightarrow\left[\frac{\cancel{24}^{8}}{\cancel{9}_{3}}+\frac{3}{4}\right]=\frac{8}{3}+\frac{3}{4}$$

$$\Rightarrow\frac{8\times4}{3\times4}+\frac{3\times3}{4\times3}=\frac{32}{12}+\frac{9}{12}$$

$$\Rightarrow\frac{32+9}{12}=\frac{41}{12}$$ **Ans.**

Q12. While travelling Rohaan paid Rs.36.45 for a rickshaw, Rs.34.50 for a metro bus and Rs.56.56 for a metro train. If he had Rs.1300, find the total amount he was left with.

Sol. For rickshaw = 36.45

For metro bus = 34.50

For metro train = 56.56

Total amount = 36.50 + 34.50 + 56.56

Total amount = 127.56

Rohan has = 1300

He left with rupees = 1300 – 127.56 = 1173.44 **Ans.**

Q13. The pack of large erasers has 8 erasers; the pack of medium erasers has 15 erasers each and the pack of small erasers has 20 erasers each. Ibrahim has 3 small, 2 medium and 2 large packs of erasers. How many erasers does he have altogether?

Sol.Pieces in large pack = 8

Number of large packs = 2

Number of erasers in large pack =

$$2 \times 8 = 16$$

Pieces in medium pack = 15

Number of medium packs = 2

Number of erasers in medium pack =

$$2 \times 15 = 30$$

Pieces in small pack = 20

Number of small packs = 3

Number of erasers in small pack =

$$20 \times 3 = 60$$

Total erasers = 16 + 30 + 60 = 106 **Ans.**

Q11. Usman and his family use $13\frac{3}{9}\ell$ of water for bathing, $10\frac{5}{15}\ell$ for cleaning and $6\frac{2}{9}\ell$ for cooking respectively. How much water do they use?

Sol.water used for bathing

$$= 13\frac{3}{9}\ell$$

water used for cleaning

$$= 10\frac{5}{15}\ell$$

water used for cooking

$$= 6\frac{2}{9}\ell$$

total water used

$$= 13\frac{3}{9} + 10\frac{5}{15} + 6\frac{2}{9}$$

$$\Rightarrow \frac{120}{9} + \frac{155}{15} + \frac{56}{9}$$

$$\Rightarrow \frac{120 \times 5}{9 \times 5} + \frac{155 \times 3}{15 \times 3} + \frac{56 \times 5}{9 \times 5}$$

$$\Rightarrow \frac{600}{45} + \frac{465}{45} + \frac{280}{45}$$

$$\Rightarrow \frac{600 + 465 + 280}{45} = \frac{1,345}{45}$$

$$\Rightarrow 29\frac{40}{45} \text{ or } 29\frac{8}{9} \text{ Ans.}$$

Q12. In a restaurant, a family ordered 3 sandwiches for Rs 250 each, 2 glasses of cold drinks for Rs 180 each and one cup of coffee for Rs 210. They paid additional tax of Rs 112. If they gave a Rs 5,000 note the cashier, how much was their total bill? How much amount did they get as change?

Sol.price of 1 sandwich = 250

Price of 3 sandwiches = $3 \times 250 = 750$

Price of 1 glass cold drink = 180

Price of 2 glass cold drinks =

$$2 \times 180 = 360$$

Price of 1 cup coffee = 210

Additional tax paid = 112

Total bill = 750 + 360 + 210 + 112 = 1,432

Rupees given to cashier = 5,000

Amount they get as change = 5,000 – 1,432 = 3,568 **Ans.**

Q13. Ali and Fahad have Rs 564.32 and Rs 876.89 respectively. They want to buy a Tafseer book for Rs 2234.23. how many more rupees do they need to buy to Tafseer book?

Sol. Ali has = 564.32

Fahad has = 876.89

Total amount with ali and fahad = 564.32 + 876.89 = 1,441.21

Price of Tafseer book = 2234.23

Amount of money they needed = 2,234.23 – 1,441.21 = 793.02 **Ans**

Unit – 3
Square and Square Root
Exercise – 3.1

Q1. Find the square of the following numbers.

a) 16

Sol. 16

Taking square of 16

$(16)^2 = 16 \times 16$

$(16)^2 = 256$ **Ans.**

b) 625

Sol. 625

Taking square of 625

$(625)^2 = 625 \times 625$

$(625)^2 = 390,625$ **Ans.**

c) 1560

Sol. 1560

Taking square of 1560

$(1560)^2 = 1560 \times 1560$

$(1560)^2 = 2,433,600$ **Ans.**

d) 1089

Sol. 1089

Taking square of 1089

$(1089)^2 = 1089 \times 1089$

$(1089)^2 = 1,185,921$ **Ans.**

e) 562

Sol. 562

Taking square of 562

$(562)^2 = 562 \times 562$

$(562)^2 = 315,844$ **Ans.**

f) 1600

Sol. 1600

Taking square of 1600

$(1600)^2 = 1600 \times 1600$

$(1600)^2 = 2,560,000$ **Ans.**

g) 810

Sol. 810

Taking square of 810

$(810)^2 = 810 \times 810$

$(810)^2 = 656,100$ **Ans.**

h) 2500

Sol. 2500

Taking square of 2500

$(2500)^2 = 2500 \times 2500$

$(2500)^2 = 6,250,000$ **Ans.**

i) 490

Sol. 490

Taking square of 490

$(490)^2 = 490 \times 490$

$(490)^2 = 240,100$ **Ans.**

j) 5600

Sol. 5600

Taking square of 5600

$(5600)^2 = 5600 \times 5600$

$(5600)^2 = 31,360,000$ **Ans.**

k) 10200

Sol. 10200

Taking square of 10200

$(10200)^2 = 10200 \times 10200$

$(10200)^2 = 104,040,000$ **Ans.**

l) 1210

Sol. 1210

Taking square of 1210

$(1210)^2 = 1210 \times 1210$

$(1210)^2 = 1,464,100$ **Ans.**

Q2. Without solving, check whether the following numbers can be perfect squares by looking at their ending digit(s).

Note: The numbers ending with 1, 4, 5, 6, 9 and 00 may or may not be perfect square. While the numbers ending with 2, 3, 7, 8 and 0 are not perfect square.

a) 441

Sol. 441 ends with 1 so it may or may not be a perfect square.

Checking:

$441 = 21 \times 21$

$441 = (21)^2$

Thus 441 is a perfect square.

b) 625

Sol.625 ends with 5 so it may or may not be a perfect square.

Checking:

$625 = 25 \times 25$

$625 = (25)^2$

Thus 625 is a perfect square.

c) 2560

Sol.2560 ends with one '0' so it is not a perfect square.

d) 1089

Sol.1089 ends with 9 so it may or may not be a perfect square.

Checking:

$1089 = 33 \times 33$

$1089 = (33)^2$

Thus 1089 is a perfect square.

e) 562

Sol.562 ends with one '2' so it is not a perfect square.

f) 1600

Sol.1600 ends with '00' so it may or may not be a perfect square.

Checking:

$1600 = 40 \times 40$

$1600 = (40)^2$

Thus 1600 is a perfect square.

g) 810

Sol.810 ends with one '0' so it is not a perfect square.

h) 2500

Sol.2500 ends with '00' so it may or may not be a perfect square.

Checking:

$2500 = 50 \times 50$

$2500 = (50)^2$

Thus 2500 is a perfect square.

i) 490

Sol.490 ends with one '0' so it is not a perfect square.

j) 5600

Sol. 5600 ends with '00' so it may or may not be a perfect square.

As 56 is not a perfect square so 5600 will be also not a perfect square.

k) 10200

Sol. 10200 ends with '00' so it may or may not be a perfect square.

As 102 is not a perfect square so 10200 will be also not a perfect square.

l) 1210

Sol. 1210 ends with one '0' so it is not a perfect square.

Q3. Test whether the following are a perfect squares or not by using prime factorization.

a) 49

Sol. 49

Prime factorization of 49

7	49
7	7
	1

$49 = 7 \times 7 = 7^2$

All factors of 49 are written in form of pairs so 49 is a perfect square.

b) 98

Sol. 98

Prime factorization of 98

2	98
7	49
7	7
	1

$98 = 2 \times 7 \times 7 = 2 \times 7^2$

All factors of 98 cannot be written in form of pairs so 98 is not a perfect square.

c) 144

Sol. 144

Prime factorization of 144

2	144
2	72
2	36
2	18
3	9
3	3
	1

$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$

$144 = 2^2 \times 2^2 \times 3^2$

All factors of 144 are written in form of pairs so 144 is a perfect square.

d) 784

Sol. 784

Prime factorization of 784

2	784
2	392
2	196
2	98
7	49
7	7
	1

$784 = 2\times2\times2\times2\times7\times7$

$784 = 2^2\times2^2\times7^2$

All factors of 784 are written in form of pairs so 784 is a perfect square.

e) **125**

Sol. 125

Prime factorization of 125

5	125
5	25
5	5
	1

$125 = 5\times5\times5$

All factors of 125 cannot be written in form of pairs so 125 is not a perfect square.

f) **1600**

Sol. 1600

Prime factorization of 1600

2	1600
2	800
2	400
2	200
2	100
2	50
5	25
5	5
	1

$1600 = 2\times2\times2\times2\times2\times2\times5\times5$

$1600 = 2^2\times2^2\times2^2\times5^2$

All factors of 1600 can be written in form of pairs so 1600 is a perfect square.

g) **147**

Sol. 147

Prime factorization of 147

3	147
7	49
7	7
	1

h) **81**

Sol. 81

Prime factorization of 81

3	81
3	27
3	9
3	3
	1

$81 = 3\times3\times3\times3$

$81 = 3^2\times3^2$

All factors of 81 can be written in form of pairs so 81 is a perfect square.

i) **450**

Sol. 450

Prime factorization of 450

2	450
3	225
3	75
5	25
5	5
	1

$450 = 2\times3\times3\times5\times5$

$450 = 2\times3^2\times5^2$

All factors of 450 cannot be written in form of pairs so 450 is not a perfect square.

j) **630**

Sol. 630

Prime factorization of 630

2	630
5	215
43	43
	1

$630 = 2\times5\times43$

All factors of 630 cannot be written in form of pairs so 630 is not a perfect square.

k) 90

Sol. 90

Prime factorization of 90

2	90
3	45
3	15
5	5
	1

$90 = 2\times3\times3\times5$

$90 = 2\times3^2\times5$

All factors of 90 cannot be written in form of pairs so 90 is not a perfect square.

l) 900

Sol. 900

Prime factorization of 900

2	900
3	450
3	150
2	50
5	25
5	5
	1

$900 = 2\times2\times3\times3\times5\times5$

$900 = 2^2\times3^2\times5^2$

All factors of 900 can be written in form of pairs so 900 is a perfect square.

Q4. Tick the perfect squares of even numbers.

Note: Square of even number is even and square of odd number is odd.

a) 81

Sol. 81 is odd. So it is the square of an odd number i.e. 9.

b) 121

Sol. 121 is odd. So it is the square of an odd number i.e. 11

c) 256

Sol. 256 is even. So it is the square of an even number i.e. 14

d) 324

Sol. 324 is even. So it is the square of an even number i.e. 18

e) 49

Sol. 49 is odd. So it is the square of an odd number i.e. 7

f) 625

Sol. 625is odd. So it is the square of an odd number i.e. 25

g) 25

Sol. 25 is odd. So it is the square of an odd number i.e. 5

Q5. Verify that the square of each of the following proper fractions is less than the fraction.

a) $\frac{3}{4}$

Sol. $\frac{3}{4}$

Taking square

$$\left(\frac{3}{4}\right)^2 = \frac{3^2}{4^2} = \frac{9}{16}$$

as we can see $\frac{3}{4} > \frac{9}{16}$

b) $\frac{9}{10}$

Sol. $\frac{9}{10}$

Taking square

$$\left(\frac{9}{10}\right)^2 = \frac{9^2}{10^2} = \frac{81}{100}$$

as we can see $\frac{9}{10} > \frac{81}{100}$

c) $\frac{17}{20}$

Sol. $\frac{17}{20}$

Taking square

$$\left(\frac{17}{20}\right)^2 = \frac{17^2}{20^2} = \frac{289}{400}$$

as we can see $\frac{17}{20} > \frac{289}{400}$

d) $\frac{15}{17}$

Sol. $\frac{15}{17}$

Taking square

$$\left(\frac{15}{17}\right)^2 = \frac{15^2}{17^2} = \frac{225}{289}$$

as we can see $\frac{15}{17} > \frac{225}{289}$

e) $\frac{2}{7}$

Sol. $\frac{2}{7}$

Taking square

$$\left(\frac{2}{7}\right)^2 = \frac{2^2}{7^2} = \frac{4}{49}$$

as we can see $\frac{2}{7} > \frac{4}{49}$

f) $\frac{4}{11}$

Sol. $\frac{4}{11}$

Taking square

$$\left(\frac{4}{11}\right)^2 = \frac{4^2}{11^2} = \frac{16}{121}$$

as we can see $\frac{4}{11} > \frac{16}{121}$

g) $\frac{6}{13}$

Sol. $\frac{6}{13}$

Taking square

$$\left(\frac{6}{13}\right)^2 = \frac{6^2}{13^2} = \frac{36}{169}$$

as we can see $\frac{6}{13} > \frac{36}{169}$

h) $\frac{11}{22}$

Sol. $\frac{11}{22}$

Taking square

$$\left(\frac{11}{22}\right)^2 = \frac{11^2}{22^2} = \frac{121}{484}$$

as we can see $\frac{11}{12} > \frac{121}{484}$

i) $\frac{45}{46}$

Sol. $\frac{45}{46}$

Taking square

$$\left(\frac{45}{46}\right)^2 = \frac{45^2}{46^2} = \frac{2025}{2116}$$

as we can see $\frac{45}{46} > \frac{2025}{2116}$

j) $\frac{99}{100}$

Sol. $\frac{99}{100}$

Taking square

$$\left(\frac{99}{100}\right)^2 = \frac{99^2}{100^2} = \frac{9801}{10000}$$

as we can see $\frac{99}{100} > \frac{9801}{10000}$

k) $\frac{34}{45}$

Sol. $\frac{34}{45}$

Taking square

$$\left(\frac{34}{45}\right)^2 = \frac{34^2}{45^2} = \frac{1156}{2025}$$

as we can see $\frac{34}{45} > \frac{1156}{2025}$

i) $\frac{17}{100}$

Sol. $\frac{17}{100}$

Taking square

$$\left(\frac{17}{100}\right)^2 = \frac{17^2}{100^2} = \frac{289}{10000}$$

as we can see $\frac{17}{100} > \frac{289}{10000}$

Q6. Verify that the squares of each of the following decimals is smaller than the decimal.

a) 0.2

Sol. 0.2

Taking square

$$(0.2)^2 = 0.2 \times 0.2$$

$$(0.2)^2 = 0.04$$

Clearly $0.04 < 0.2$

b) 5.1

Sol. 5.1

Taking square

$$(5.1)^2 = 5.1 \times 5.1$$

$$(5.1)^2 = 26.01$$

Clearly $5.1 < 26.01$

c) 2.1

Sol. 2.1

Taking square

$$(2.1)^2 = 2.1 \times 2.1$$

$$(2.1)^2 = 4.41$$

Clearly $2.1 < 4.41$

d) 6.8

Sol. 6.8

Taking square

$$(6.8)^2 = 6.8 \times 6.8$$

$$(6.8)^2 = 46.24$$

Clearly $6.8 < 46.24$

e) 1.02

Sol. 1.02

Taking square

$$(1.02)^2 = 1.02 \times 1.02$$

$$(1.02)^2 = 1.0404$$

Clearly $1.02 < 1.0404$

f) 0.05

Sol. 0.05

Taking square

$$(0.05)^2 = 0.05 \times 0.05$$

$$(0.05)^2 = 0.0025$$

Clearly $0.0025 < 0.05$

g) 0.23

Sol. 0.23

Taking square

$$(0.23)^2 = 0.23 \times 0.23$$

$$(0.23)^2 = 0.0529$$

Clearly $0.0529 < 0.23$

h) 0.98

Sol. 0.98

Taking square

$$(0.98)^2 = 0.98 \times 0.98$$

$$(0.98)^2 = 0.9604$$

Clearly $0.9604 < 0.98$

i) 0.55

Sol. 0.55

Taking square

$$(0.55)^2 = 0.55 \times 0.55$$

$$(0.55)^2 = 0.3025$$

Clearly $0.3025 < 0.55$

j) 0.10

Sol. 0.10

Taking square

$$(0.10)^2 = 0.10 \times 0.10$$

$$(0.10)^2 = 0.01$$

Clearly $0.01 < 0.10$

k) 0.89

Sol. 0.89

Taking square

$(0.89)^2 = 0.89 \times 0.89$

$(0.89)^2 = 0.7921$

Clearly $0.7921 < 0.89$

l) **3.24**

Sol. 3.24

Taking square

$(3.24)^2 = 3.24 \times 3.24$

$(3.24)^2 = 10.4976$

Clearly $3.24 < 10.4976$

Exercise – 3.2

Q1. Find the square root of the following numbers by factorization method.

a) **64**

Sol. 64

Square root by factorization method

2	64
2	32
2	16
2	8
2	4
2	2
	1

$64 = \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2}$

Take only one number from each pair and find their product.

$\sqrt{64} = 2 \times 2 \times 2 = 8$ **Ans.**

b) **121**

Sol. 121

Square root by factorization method

11	121
11	11
	1

$121 = \overline{11 \times 11}$

Take only one number from each pair and find their product.

$\sqrt{121} = 11$ **Ans.**

c) **169**

Sol. 169

Square root by factorization method

13	169
13	13
	1

$169 = \overline{13 \times 13}$

Take only one number from each pair and find their product.

$\sqrt{169} = 13$ **Ans.**

d) 625

Sol. 625

Square root by factorization method

5	625
5	125
5	25
5	5
	1

$625 = \overline{5 \times 5} \times \overline{5 \times 5}$

Take only one number from each pair and find their product.

$\sqrt{625} = 5 \times 5 = 25$ **Ans.**

e) 324

Sol. 324.

Square root by factorization method

$324 = \overline{2 \times 2} \times \overline{3 \times 3} \times \overline{3 \times 3}$

Take only one number from each pair and find their product.

$\sqrt{324} = 2 \times 3 \times 3 = 18$ **Ans.**

f) 225

Sol. 225

Square root by factorization method

3	225
3	75
5	25
5	5
	1

$225 = \overline{3\times 3}\times\overline{5\times 5}$

Take only one number from each pair and find their product.

$\sqrt{225} = 3\times 5 = 15$ **Ans.**

g) 49

Sol. 49

Square root by factorization method

7	49
7	7
	1

$49 = \overline{7\times 7}$

Take only one number from each pair and find their product.

$\sqrt{49} = 7$ **Ans.**

h) 900

Sol. 900

Square root by factorization method

2	900
2	450
3	225
3	75
5	25
5	5
	1

$900 = \overline{2\times 2}\times\overline{3\times 3}\times\overline{5\times 5}$

Take only one number from each pair and find their product.

$\sqrt{900} = 2\times 3\times 5 = 30$ **Ans.**

Q2. Find the square root of the following fractions by factorization method.

a) $\frac{256}{361}$

Sol. $\frac{256}{361}$

2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

19	361
19	19
	1

$\frac{256}{361} = \frac{\overline{2\times 2}\times\overline{2\times 2}\times\overline{2\times 2}\times\overline{2\times 2}}{\overline{19\times 19}}$

Take only one number from each pair and find their product.

$\sqrt{\frac{256}{361}} = \frac{2\times 2\times 2\times 2}{19}$

$\sqrt{\frac{256}{361}} = \frac{16}{19}$ **Ans.**

b) $3\frac{1}{16}$

Sol. $3\frac{1}{16} = \frac{3\times 16+1}{16} = \frac{49}{16}$

7	49
7	7
	1

2	16
2	8
2	4
2	2
	1

$\frac{49}{16} = \frac{\overline{7\times 7}}{\overline{2\times 2}\times\overline{2\times 2}}$

Take only one number from each pair and find their product.

$$\sqrt{\frac{49}{16}} = \frac{7}{2\times 2}$$

$$\sqrt{\frac{49}{16}} = \frac{7}{4}$$ **Ans.**

c) $5\frac{125}{100}$

Sol. $5\frac{125}{100} = \frac{5\times 100+125}{100} = \frac{625}{100}$

5	625
5	125
5	25
5	5
	1

2	100
2	50
5	25
5	5
	1

$$\frac{625}{100} = \frac{\overline{5\times 5}\times\overline{5\times 5}}{\overline{2\times 2}\times\overline{5\times 5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{625}{100}} = \frac{5\times 5}{2\times 5}$$

$$\sqrt{\frac{625}{100}} = \frac{25}{10}$$ **Ans.**

d) $\frac{100}{841}$

Sol. $\frac{100}{841}$

29	841
29	29
	1

2	100
2	50
5	25
5	5
	1

$$\frac{100}{841} = \frac{\overline{2\times 2}\times\overline{5\times 5}}{\overline{29\times 29}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{100}{841}} = \frac{2\times 5}{29}$$

$$\sqrt{\frac{100}{841}} = \frac{10}{29}$$ **Ans.**

e) $\frac{400}{361}$

Sol. $\frac{400}{361}$

2	400
2	200
2	100
2	50
5	25
5	5
	1

19	361
19	19
	1

$$\frac{400}{361} = \frac{\overline{2\times 2}\times\overline{2\times 2}\times\overline{5\times 5}}{\overline{19\times 19}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{400}{361}} = \frac{2\times 2\times 5}{19}$$

$$\sqrt{\frac{400}{361}} = \frac{20}{19}$$ **Ans.**

f) $\frac{625}{144}$

Sol. $\frac{625}{144}$

5	625
5	125
5	25
5	5
	1

2	144
2	72
2	36
2	18
3	9
3	3
	1

$$\frac{625}{144}=\frac{\overline{5\times5}\times\overline{5\times5}}{\overline{2\times2}\times\overline{2\times2}\times\overline{3\times3}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{625}{144}}=\frac{5\times5}{2\times2\times3}$$

$$\sqrt{\frac{625}{144}}=\frac{25}{12}\ \textbf{Ans.}$$

g) $\frac{16}{484}$

Sol. $\frac{16}{484}$

2	484
2	242
11	121
11	11
	1

2	16
2	8
2	4
2	2
	1

$$\frac{16}{484}=\frac{\overline{2\times2}\times\overline{2\times2}}{\overline{2\times2}\times\overline{11\times11}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{16}{484}}=\frac{2\times2}{2\times11}$$

$$\sqrt{\frac{16}{484}}=\frac{4}{22}\ \textbf{Ans.}$$

h) $\frac{36}{961}$

Sol. $\frac{36}{961}$

31	961
31	31
	1

2	36
2	18
3	9
3	3
	1

$$\frac{36}{961}=\frac{\overline{2\times2}\times\overline{3\times3}}{\overline{31\times31}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{36}{961}}=\frac{2\times3}{31}$$

$$\sqrt{\frac{36}{961}}=\frac{6}{31}\ \textbf{Ans.}$$

Q3. Find the square root of the following decimal numbers by factorization method.

a) 0.49

Sol. 0.49

$$0.49=\frac{49}{100}$$

7	49
7	7
	1

2	100
2	50
5	25
5	5
	1

$$\frac{49}{100}=\frac{\overline{7\times7}}{\overline{2\times2}\times\overline{5\times5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{49}{100}}=\frac{7}{2\times5}$$

$$\sqrt{\frac{49}{100}}=\frac{7}{10}$$

$$\sqrt{0.49}=0.7\ \textbf{Ans.}$$

b) 0.25

Sol. 0.25

$$0.25=\frac{25}{100}$$

5	25
5	5
	1

2	100
2	50
5	25
5	5
	1

$$\frac{25}{100}=\frac{\overline{5\times5}}{\overline{2\times2}\times\overline{5\times5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{25}{100}}=\frac{5}{2\times5}$$

$$\sqrt{\frac{25}{100}}=\frac{5}{10}$$

$\sqrt{0.25}=0.5$ **Ans.**

c) 1.69

Sol. 1.69

$$1.69=\frac{169}{100}$$

13	169
13	13
	1

2	100
2	50
5	25
5	5
	1

$$\frac{169}{100}=\frac{\overline{13\times13}}{\overline{2\times2}\times\overline{5\times5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{169}{100}}=\frac{13}{2\times5}$$

$$\sqrt{\frac{169}{100}}=\frac{13}{10}$$

$\sqrt{1.69}=1.3$ **Ans.**

d) 56.25

Sol. 56.25

$$56.25=\frac{5625}{100}$$

3	5625
3	1875
5	625
5	125
5	25
5	5
	1

2	100
2	50
5	25
5	5
	1

$$\frac{5625}{100}=\frac{\overline{3\times3}\times\overline{5\times5}\times\overline{5\times5}}{\overline{2\times2}\times\overline{5\times5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{5625}{100}}=\frac{3\times5\times5}{2\times5}$$

$$\sqrt{\frac{5625}{100}}=\frac{75}{10}$$

$\sqrt{56.25}=7.5$ **Ans.**

e) 7.84

Sol. 7.84

$$7.84=\frac{784}{100}$$

2	784
2	392
2	196
2	98
7	49
7	7
	1

2	100
2	50
5	25
5	5
	1

$$\frac{784}{100}=\frac{\overline{2\times2}\times\overline{2\times2}\times\overline{7\times7}}{\overline{2\times2}\times\overline{5\times5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{784}{100}} = \frac{2\times 2\times 7}{2\times 5}$$

$$\sqrt{\frac{784}{100}} = \frac{28}{10}$$

$$\sqrt{7.84} = 2.8 \textbf{Ans.}$$

f) 11.56

Sol. 11.56

$$11.56 = \frac{1156}{100}$$

2	1156
2	578
17	289
17	17
	1

2	100
2	50
5	25
5	5
	1

$$\frac{1156}{100} = \frac{\overline{2\times 2}\times\overline{17\times 17}}{\overline{2\times 2}\times\overline{5\times 5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{1156}{100}} = \frac{2\times 17}{2\times 5}$$

$$\sqrt{\frac{1156}{100}} = \frac{34}{10}$$

$$\sqrt{11.56} = 3.4 \textbf{Ans.}$$

g) 5.29

Sol. 5.29

$$5.29 = \frac{529}{100}$$

23	529
23	23
	1

2	100
2	50
5	25
5	5
	1

$$\frac{529}{100} = \frac{\overline{23\times 23}}{\overline{2\times 2}\times\overline{5\times 5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{529}{100}} = \frac{23}{2\times 5}$$

$$\sqrt{\frac{529}{100}} = \frac{23}{10}$$

$$\sqrt{5.29} = 2.3 \textbf{Ans.}$$

h) 2.25

Sol. 2.25

$$2.25 = \frac{225}{100}$$

3	225
3	75
5	25
5	5
	1

2	100
2	50
5	25
5	5
	1

$$\frac{225}{100} = \frac{\overline{3\times 3}\times\overline{5\times 5}}{\overline{2\times 2}\times\overline{5\times 5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{225}{100}} = \frac{3\times 5}{2\times 5}$$

$$\sqrt{\frac{225}{100}} = \frac{15}{10}$$

$$\sqrt{2.25} = 1.5 \textbf{Ans.}$$

Exercise – 3.3

Q1. Find the square root of the following natural numbers by division method

a) 729

Sol. 729

Square root by division method

$$\begin{array}{r|l} & 27 \\ \hline 2 & 729 \\ & 4 \\ \hline 47 & 329 \\ & 329 \\ \hline & \times \end{array}$$

$\sqrt{729} = 27$ **Ans.**

b) 400

Sol. 400

Square root by division method

$$\begin{array}{r|l} & 20 \\ \hline 2 & 400 \\ & 4 \\ \hline 40 & 00 \\ & 00 \\ \hline & \times \end{array}$$

$\sqrt{400} = 20$ **Ans.**

c) 576

Sol. 576

Square root by division method

$$\begin{array}{r|l} & 24 \\ \hline 2 & 576 \\ & 4 \\ \hline 44 & 176 \\ & 176 \\ \hline & \times \end{array}$$

$\sqrt{576} = 24$ **Ans.**

d) 841

Sol. 841

Square root by division method

$$\begin{array}{r|l} & 29 \\ \hline 2 & 841 \\ & 4 \\ \hline 49 & 441 \\ & 441 \\ \hline & \times \end{array}$$

$\sqrt{841} = 29$ **Ans.**

e) 225

Sol. 225

Square root by division method

$$\begin{array}{r|l} & 15 \\ \hline 1 & 225 \\ & 1 \\ \hline 25 & 125 \\ & 125 \\ \hline & \times \end{array}$$

$\sqrt{225} = 15$ **Ans.**

f) 36

Sol. 36

Square root by division method

$$\begin{array}{r|l} & 6 \\ \hline 6 & 36 \\ & 36 \\ \hline & \times \end{array}$$

$\sqrt{36} = 6$ **Ans.**

g) 144

Sol. 144

Square root by division method

$$\begin{array}{r|l} & 12 \\ \hline 1 & 144 \\ & 1 \\ \hline 22 & 44 \\ & 44 \\ \hline & \times \end{array}$$

$\sqrt{144} = 12$ **Ans.**

h) 625

Sol. 625

Square root by division method

$$\begin{array}{r|l} & 25 \\ \hline 2 & 625 \\ & 4 \\ \hline 45 & 225 \\ & 225 \\ \hline & \times \end{array}$$

$\sqrt{625} = 25$ **Ans.**

Q2. Find the square root of the following fractions by division method.

a) $\frac{25}{625}$

Sol. $\frac{25}{625}$

Square root by division method

$$\begin{array}{r|l} & 25 \\ \hline 2 & 625 \\ & 4 \\ \hline 45 & 225 \\ & 225 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 6 \\ \hline 6 & 36 \\ & 36 \\ \hline & \times \end{array}$$

$\sqrt{625} = 25$ and $\sqrt{36} = 6$

$\sqrt{\frac{25}{625}} = \frac{5}{25}$ **Ans.**

b) $\frac{784}{81}$

Sol. $\frac{784}{81}$

Square root by division method

$$\begin{array}{r|l} & 28 \\ \hline 2 & 784 \\ & 4 \\ \hline 48 & 384 \\ & 384 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 9 \\ \hline 9 & 81 \\ & 81 \\ \hline & \times \end{array}$$

$\sqrt{784} = 28$ and $\sqrt{81} = 9$

$\sqrt{\frac{784}{81}} = \frac{28}{9}$ **Ans.**

c) $\frac{169}{256}$

Sol. $\frac{169}{256}$

Square root by division method

$$\begin{array}{r|l} & 16 \\ \hline 1 & 256 \\ & 1 \\ \hline 26 & 156 \\ & 156 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 13 \\ \hline 13 & 169 \\ & 169 \\ \hline & \times \end{array}$$

$\sqrt{256} = 16$ and $\sqrt{169} = 13$

$\sqrt{\frac{169}{256}} = \frac{13}{16}$ **Ans.**

d) $\frac{289}{324}$

Sol. $\frac{289}{324}$

Square root by division method

$$\begin{array}{r|l} & 18 \\ \hline 2 & 324 \\ & 1 \\ \hline 28 & 224 \\ & 224 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 17 \\ \hline 17 & 289 \\ & 289 \\ \hline & \times \end{array}$$

$\sqrt{324} = 18$ and $\sqrt{289} = 17$

$\sqrt{\frac{289}{324}} = \frac{17}{18}$ **Ans.**

e) $\frac{9}{49}$

Sol. $\frac{9}{49}$

Square root by division method

$$\begin{array}{r|l} & 7 \\ 7 & 49 \\ & 49 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 3 \\ 3 & 9 \\ & 9 \\ \hline & \times \end{array}$$

$\sqrt{49} = 7$ and $\sqrt{9} = 3$

$\sqrt{\frac{9}{49}} = \frac{3}{7}$ **Ans.**

f) $\frac{676}{576}$

Sol. $\frac{676}{576}$

Square root by division method

$$\begin{array}{r|l} & 26 \\ 2 & 676 \\ & 4 \\ \hline 46 & 276 \\ & 276 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 24 \\ 2 & 576 \\ & 4 \\ \hline 44 & 176 \\ & 176 \\ \hline & \times \end{array}$$

$\sqrt{676} = 26$ and $\sqrt{576} = 24$

$\sqrt{\frac{676}{576}} = \frac{26}{24}$ **Ans.**

g) $\frac{121}{49}$

Sol. $\frac{121}{49}$

Square root by division method

$$\begin{array}{r|l} & 11 \\ 1 & 121 \\ & 1 \\ \hline 21 & 21 \\ & 21 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 7 \\ 7 & 49 \\ & 49 \\ \hline & \times \end{array}$$

$\sqrt{121} = 11$ and $\sqrt{49} = 7$

$\sqrt{\frac{121}{49}} = \frac{11}{7}$ **Ans.**

h) $\frac{64}{900}$

Sol. $\frac{64}{900}$

Square root by division method

$$\begin{array}{r|l} & 30 \\ 3 & 900 \\ & 9 \\ \hline 60 & 00 \\ & 00 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 8 \\ 8 & 64 \\ & 64 \\ \hline & \times \end{array}$$

$\sqrt{900} = 30$ and $\sqrt{64} = 8$

$\sqrt{\frac{64}{900}} = \frac{8}{30}$ **Ans.**

Q3. Find the square root of the following decimal numbers by division method.

a) 62.41

Sol. 62.41

$62.41 = \frac{6241}{100}$

Square root by division method

$$\begin{array}{r|l} & 79 \\ 7 & 6241 \\ & 49 \\ \hline 149 & 1341 \\ & 1341 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{6241} = 79$ and $\sqrt{100} = 10$

$\sqrt{\frac{6241}{100}} = \frac{79}{10} = 7.9$ **Ans.**

b) 79.21

Sol. 79.21

$$79.21 = \frac{7921}{100}$$

Square root by division method

$$\begin{array}{r|l} & 89 \\ 8 & 7921 \\ & 64 \\ \hline 169 & 1521 \\ & 1521 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{7921} = 89$ and $\sqrt{100} = 10$

$\sqrt{\frac{7921}{100}} = \frac{89}{10} = 8.9$ **Ans.**

c) 86.49

Sol. 86.49

$$86.49 = \frac{8649}{100}$$

Square root by division method

$$\begin{array}{r|l} & 93 \\ 9 & 8649 \\ & 81 \\ \hline 183 & 549 \\ & 549 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{8649} = 93$ and $\sqrt{100} = 10$

$\sqrt{\frac{8649}{100}} = \frac{93}{10} = 9.3$ **Ans.**

d) 92:16

Sol. 92.16

$$92.16 = \frac{9216}{100}$$

Square root by division method

$$\begin{array}{r|l} & 96 \\ 9 & 9216 \\ & 81 \\ \hline 186 & 1116 \\ & 1116 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{9216} = 96$ and $\sqrt{100} = 10$

$\sqrt{\frac{9216}{100}} = \frac{96}{10} = 9.6$ **Ans.**

e) 2.89

Sol. 2.89

$$2.89 = \frac{289}{100}$$

Square root by division method

$$\begin{array}{r|l} & 17 \\ 1 & 289 \\ & 1 \\ \hline 27 & 189 \\ & 189 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{289} = 17$ and $\sqrt{100} = 10$

$\sqrt{\frac{289}{100}} = \frac{17}{10} = 1.7$ **Ans.**

f) 1.69

Sol. 1.69

$$1.69 = \frac{169}{100}$$

Square root by division method

$$\begin{array}{r|l} & 13 \\ \hline 1 & 169 \\ & 1 \\ \hline 23 & 69 \\ & 69 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ \hline 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{169} = 13$ and $\sqrt{100} = 10$

$\sqrt{\frac{169}{100}} = \frac{13}{10} - 1.3$ **Ans.**

g) 1.21

Sol. 1.21

$1.21 = \frac{121}{100}$

Square root by division method

$$\begin{array}{r|l} & 11 \\ \hline 1 & 121 \\ & 1 \\ \hline 21 & 21 \\ & 21 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ \hline 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{121} = 11$ and $\sqrt{100} = 10$

$\sqrt{\frac{121}{100}} = \frac{11}{10} = 1.1$ **Ans.**

h) 7.84

Sol. 7.84

$7.84 = \frac{784}{100}$

Square root by division method

$$\begin{array}{r|l} & 28 \\ \hline 2 & 784 \\ & 4 \\ \hline 48 & 384 \\ & 384 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ \hline 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{784} = 28$ and $\sqrt{100} = 10$

$\sqrt{\frac{784}{100}} = \frac{28}{10} = 2.8$ **Ans.**

Exercise – 3.4

Q1. There are 784 chairs in a hall arranged in such a way that the chairs in each row are equal to the total number of rows. Find the number of rows.

Sol. Total chairs = 784

As number of rows = number of chairs in each row

So number of rows = $\sqrt{784}$

$$\begin{array}{r|l} & 28 \\ \hline 2 & 784 \\ & 4 \\ \hline 48 & 384 \\ & 384 \\ \hline & \times \end{array}$$

Thus number of rows = 28 Ans.

Q2. The length of the base and altitude of a triangle is 32 cm and 18cm respectively. If the area of the square is double the area of the triangle, find the length of the square.

Sol. Length of base = 32 cm

Length of altitude = 18 cm

Area of triangle = $\frac{1}{2} b \times h$

Area of triangle = $\frac{1}{2}(32cm)(18cm)$

Area of triangle = $\frac{1}{2}(576cm^2)$

According to question:
Area of square = 2×Area of triangle

Area of square= $2\times\frac{1}{2}(576cm^2)$

Area of square = 576 cm^2
$(\text{length of side})^2$= Area of square

$(length\ of\ side)^2 = (576cm^2)$

Taking square root

$\sqrt{(length\ of\ side)^2} = \sqrt{(576cm^2)}$

Length of side = $\sqrt{576}\ cm$

```
    24
  ------
2 | 576
  | 4
  |---
44| 176
  | 176
  |---
    ×
```

Thus length of one side of square = 24 cm
Ans.

Q3. The area of a rectangular sheet is equal to the area of another square shaped paper. Find the length of the square shaped paper if the length and width of the rectangular paper are 28cm and 7 cm respectively.

Sol. Length of rectangle=28cm
Width of rectangle = 7 cm
Area of rectangle
= length × width
Area of rectangle = 28 × 7
Area of rectangle = 196 cm^2
According to question:
Area of square = Area of rectangle
Area of square = 196 cm^2
$(\text{length of side})^2$= Area of square

$(length\ of\ side)^2 = (196cm^2)$

Taking square root

$\sqrt{(length\ of\ side)^2} = \sqrt{(196cm^2)}$

Length of side = $\sqrt{196}\ cm$

```
    14
  ------
1 | 196
  | 1
  |---
24| 96
  | 96
  |---
    ×
```

Thus length of one side of square = 14 cm
Ans.

Q4. If the length of a square shaped field is 45 meters. What will be the cost of leveling the field at the rate of Rs.455 per square meter?

Sol. Length of square shaped field = 45 meter
Area of square shaped field
= $(\text{length of side})^2$
Area of square = $(45)^2$
Area of square shaped field
=2025 m^2
Cost of leveling per square meter = Rs.455
Cost of leveling 2025m^2 = 2025 × 455
Cost of leveling 2025m^2 = Rs.921,375
Ans.

Q5. Find the length of the square shaped Masjid if its area is 900 m^2.

Sol. Area of Masjid = 900 m^2
Length of one side of square shaped Masjid = $\sqrt{900m^2}$

```
    30
  ------
3 | 900
  | 9
  |---
60| 00
  | 00
  |---
    ×
```

Thus length of one side of square shaped Masjid = 30 m

Q6. The square shaped parking area is 225 m^2. Find the cost of constructing a

tiled path around it at the rate of Rs.435 per meter.

Sol. Area of parking = $225m^2$

Length of one side = $\sqrt{225m^2}$

$$\begin{array}{r|l} & 15 \\ \hline 1 & 225 \\ & 1 \\ \hline 25 & 125 \\ & 125 \\ \hline & \times \end{array}$$

Length of one side of parking area = 15 meter

Now perimeter of parking = 4× length of one side

Perimeter = 4×15 meter

Perimeter = 60 m

Cost of tile path per meter = Rs.435

Cost of tile path for 60 meter = 60 × 435

Cost of tile path = 26,100 **Ans**

Q7. The area of a square shaped garden is 169 square meters.

a. Find the perimeter of the garden.

b. Find the cost of fencing around its border if the rate of fencing is Rs.670 per meter.

Sol. Area of garden = $169m^2$

Length of side = $\sqrt{169m^2}$

$$\begin{array}{r|l} & 13 \\ \hline 1 & 169 \\ & 1 \\ \hline 23 & 69 \\ & 69 \\ \hline & \times \end{array}$$

Length of one side = 13m

Perimeter = 4 × side

Perimeter = 4 × 13 m

Perimeter = 52 m

Cost of fencing per meter = Rs.670

Cost of fencing around the border = 670 × 52

Cost of fencing around the border = Rs.34,840**Ans.**

Review Exercise – 3

Q1. Choose the correct option.

a) When we find the square of an even number, the result is a/an ____ number.

i. Odd
ii. Even
iii. Prime
iv. Composite

b) When we find the square of a/an ___ fraction the result is less than itself.

i. Improper
ii. Mixed
iii. Proper
iv. Proper and improper

c) If $y = x^2$, then x = ___

i. y^2
ii. $x \times x$
iii. $\sqrt{x}$
iv. $\sqrt{y}$

d) When a number is __ by itself, the value we get is called the square of that number.

i. Added
ii. Subtracted
iii. Multiplied
iv. Divided

e) The square of a decimal less than ___ is smaller than itself.

i. 0
ii. 1
iii. 2
iv. 3

Q2. Find the square of the following numbers.

a) 91

Sol. 91

Taking square

$(91)^2 = 91 \times 91$

$(91)^2 = 8281$ **Ans.**

b) 107

Sol. 107
Taking square

$(107)^2 = 107 \times 107$

$(107)^2 = 11409$ **Ans.**

c) 127
Sol. 127
Taking square

$(127)^2 = 127 \times 127$

$(127)^2 = 16129$ **Ans.**

d) 156
Sol. 156
Taking square

$(156)^2 = 156 \times 156$

$(156)^2 = 24336$ **Ans.**

e) 149
Sol. 149
Taking square

$(149)^2 = 149 \times 149$

$(149)^2 = 22,201$ **Ans.**

f) 16
Sol. 16
Taking square

$(16)^2 = 16 \times 16$

$(16)^2 = 256$ **Ans.**

Q3. Test whether the following are perfect squares or not.

a) 121
Sol.121
Prime factorization of 121

11	121
11	11
	1

$121 = 11 \times 11 = 11^2$
All factors of 121 are written in form of pairs so 121 is a perfect square.

b) 225
Sol.225
Prime factorization of 225

3	225
3	75
5	25
5	5
	1

$225 = 3 \times 3 \times 5 \times 5 = 3^2 \times 5^2$
All factors of 225 are written in form of pairs so 225 is a perfect square.

c) 325
Sol.325
Prime factorization of 325

5	325
5	65
13	13
	1

$325 = 5 \times 5 \times 13 = 5^2 \times 13$
All factors of 325cannot be written in form of pairs so 325 is not a perfect square.

d) 441
Sol.441
Prime factorization of 49

3	441
3	147
7	49
7	7
	1

$441 = 3 \times 3 \times 7 \times 7 = 3^2 \times 7^2$
All factors of 441 are written in form of pairs so 441 is a perfect square.

Q4. Tick the perfect squares of odd numbers.

Note: Square of odd number is odd and square of odd number is odd.

a) 289
Sol. 289 is odd. So it is the square of an odd number i.e. 17.

b) 225
Sol. 225 is odd. So it is the square of an odd number i.e. 15.

c) 64

Sol. 64 is even. So it is the square of an even number i.e. 8

d) 196

Sol. 196 is even. So it is the square of an even number i.e. 14.

Q5. Find the square of the following proper fractions.

a) $\frac{5}{9}$

Sol. $\frac{5}{9}$

Taking square

$$\left(\frac{5}{9}\right)^2 = \frac{5^2}{9^2} = \frac{25}{81} \textbf{ Ans.}$$

b) $\frac{16}{25}$

Sol. $\frac{16}{25}$

Taking square

$$\left(\frac{16}{25}\right)^2 = \frac{16^2}{25^2} = \frac{256}{625} \textbf{ Ans.}$$

c) $\frac{9}{17}$

Sol. $\frac{9}{17}$

Taking square

$$\left(\frac{9}{17}\right)^2 = \frac{9^2}{17^2} = \frac{81}{289} \textbf{ Ans.}$$

d) $\frac{53}{57}$

Sol. $\frac{53}{57}$

Taking square

$$\left(\frac{53}{57}\right)^2 = \frac{53^2}{57^2} = \frac{2809}{3249} \textbf{ Ans.}$$

Q6. Find the square root of the following numbers by factorization and division method.

a) 100

Sol. 100

Square root by factorization method

2	100
2	50
5	25
5	5
	1

$100 = \overline{2\times 2}\times\overline{5\times 5}$

Take only one number from each pair and find their product.

$\sqrt{100} = 2\times 5 = 10$ **Ans.**

b) 841

Sol. 841

Square root by factorization method

29	841
29	29
	1

$841 = \overline{29\times 29}$

Take only one number from each pair and find their product.

$\sqrt{841} = 29$ **Ans.**

c) 900

Sol. 900

Square root by factorization method

2	900
2	450
3	225
3	75
5	25
5	5
	1

$900 = \overline{2\times 2}\times\overline{3\times 3}\times\overline{5\times 5}$

Take only one number from each pair and find their product.

$\sqrt{900} = 2\times3\times5 = 30$ **Ans.**

d) 256

Sol. 256

2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$256 = \overline{2\times2}\times\overline{2\times2}\times\overline{2\times2}\times\overline{2\times2}$

Take only one number from each pair and find their product.

$\sqrt{256} = 2\times2\times2\times2$

$\sqrt{256} = 16$ **Ans.**

Q7. Find the square root of the following decimal numbers by factorization method.

a). 1.69

Sol.1.69

$1.69 = \frac{169}{100}$

13	169
13	13
	1

2	100
2	50
5	25
5	5
	1

$\frac{169}{100} = \frac{\overline{13\times13}}{\overline{2\times2}\times\overline{5\times5}}$

Take only one number from each pair and find their product.

$\sqrt{\frac{169}{100}} = \frac{13}{2\times5}$

$\sqrt{\frac{169}{100}} = \frac{13}{10}$

$\sqrt{1.69} = 1.3$ **Ans.**

b) 3.24

Sol.3.24

$3.24 = \frac{324}{100}$

2	324
2	162
3	81
3	27
3	9
3	3
	1

2	100
2	50
5	25
5	5
	1

$\frac{324}{100} = \frac{\overline{2\times2}\times\overline{3\times3}\times\overline{3\times3}}{\overline{2\times2}\times\overline{5\times5}}$

Take only one number from each pair and find their product.

$\sqrt{\frac{324}{100}} = \frac{2\times3\times3}{2\times5}$

$\sqrt{\frac{324}{100}} = \frac{18}{10}$

$\sqrt{3.24} = 1.8$ **Ans.**

c) 2.25

Sol.2.25

$2.25 = \frac{225}{100}$

3	225
3	75
5	25
5	5
	1

2	100
2	50
5	25
5	5
	1

$$\frac{225}{100}=\frac{\overline{3\times 3}\times\overline{5\times 5}}{\overline{2\times 2}\times\overline{5\times 5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{225}{100}}=\frac{3\times 5}{2\times 5}$$

$$\sqrt{\frac{225}{100}}=\frac{15}{10}$$

$$\sqrt{2.25}=1.5\ \textbf{Ans.}$$

d) 0.09

Sol.0.09

$$0.09=\frac{9}{100}$$

3 | 9
3 | 3
| 1

2 | 100
2 | 50
5 | 25
5 | 5
| 1

$$\frac{9}{100}=\frac{\overline{3\times 3}}{\overline{2\times 2}\times\overline{5\times 5}}$$

Take only one number from each pair and find their product.

$$\sqrt{\frac{9}{100}}=\frac{3}{2\times 5}$$

$$\sqrt{\frac{9}{100}}=\frac{3}{10}$$

$$\sqrt{0.09}=0.3\ \textbf{Ans.}$$

Q8. Find the square root of the following decimal numbers by division method.

a) 0.16

Sol.0.16

$$0.16=\frac{16}{100}$$

Square root by division method

$$\begin{array}{r|l} & 4 \\ 4 & 16 \\ & 16 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{16}=4$ and $\sqrt{100}=10$

$$\sqrt{\frac{16}{100}}=\frac{4}{10}=0.4\ \textbf{Ans.}$$

b) 0.81

Sol.0.81

$$0.81=\frac{81}{100}$$

Square root by division method

$$\begin{array}{r|l} & 9 \\ 9 & 81 \\ & 81 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{81}=9$ and $\sqrt{100}=10$

$$\sqrt{\frac{81}{100}}=\frac{9}{10}=0.9\ \textbf{Ans.}$$

c) 1.96

Sol.1.96

$$1.96=\frac{196}{100}$$

Square root by division method

$$\begin{array}{r|l} & 14 \\ 1 & 196 \\ & 1 \\ \hline 24 & 96 \\ & 96 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{196}=14$ and $\sqrt{100}=10$

$$\sqrt{\frac{196}{100}}=\frac{14}{10}=1.4\ \textbf{Ans.}$$

d) 7.84

Sol.7.84

$$7.84 = \frac{784}{100}$$

Square root by division method

$$\begin{array}{r|l} & 28 \\ \hline 2 & 784 \\ & 4 \\ \hline 48 & 384 \\ & 384 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 10 \\ \hline 10 & 100 \\ & 100 \\ \hline & \times \end{array}$$

$\sqrt{784} = 28$ and $\sqrt{100} = 10$

$$\sqrt{\frac{784}{100}} = \frac{28}{10} = 2.8 \text{ Ans.}$$

Q9. The area of the square garden is $961m^2$. Find the cost of wooden fencing around it at the rate of Rs.205 per meter.

Sol. Area of garden = $961m^2$

Length of one side = $\sqrt{961m^2}$

$$\begin{array}{r|l} & 31 \\ \hline 3 & 961 \\ & 9 \\ \hline 61 & 61 \\ & 61 \\ \hline & \times \end{array}$$

Length of one side = 31 m

Perimeter = 4 × side

Perimeter = 4 × 31 m

Perimeter = 124 m

Cost of wooden fencing per meter = Rs.205

Total cost of wooden fencing around the garden

= 205 × 124

Total cost of wooden fencing around the garden=Rs.25420

Q10. Area of a square garden is $484m^2$. Find the length of wire which is required to cover its all sides.

Sol. Area of garden = $484m^2$

Length of side = $\sqrt{484m^2}$

Square root by division method

$$\begin{array}{r|l} & 22 \\ \hline 2 & 484 \\ & 4 \\ \hline 42 & 84 \\ & 84 \\ \hline & \times \end{array}$$

$\sqrt{484} = 22$

Length of one side = 22m

Perimeter = 4 × side

Perimeter = 4 × 22m

Perimeter = 88 meter

Length of wire to cover all of its sides = 88 meter **Ans.**

Q11. Area of a square is equal to the area of a rectangle whose breadth is 6cm and length 24 cm. find the length of a side of the square.

Sol.length of rectangle=24cm

Breadth of rectangle = 6 cm

Area of rectangle

= length × breadth

Area of rectangle = 24 × 6

Area of rectangle = 144 cm^2

According to question:

Area of square is equal to area of rectangle. So,

Area of square = $144cm^2$

Length of one side of square = $\sqrt{144m^2}$

$$\begin{array}{r|l} & 12 \\ \hline 1 & 144 \\ & 1 \\ \hline 22 & 44 \\ & 44 \\ \hline & \times \end{array}$$

$\sqrt{144} = 12$

Length of one side of square is 12 cm **Ans.**

Q12. Arrange 196 students in such a way that the number of rows and students in each row is equal.

Sol. total students = 196

As number of rows is equal to number of student in each row. So,

Number of rows = $\sqrt{196}$

$$\begin{array}{r|l} & 14 \\ \hline 1 & 196 \\ & 1 \\ \hline 24 & 96 \\ & 96 \\ \hline & \times \end{array}$$

$\sqrt{196} = 14$

Number of rows = 14 **Ans.**

Q13. The base and altitude of the parallelogram is 16cm and 9cm. if the area of a square is equal to the area of this parallelogram, find the length of the side of the square.

Sol. Altitude of parallelogram= 9 cm

Base of parallelogram=16cm

Area of parallelogram

= base × altitude

Area of parallelogram=9×16

Area of parallelogram= $144cm^2$

According to question:

Area of square is equal to area of parallelogram

Area of square = 144 cm^2

Length of one side of square

$= \sqrt{144cm^2}$

$$\begin{array}{r|l} & 12 \\ \hline 1 & 144 \\ & 1 \\ \hline 22 & 44 \\ & 44 \\ \hline & \times \end{array}$$

$\sqrt{144} = 12$

Length of one side of square is 12 cm **Ans.**

Unit – 4
Ratio, Rate and Proportion
Exercise – 4.1

Q1. If the cost of 7 litres of milk is Rs.770, what is the unit rate of milk?

Sol. Quantity of milk = 7 litres

Price of milk = Rs.770

Unit rate of milk = 770 ÷ 7

$$\begin{array}{r|l} & 110 \\ \hline 7 & 770 \\ & 770 \\ \hline & \times \end{array}$$

Unit rate of milk=Rs.110 **Ans.**

Q2. A worker works in a factory. He works 78 hours during 5 days of the week. Find the average rate of working per day?

Sol. Total time = 78 hours

Total days = 5

Average rate of working per day = 78 ÷ 5

$$\begin{array}{r|l} & 15.6 \\ \hline 5 & 78 \\ & 75 \\ \hline & 30 \\ & 30 \\ \hline & \times \end{array}$$

Average rate of working per day = 15.6 hours

Q3. Ahad completed 6 rounds of a jogging track in 2 hours. What is his average rate of completing rounds?

Sol. Total rounds = 6

Time taken = 2 hours

Average rate of completing rounds = 6 ÷ 2 =3 rounds per hour.

Q4. A person types 480 words in half an hour. How long will he take to type?

a. **765 words**
b. **1250 words**
c. **6230 words**

Sol. Total words = 480

Time taken = 30 minutes

Time taken for one word

= 30 ÷ 480

Time taken for one word

=0.0625 min per word

a. Time taken for 765 words = 765×0.0625

Time taken for 765 words =
47.81 min

b. Time taken for 1250 words =
1250×0.0625.
Time taken for 1250 words =
78.125 min

c. Time taken for 6230 words =
6230×0.0625
Time taken for 6230 words =
389.375 min

Q5. Raza counted his heart beats and found that his heart beats 228 times in 3 minutes. What is his average heart beat rate?

SolTotal heart beat=228 times
Time taken = 3 min
Average heart beat = $228 \div 3$
Average heart beat = 76 time per minute.

Q6. Maha skipped the rope 108 times in 4 minutes. What is her average skipping rate per minute?

SolTotal skipping = 108 times
Time taken = 4 minutes
Average skipping rate= $108 \div 4$
Average skipping rate = 27 times per minute

Q7. Madiha wrote 66 pages of a book in 3 days. What is her average writing rate per day?

Sol. Pages written = 66
Number of days = 3
Average writing rate per day
$= 66 \div 3 = 22$
Average writing rate per day is 22 pages per day.

Exercise – 4.2

Q1. Find the ratio among the quantities.

a) 444 to 234
Sol.444 to 234
444 : 234
222 : 117 (Divide by 2)
74 : 39

b) 16 hrs to 22 hrs
Sol.16 hrs to 22 hrs
16 : 22
8 : 11 (Divide by 2)

c) 565m to 50m to 229m
Sol.565m to 50m to 229m
565 : 50 : 229

d) 12 g to 88 g to 56 g
Sol. 12 g to 88 g to 56 g
12 : 88 : 56
3 : 22 : 14 (Divide by 4)

e) 100ml to 60ml to 88ml
Sol.100ml to 60ml to 88ml
100 : 60 : 88
25 : 15 : 22 (Divide by 4)

Q2. If Rs.340 is divided between Sara and Sonia according to the ratio 3 : 7, find the amount each gets.

Sol. Total amount = Rs.340
Ratio = 3 : 7
Sum of ratio = 3 + 7 = 10

$$\text{Share of Sara} = \frac{3}{10} \times 340 = 102$$

$$\text{Share of Sonia} = \frac{7}{10} \times 340 = 238$$

Q3. A prize money of Rs.342,000 is divided among three contestants A, B and C in the ratio of 2 : 3 : 4. Find the share of each.

Sol. Total money=Rs.342,000
Ratio of A, B and C = 2 : 3 : 4
Sum of ratio = 2 + 3 + 4 = 9

$$\text{Share of A} = \frac{2}{9} \times 342000 = 76000$$

$$\text{Share of B} = \frac{3}{9} \times 342000 = 114{,}000$$

$$\text{Share of C} = \frac{4}{9} \times 342000 = 152{,}000$$

Q4. Rashid earns Rs.32,000 per month. His monthly expenditure is Rs.24,000.

a. What is his savings?
b. Find the ratio of expenditure to savings.

Sol.Total earning = Rs.32,000
(Divide by 3)
Monthly expenditure
= Rs.24,000
Savings = Earning – Expenditure
Savings = 32,000 – 24,000
Savings = 8,000
Ratio of expenditure to savings

Expenditure : Savings
24,000 : 8.000
24 : 8
3 : 1

Q5. Saleem's salary increased from Rs.30,000 to Rs.42,000. Find the ratio between:

a. **His old salary to new salary.**
b. **Increase in his salary to new salary.**

Sol. Old salary = 30,000
New salary = 42,000
Ratio of old salary to new salary
Old salary : new salary
30,000 : 42,000
30 : 42 (Divide by 1000)
10 : 14 (Divide by 3)
5 : 7 (Divide by 2)
Increase in salary = new salary – old salary
Increase = 42,000 – 30,000
Increase in salary = 12,000

Exercise – 4.3

Q1. Calculate the increased or decreased quantities according to given ratios.

a. 48m in the ratio 5 : 8
Sol. 48m in the ratio 5 : 8
Total = 48 m
Ratio = 5 : 8

In fraction form = $\frac{5}{8}$

It is a proper fraction

Now $\frac{5}{8} \times 48 = 30$ (decrease)

b. 126 hours in the ratio 7 : 3
Sol. 126 hours in the ratio 7 : 3
Total hours = 126
Ratio = 7 : 3

In fraction form = $\frac{7}{3}$

It is an improper fraction

Now $\frac{7}{3} \times 126 = 294$ (increase)

c. 8900 in the ratio 9 : 10 (Divide by 10)
Sol. 8900 in the ratio 9 : 10
Total = 8900
Ratio = 9 : 10

In fraction form = $\frac{9}{10}$

It is a proper fraction

No $\frac{9}{10} \times 8900 = 8010$ (decrease)

d. 666 in the ratio 5 : 3
Sol. 666 in the ratio 5 : 3
Total = 666
Ratio = 5 : 3

In fraction form = $\frac{5}{3}$

It is an improper fraction

Now $\frac{5}{3} \times 666 = 1110$ (increase)

e. 428 in the ratio 3 : 4
Sol.428 in the ratio 3 : 4
Total = 428
Ratio = 3 : 4

In fraction form = $\frac{3}{4}$

It is a proper fraction

Now $\frac{3}{4} \times 428 = 321$ (decrease)

f. 35 in the ratio 2 : 5
Sol.35 in the ratio 2 : 5
Total = 35
Ratio = 2 : 5

In fraction form = $\frac{2}{5}$

It is a proper fraction

Now $\frac{2}{5} \times 35 = 14$ (decrease)

g. 708 in the ratio 7 : 6
Sol.708 in the ratio 7 : 6
Total = 708
Ratio = 7 : 6

In fraction form = $\frac{7}{6}$

It is an improper fraction

Now $\frac{7}{6} \times 708 = 826$ (increase)

Q2. The management of a school decided to increase the number of teachers from 28 to 40. Find the ratio of the number of new teachers to the number of previous teachers.

Sol. Number of old teachers=28
Number of new teachers =40
Increased in number of teachers = 40 – 28
= 12
Ratio of new teachers to previous teachers.
40 : 28
10 : 7 (Divide by 4)

Q3. After discount, price of a chopper decreased from Rs.11,250 to Rs.8,750. Find the ratio of the discounted price to the original price.

Sol. Price of chopper = Rs.11,250
Discounted price = Rs.8,750
Amount of discount = 11,250 – 8,750
Amount of discount = 2500
Ratio of discounted price to original price
8,750 : 11,250
875 : 1,125 (Divide by 10)
35 : 45
7 : 9

Q4. Change the quantity 63 in the ratio 5 : 3. Also tell before calculation whether the new quantity will be greater or smaller than the old one.

Sol. Total quantity = 53
Ratio = 5 : 3

In fraction form = $\frac{5}{3}$

It is an improper fraction

Now $\frac{5}{3} \times 63 = 105$ (greater)

Q5. Change the quantity 522 in the ratio 5 : 6. Also tell before calculation whether the new quantity will be greater or smaller than the old one.

Sol. Total quantity = 522
Ratio = 5 : 6

In fraction form = $\frac{5}{6}$

It is a proper fraction

Now $\frac{5}{6} \times 522 = 435$ (smaller)

Q6. A baker baked 360 cupcakes in a day. If he increased the quantity of baking cupcakes in the ration 7:6, what is the new quantity of cupcakes he would be backing daily?

Sol. Total baked cake = 360
Increase in the ratio = 7 : 6

In fraction form $\frac{7}{6}$

It is an improper fraction

Now $\frac{7}{6} \times 360 = 420$ Ans.

Q7. There are 456 workers work in a factory. The factory owner wants to decrease the number of workers in the ratio 7:8. How many workers will work in the factory now?

Sol. Total workers = 456
Decrease in ratio = 7 : 8
(Divide by 25)
(Divide by 5)
In fraction form = $\frac{7}{8}$

It is a proper fraction

Now $\frac{7}{8} \times 456 = 399$ Ans.

Q8. Asad drink 8 litres of water daily. Find:

a. **If the increase the quantity of drinking water in ratio 3:2, how much water will he drink now?**
b. **If he decrease the quantity of drinking water in ratio 3:4, what is the new quantity of water he will drink?**

Sol. Quantity of water = 8 litres
a. Increase in ratio = 3:2

In fraction form $\frac{3}{2}$

It is an improper fraction

Now $\frac{3}{2}\times 8 = 12$ litres

b. Decrease in ratio =3:4

in fraction form = $\frac{3}{4}$

it is a proper fraction

Now $\frac{3}{4}\times 8 = 6$ litres.

Exercise – 4.4

Q1. Find the value of 'x' in the following.

a) $\frac{x}{21} = \frac{4}{7}$

Sol. $\frac{x}{21} = \frac{4}{7}$

Apply cross product

$7\times x = 4\times 21$

Divide both sides by 7.

$\frac{7\times x}{7} = \frac{4\times 21}{7}$

$x = 12$ **Ans.**

b) $\frac{1}{x} = \frac{2}{3}$

Sol. $\frac{1}{x} = \frac{2}{3}$

Apply cross product

$x\times 2 = 1\times 3$

Divide both sides by 2

$\frac{x\times 2}{2} = \frac{1\times 3}{2}$

$x = \frac{3}{2}$ **Ans.**

c) $\frac{5}{15} = \frac{x}{30}$

Sol. $\frac{5}{15} = \frac{x}{30}$

Apply cross product

$x\times 15 = 5\times 30$

Divide both sides by 15

$\frac{x\times 15}{15} = \frac{5\times 30}{15}$

$x = 10$ **Ans.**

d) $x : 24 :: 8 : 6$

Sol. $x : 24 :: 8 : 6$

Product of extreme = Product of mean

$x\times 6 = 8\times 24$

Divide both sides by 6

$\frac{x\times 6}{6} = \frac{8\times 24}{6}$

$x = 32$ **Ans.**

e) $15 : x :: 100 : 200$

Sol. $15 : x :: 100 : 200$

Product of mean = Product of extreme

$x\times 100 = 15\times 200$

Divide both sides by 100

$\frac{x\times 100}{100} = \frac{15\times 200}{100}$

$x = 30$ **Ans.**

Q2. What is the fourth proportional of 3, 9 and 7?

Sol. Let the fourth proportional be 'x'

Then $3 : 9 :: 7 : x$

Product of extreme = Product of mean

$x\times 3 = 9\times 7$

Divide both sides by 3

$\frac{x\times 3}{3} = \frac{9\times 7}{3}$

$x = 21$ **Ans.**

Q3. Beenish reads 25 pages of a storybook in 40 minutes. How many pages will she read in 60 minutes?

Sol. Let number of pages be 'x'

In proportion form:

Minutes : Pages

40 : 25

60 : x

$\frac{40}{60}=\frac{25}{x}$ Apply cross product

$40\times x=25\times 60$

Divide both sides by 40

$\frac{40\times x}{40}=\frac{25\times 60}{40}$

$x=37.5$ **Ans.**

Q4. 7 bats cost Rs.5500. what will 3 bats be bought at?

Sol. Let the price be 'x'

In proportion form:

Price : Bat

5500 : 7

X : 3

$\frac{5500}{x}=\frac{7}{3}$

Apply cross product

$7\times x=5500\times 3$

Divide both sides by 7

$\frac{7\times x}{7}=\frac{5500\times 3}{7}$

$x=2357.14$ **Ans.**

Q5. 5 litres of cooking oil costs Rs.755. what is the cost of 9 litres of cooking oil?

Sol. Let the cost be 'x'

In proportion form:

Cost : oil in litres

755 : 5

X : 9

$\frac{755}{x}=\frac{5}{9}$

Apply cross product

$5\times x=755\times 9$

Divide both sides by 5

$\frac{5\times x}{5}=\frac{755\times 9}{5}$

$x=1359$ **Ans.**

Q6. It takes 8 men to make 18 chairs in 9 days. How many men can make 27 chairs in the same number of days?

Sol. Let number of men be 'x'

Men : Days : Chairs

8 : 9 : 18

x : 9 : 27

$\frac{8}{x}=\frac{9}{9}\times\frac{18}{27}$

$\frac{8}{x}=\frac{18\times 9}{27\times 9}=\frac{162}{243}$

Apply cross product

$x\times 162=8\times 243$

Divide both sides by 162

$\frac{x\times 162}{162}=\frac{8\times 243}{162}$

$x=\frac{1944}{162}$ $x=12$ **Ans.**

Q7, A motor bike required 2 litres of fuel to cover 100 km. how many litres of fuel are needed to cover 50 km?

Sol. Let the required litres of fuel be 'x'

Fuel : Kilometer

2 : 100

x : 50

$\frac{2}{x}=\frac{100}{50}$

Apply cross product

$x\times 100=2\times 50$

Divide both sides by 100

$\frac{x\times 100}{100}=\frac{2\times 50}{100}$

$x=1$ *litres* **Ans.**

Q8. In a camp of 36 earthquake victims, there is enough food for 20 days. If 12 more people come in, how many days will the food last?

Sol. Let the required number of days be 'x'

By the arrival of 12 more people, the number of peoples be 36 + 12 = 48

People : Days

36 : 20

48 : x

$\frac{36}{48}=\frac{x}{20}$

Apply cross product

$x \times 48 = 20 \times 36$

Divide both sides by 48

$$\frac{x \times 48}{48} = \frac{20 \times 36}{48}$$

$x = 15$ Days.

Q9. If 14 men can paint a Masjid in 12 hours, in how many hours can 10 men paint the same Masjid?

Sol. Let the required number of hours be 'x'

Hours : Men

12 : 14

x : 10

$$\frac{x}{12} = \frac{14}{10}$$

Apply cross product

$x \times 10 = 12 \times 14$

Divide both sides by 10

$$\frac{x \times 10}{10} = \frac{12 \times 14}{10}$$

$x = 16.8$ Hours.

Review Exercise – 4

Q1. Choose the correct option.

a) ___ is the comparison of two or more quantities or number.

i. Ratio
ii. Proportion
iii. Equality
iv. Addition

b) ___ of two ratios is known as a proportion.

i. Difference
ii. Equality
iii. Sum
iv. Addition

c) In a class there are 20 boys and 15 girls. The ratio of boys to girls is

i. 4 : 3
ii. 3 : 4
iii. 4 : 5
iv. 5 : 4

d) Two quantities will be directly proportional to each other if with the decrease in one quantity the other quantity _____.

i. Increase
ii. Decreases
iii. Remains unchanged
iv. Adds up

e) The ratio of 12 : 4 is equivalent to ____

i. 1 : 2
ii. 2 : 1
iii. 6 : 2
iv. 2 : 6

f) The speed of a vehicle and the time to reach the destination is ____

i. Directly proportional
ii. Inversely proportional
iii. Same proportional
iv. Equally proportional

g) There is a/an ____ proportional between length and width of a square.

i. Direct
ii. Inverse
iii. Continued
iv. Alternate

h) 76 increased in 5 : 2 is

i. 32
ii. 38
iii. 190
iv. 90

Q2. Define and give examples of the following.

a. Rate

Sol. A rate is a ratio that compares two quantities with different units of measure. Rate is used almost every day. For example: unit price of item, speed, service charges etc.

OR

A rate is a comparison of quantities of different kinds with different units. Different quantities can be used together to form a rate. For example: 89 km/hour.

b. Ratio

Sol.Ratio is the term that is used to compare two or more quantities of the same kind. The symbol ":" is used to separate the ratio.

For example: ratio of 4 to 5 is written as:

4 : 5

c. Average rate

Sol. Average rate is the rate in which something is done during a definite time interval. Constant rate assumes that the average rate of something being done is the same during the whole-time interval.
For example:
Average rate of learning new words per

$$\text{day} = \frac{5+3+4}{3}$$

$$\Rightarrow \frac{12}{3} = 3 \text{ words per day.}$$

d. Proportion and its types

Sol. When two ratios become equal it forms a proportion. It is denoted by "::" or "="

There are four quantities in a proportion
i.e. a : b :: c : d

Types of proportion:

There are two types of proportion

i. Direct proportion
ii. Inverse proportion

If with the increase in one quantity, the other quantity is increased and with the decrease in one quantity the other quantity decreased then these quantities are in direct proportion.
For example: Number of items and its weight is in direct proportion
If with the increase in one quantity, the other quantity is decreased and with the decrease in one quantity the other quantity increased then these quantities are in inverse proportion.
For example: Speed of vehicle and the time to reach the destination are inversely proportional.

Q3. There are 35 benches in a park. If the park administration wants to decrease the number of benches due to shortage of space in ratio 4:5, how many benches will be there?

Sol. Total benches = 35
Decrease in ratio = 4 : 5

$$\text{In fraction form} = \frac{4}{5}$$

New number of benches

$$= \frac{4}{5} \times 35 = 28 \textbf{ Ans.}$$

Q4. Israr donated Rs.8100 to a charity organization during the year 2021. If he wants to increase the donation money in ratio 11:9 during 2022. What will be the new amount of donation?

Sol. Donation in 2021 = Rs.8100
Increase in ration = 11 : 9

$$\text{In fraction form} = \frac{11}{9}$$

$$\text{Donation in 2022} = \frac{11}{9} \times 8100 = 9900$$

Ans.

Q5. A tailor stitched 18 scarves in 3 hours. Find his average rate of stitching scarves.

Sol. Number of scarves = 18
Time taken = 3 hours
Average rate of stitching = $18 \div 3 = 6$
Average rate of stitching is 6 scarves per hours.

Q6. Find the value of 'x' in each of the following proportions.

a) 1 : 10 :: x : 5
Sol.1 : 10 :: x : 5
Product of mean = Product of extreme
$10 \times x = 1 \times 5$
Divide both sides by 10

$$\frac{10 \times x}{10} = \frac{1 \times 5}{10}$$

$$x = \frac{5}{10} \Rightarrow x = 0.2 \textbf{ Ans.}$$

b) 8 : 4 :: 20 : x
Sol.8 : 4 :: 20 : x
Product of extreme = product of mean
$8 \times x = 4 \times 20$
Divide both sides by 8

$$\frac{8 \times x}{8} = \frac{4 \times 20}{8}$$

$$\Rightarrow x = 10 \textbf{ Ans.}$$

c) x : 32 :: 4 : 8
Sol.x : 32 :: 4 : 8

Product of extreme = product of mean

$x \times 8 = 4 \times 32$

Divide both sides by 8

$$\frac{x \times 8}{8} = \frac{4 \times 32}{8}$$

$\Rightarrow x = 16$ **Ans.**

d) $50 : x :: 200 : 100$

Sol. $50 : x :: 200 : 100$

Product of mean = Product of extreme

$x \times 200 = 50 \times 100$

Divide both sides by 200

$$\frac{x \times 200}{200} = \frac{50 \times 100}{200}$$

$\Rightarrow x = 25$ **Ans.**

Q7. Ali and Anas distributed an amount in the ratio of 5:6. Find the amount of Ali, if Anas gets Rs.170. also find the total amount.

Sol. Let the total amount be 'x'

Ratio of Ali and Anas = 5 : 6

Sum of ratio = 5 + 6 = 11

Share of Anas = Rs.170

First find the total amount

$$\frac{5}{11} \times x = 170$$

Multiply both sides by $\frac{11}{5}$

$$\frac{11}{5} \times \frac{5}{11} \times x = 170 \times \frac{11}{5}$$

$\Rightarrow x = 374$

Total amount = Rs.374

Share of Ali = $\frac{7}{11} \times 374 = 238$

Share of Ali is Rs.238

Q8. Ten workers complete a task in 7 days. How many workers are needed to complete the same task in 14 days?

Sol. Let the required number of workers be 'x'

Workers : Days

10 : 7

x : 14

$$\frac{x}{10} = \frac{7}{14}$$

Apply cross product

$x \times 14 = 7 \times 10$

Divide both sides by 14

$$\frac{x \times 14}{14} = \frac{7 \times 10}{14}$$

$\Rightarrow x = 5$

Thus the required number of workers is 5.

Q9. An army camp of 150 men has enough food for 40 days. How long will the food last if the number of men in the camp is reduced to 120?

Sol. Let the required number of days be 'x'

Days : Men

40 : 150

x : 120

$$\frac{x}{40} = \frac{150}{120}$$

Apply cross product

$x \times 120 = 40 \times 150$

Divide both sides by 120

$$\frac{x \times 120}{120} = \frac{40 \times 150}{120}$$

$\Rightarrow x = 50$

Thus the required number of days is 50.

Unit – 5
Mathematics Arithmetic
Exercise – 5.1

Q1. Complete the following table:

	a	b	c	d	e
C.P	1800	2450	4000	6425	9000
S.P	1500	2200			
Profit			1260		
Loss				200	2000
Profit %					
Loss %					

Sol.

a. Cost price = Rs.1800

Loss = cost price – sale price

$$\text{Loss \%} = \frac{\text{loss}}{\text{cost price}} \times 100\%$$

$$\text{Loss \%} = \frac{100\%}{6} = 16.67\%$$

Sale price = Rs.1500

Loss = 1800 – 1500 = 300

$$\text{Loss \%} = \frac{300}{1800} \times 100\%$$

b. Cost price = Rs.2450

Loss = cost price – sale price

$$\text{Loss \%} = \frac{\text{loss}}{\text{cost price}} \times 100\%$$

$$\text{Loss \%} = \frac{\cancel{25}^{5}}{\cancel{245}_{49}} \times 100\%$$

Sale price = Rs.2200

Loss = 2450 – 2200 = 250

$$\text{Loss \%} = \frac{250}{2450} \times 100\%$$

$$\text{Loss \%} = \frac{500}{49}\% = 10.2\%$$

c. Cost price = Rs.4000

Sale price= cost price + profit

Sale price = Rs.5260

$$\text{Profit \%} = \frac{profit}{\text{cost price}} \times 100\%$$

$$\text{Profit \%} = \frac{126}{4}\%$$

Profit = Rs.1260

Sale price = 4000 + 1260

$$\text{Profit \%} = \frac{1260}{\cancel{4000}} \times \cancel{100}\%$$

$$\text{Profit \%} = 31.5\%$$

d. Cost price = Rs.6425

Sale price = cost price – loss

Sale price = Rs.6225

$$\frac{\text{loss}}{\text{cost price}} \times 100\%$$

$$\text{Loss \%} = \frac{200}{6425} \times 100\%$$

Loss = Rs.200

Sale price = 6425 – 200

Loss % =

$$\text{Loss \%} = \frac{\cancel{200}^{8}}{\cancel{6425}_{257}} \times 100\%$$

$$\text{Loss \%} = \frac{800\%}{257} = 3.11\%$$

e. **Cost price = Rs.9000**

Sale price = cost price – loss

Sale price = Rs.7000

$$\text{Loss \%} = \frac{\text{loss}}{\text{cost price}} \times 100\%$$

$$\text{Loss \%} = \frac{2000}{9000} \times 100\%$$

Loss = Rs.2000

Sale price = 9000 – 2000

Loss % =

$$\text{Loss \%} = \frac{2}{9} \times 100\%$$

$$\text{Loss \%} = \frac{200\%}{9} = 22.23\%$$

	a	b	C	D	e
C.P	1800	2450	4000	6425	9000
S.P	1500	2200	5260	6225	7000
Profit			1260		
Loss	300	250		200	2000
Profit %			31.5%		
Loss %	16.67%	10.2%		3.11%	22.23%

Q2. A watch is bought for Rs.250 and sold for Rs.300. find the profit and profit %?

Sol. Sale price = Rs.300

Cost price = Rs.250

Profit = sale price – cost price

Profit = 300 – 250 = 50

$$\text{Profit \%} = \frac{profit}{\text{cost price}} \times 100\%$$

$$\text{Profit \%} = \frac{\cancel{50}}{\cancel{250}} \times 100\%$$

$$\text{Profit \%} = \frac{1}{5} \times 100\%$$

Profit % = 20% **Ans.**

Q3. Amna bought a doll for Rs.475 and sold it for Rs.425. find her loss as well as loss percentage.

Sol. cost price = Rs.475

Sale price = Rs.425

Loss = cost price – sale price

Loss = 475 – 425 = 50

$$\text{Loss \%} = \frac{\text{loss}}{\text{cost price}} \times 100\%$$

$$\text{Loss \%} = \frac{\cancel{50}^{2}}{\cancel{475}_{19}} \times 100\%$$

$$\text{Loss \%} = \frac{200}{19}\%$$

Loss % = 10.52% **Ans.**

Q4. Usman bought a bike for Rs.50,000. After a few months, he sold it for Rs.40,000. Find his profit or loss and its percentage.

Sol. Cost price = Rs.50,000

Sale price = Rs.40,000

Loss = cost price – sale price

Loss = 50,000 – 40,000

Loss = Rs.10,000

$$\text{Loss \%} = \frac{\text{loss}}{\text{cost price}} \times 100\%$$

$$\text{Loss \%} = \frac{10,000}{50,000} \times 100\%$$

$$\text{Loss \%} = \frac{100}{5}\%$$

Loss % = 20% **Ans.**

Q5. Najma bought a house for Rs.750,000 and sold it for Rs.800,000. Find her profit or loss percentage.

Sol. Cost price = Rs.750,000
Sale price = Rs.800,000
Profit = sale price – cost price
Profit = 800,000 – 750,000
Profit = 50,000

$$\text{Profit \%} = \frac{profit}{\text{cost price}} \times 100\%$$

$$\text{Profit \%} = \frac{50,000}{750,000} \times 100\%$$

$$\text{Profit \%} = \frac{1}{15} \times 100\%$$

Profit % = 6.67% **Ans.**

Q6. The marked price of a chair is Rs.800. it sold for Rs.600. Find the discount percentage.

Sol. Marked price = Rs.800
Sale price = Rs.600
Discount = marked price – sale price
Discount = 800 – 600 = 200

$$\text{Discount\%} = \frac{\text{discount}}{\text{marked price}} \times 100\%$$

$$\text{Discount\%} = \frac{200}{800} \times 100\%$$

$$\text{Discount \%} = \frac{1}{4} \times 100\%$$

Discount % = 25% **Ans.**

Q7. A shirt, with a marked price of Rs.450, was sold for Rs.375. Find the discount which is allowed on the shirt and discount %.

Sol. Marked price = Rs.450
Sale price = Rs.375
Discount = Marked price – sale price
Discount = 450 – 375 = Rs.75

$$\text{Discount\%} = \frac{\text{discount}}{\text{marked price}} \times 100\%$$

$$\text{Discount\%} = \frac{75^{1}}{450_{6}} \times 100\%$$

$$\text{Discount \%} = \frac{1}{6} \times 100\%$$

Discount % = 16.67 % **Ans.**

Exercise – 5.2

Q1. Calculate the property tax on the following amounts at the rate of 8%.

a) Rs.175,500
b) Rs.3,467,890
c) Rs.12,345,678
d) Rs.34,567,800

Sol. Rate of tax = 8 %

a. **Rs.175,500**
Amount = Rs.175,500
Amount of tax
= 8% of Rs.175,500
Amount of tax

$$= \frac{8}{100} \times 175,500$$

Amount of tax = Rs.14,040

b. **Rs.3,467,890**
Amount = Rs.3,467,890
Amount of tax
= 8% of Rs.3,467,890
Amount of tax

$$= \frac{8}{100} \times 3,467,890$$

Amount of tax= Rs.277,431.2

c. **Rs.12,345,678**
Amount = Rs.12,345,678
Amount of tax
= 8% of Rs.12,345,678
Amount of tax

$$= \frac{8}{100} \times 12,345,678$$

Amount of tax=Rs.987,654,24

d. **Rs.34,567,800**
Amount =Rs.12,345,678
Amount of tax
= 8% of Rs.12,345,678
Amount of tax

$$= \frac{8}{100} \times 34,567,800$$

Amount of tax= Rs.2,765,424

Q2. Find the total amount of money which a buyer has to pay for each article with a 17% general sales tax imposed on it.

a) **Car = Rs.1,856,000**
b) **Motorbike=Rs.125,000**
c) **Bus = Rs.7,500,000**

Sol. GST = 17%

a. **Price of car=Rs.1,856,000.**

Amount of tax = 17% of Rs.1,856,000

Amount of tax

$$= \frac{17}{100} \times 1{,}856{,}000$$

Amount of tax= $= \frac{17}{100} \times 1{,}856{,}000$

Amount of tax =17×18,560

Amount of tax = Rs.315,520

Total amount that the buyer has to pay

= Rs.315,520 + Rs.1,856,000

Total amount = Rs.2,171,520

b. **Price of motorbike = Rs.125,000**

Amount of tax = 17% of Rs.125,000

Amount of tax

$$= \frac{17}{100} \times 125{,}000$$

Amount of tax= $= \frac{17}{100} \times 125{,}000$

Amount of tax =17×1,250

Amount of tax = Rs.21,250

Total amount that the buyer has to pay

= Rs.21,250 + Rs.125,000

Total amount = Rs.146,250

c. **Price of bus =Rs.7,500,000**

Amount of tax = 17% of Rs.7,500,000

Amount of tax

$$= \frac{17}{100} \times 7{,}500{,}000$$

Amount of tax= $= \frac{17}{100} \times 7{,}500{,}000$

Amount of tax =17×75,000

Amount of tax= Rs.1,275,000

Total amount that the buyer has to pay

= Rs.1,275,000 + Rs.7,500,000

Total amount = Rs.8,775,000

Q3. Find the property tax on a property of Rs.650,000 at the rate of 1.5%.

Sol. Property worth = Rs.650,000

Rate of tax = 1.5%

Amount of tax = 1.5% of Rs.650,000

Amount of tax $= \frac{1.5}{100} \times 650{,}000$

Amount of tax $= \frac{1.5}{100} \times 650{,}000$

Amount of tax $= 1.5 \times 6{,}500$

Amount of tax = Rs.9,750

Q4. An owner of a factory paid the property tax of Rs.40,500 at the rate of 9%. Find the worth of the property.

Sol. Tax paid = Rs.40,500

Rate of tax = 9%

Property worth =?

Let the property worth be 'x'

9% of property worth = amount of tax

9% of x = 40,500

$$\frac{9}{100} \times x = 40{,}500$$

Multiply both sides by $\frac{100}{9}$

$$\frac{100}{9} \times \frac{9}{100} \times x = 40{,}500 \times \frac{100}{9}$$

$$x = \frac{4{,}050{,}000}{9}$$

Property worth = Rs.450,000

Q5. A house has a value of Rs.8,000,000. If the property tax is 6%. Calculate the amount of property tax.

Sol. Value of the house = Rs.8,000,000

Rate of property tax = 6%

Amount of property tax

=6% of Rs.8,000,000

Amount of tax= $\frac{6}{100} \times 8{,}000{,}000$

Amount of tax= $6 \times 80{,}000$

Amount of tax = Rs.480,000

Q6. Mr Asim owns a plot worth Rs.6,700,400. What is the amount of property tax to be paid at the rate of 2.5%.

Sol. Plot worth = Rs.6,700,400

Rate of tax = 2.5%

Amount of tax = 2.5% of Rs.6,700,400

Amount of tax=

$$\frac{2.5}{100}\times 6,700,400$$

Amount of tax = 2.5×67,004

Amount of tax = Rs.167,510

Q7. Madeeha paid Rs.7800 as the property tax of her house at the rate of 3%. Find the worth of the property.

Sol. Amount of property tax paid by Madeeha = Rs.7,800

Rate of property tax = 3%

Property worth =?

Let the property worth be 'x'

3% of property worth = amount of tax

3% of x = 7,800

$$\frac{3}{100}\times x = 7,800$$

Multiply both sides by $\frac{100}{3}$

$$\frac{100}{3}\times\frac{3}{100}\times x = 7,800\times\frac{100}{3}$$

$$x = \frac{780,000}{3}$$

Property worth = Rs.260,000

Q8. Find the cost of an item if the buyer paid Rs.350 as GST at the rate of 17%.

Sol. GST paid by Buyer=Rs.350

GST rate = 17%

Let the cost price be 'x'

17 % of cost price = Amount of GST

$$17\% \ of \ x = Rs.350$$

$$\frac{17}{100}\times x = 350$$

Multiply both sides by $\frac{100}{17}$

$$\frac{100}{17}\times\frac{17}{100}\times x = 350\times\frac{100}{17}$$

$$x = \frac{35,000}{17} = 2058.82$$

Thus the cost price = Rs.2058.82 Ans.

Q9. The price of a shirt including 17% general sale tax is Rs.560. find the original price of the shirt.

Sol. Let the original price of shirt be 'x'

Rate of tax = 17%

Price of shirt including tax = Rs.560

To find the original price of shirt:

$$x + 17\% \ of \ x = 560$$

$$x + \frac{17}{100}\times x = 560$$

$$\frac{x}{1} + \frac{17x}{100} = 560$$

$$\frac{100x+17x}{100} = 560 \quad \text{LCM}$$

Multiply 100 on both sides

$$100\times\frac{100x+17x}{100} = 560\times 100$$

$$117x = 56000$$

Divide both sides by 117

$$\frac{117x}{117} = \frac{56000}{117}$$

$$x = 478.63$$

Thus the original price of shirt is Rs.478.63 Ans.

Q10. The price of a refrigerator is Rs.66,400 after including GST at the rate of 17%. What is the amount of GST.

Sol. Price of refrigerator = Rs.66,400

Rate of GST = 17%

Amount of GST =?

Amount of GST = 17% of Rs.66,400

Amount of GST=17%× 66,400

Amount of GST $= \frac{17}{100} \times 66,400$

Amount of GST=17×664

Amount of GST=Rs.11,288

Q11. Raza purchased an item for Rs.1590 with GST at the rate of 10%. Calculate the total cost after GST is added.

Sol. Price of item = Rs.1,590

GST rate = 10%

Amount of GST=10 % of 1590

Amount of GST $= \frac{10}{100} \times 1,590$

Amount of GST = Rs.159

Cost after GST = 1,590 + 159

Cost after GST = Rs.1,749

Q12. Ali purchase a motocycle in Rs.52,900. He paid 5% tax on it. Ali sold that motorcycle in Rs.53,500 and he charged tax 7% on it. Find the value added tax on it.

Sol. Price of motorcycle = Rs.52,900

Rate of tax= 5 %

Amount of tax=5 % of 52,900

Amount of tax $= \frac{5}{100} \times 52,900$

Amount of tax = 5×529

Amount of tax = Rs.2,645

Sale price of motorcycle = Rs.53,500

Tax recovered by shopkeeper = 7 % of 53,500

Tax recovered $= \frac{7}{100} \times 53,500$

Tax recovered = 7×535

Tax recovered = 3,745

Value added tax = 3,745 – 2,645

Value added tax = Rs.1,100

Q13. The monthly income of Asma is Rs.56,000. Find the amount of income tax she paid if she paid Rs.7255 as zakat.

Sol. Monthly income = Rs.56,000

Annual income = 12×56,000

Annual income = Rs.672,000

Zakat paid = Rs.7,255

Net income = 672,000 – 7,255 = Rs.664,745

Rate of income tax = 5%

Taxable income = 5 % of 664,745

Taxable income $= \frac{5}{100} \times 664,745$

Taxable income $= \frac{3,323,725}{100}$

Taxable income = Rs.33,237.25

Q14. A shopkeeper purchased a sack of rice in Rs.6,890 and he paid 4% tax on it. Now shopkeeper sold that sack of rice in Rs.7,900 and charges tax 6% on it. Find the value added tax on it.

Sol. Price of rice = Rs.6,890

Rate of tax = 4 %

Amount of tax paid=4% of 6,890

Tax paid $= \frac{4}{100} \times 6890$

Tax paid $= \frac{27560}{100}$

Tax paid = 275.6

Sale price of rice = Rs.7,900

Rate of tax charged =6 %

Amount of tax charged by shopkeeper = 6 % of 7,900

$= \frac{6}{100} \times 7,900$

$= 6 \times 79 = 474$

Amount of tax charged by shopkeeper = Rs.474

Value added tax = 474 – 275.6 = 198.4

Ans.

Q15. Umar works in a factory on commission. He got 2.2% commission on each item sale. If he sold an item of Rs.78,600. How much commission he got?

Sol. Total sale = Rs.78,600

Rate of commission = 2.2%

Amount of commission = 2.2% of 78,600

Amount of commission =

$$\frac{2.2}{100}\times 78,600$$

Amount of commission =

Q16. Kamal works in a laptop shop. He got commission of 3.2% on each laptop sold. If he sold 6 laptops costing a total amount of Rs.471,000, how much amount he got as commission?

Sol. Total sale price of 6 laptops = Rs.471,000

Rate of commission = 3.2%

Amount of commission = 3.2% of 471,000

Amount of commission =

$$\frac{3.2}{100}\times 471,000$$

Amount of commission =

$$3.2\times 4,710$$

Amount of commission = Rs.15,072**Ans.**

Exercise – 5.3

Q1. Asma's savings are Rs.78,480 for a year. How much Zakat will she pay?

Sol. Total saving = Rs.77,480

Rate of Zakat = 2.5%

Amount of Zakat = 2.5% of Rs.77,480

Amount of Zakat =

$$\frac{2.5}{100}\times 77,480$$

Amount of Zakat =

$$=\frac{2.5\times 7,748}{10}$$

Amount of Zakat = Rs.19,370

Q2. Hassaan paid Rs.7,750 as Zakat. What were his yearly savings?

Sol. Amount of Zakat paid = Rs.7,750

Rate of Zakat = 2.5%

Total saving =?

Let total saving be 'x'

Then

2.5% of total saving = amount of Zakat

2.5% of x = 7,750

$$\frac{2.5}{100}\times x = 7,750$$

$2.2\times 786 = 1,729.2$

Multiply both sides by $\frac{100}{2.5}$

$$\frac{100}{2.5}\times\frac{2.5}{100}\times x = 7,750\times\frac{100}{2.5}$$

$$x = 7,750\times 40$$

Total saving = Rs.310,000

Q3. Mr Akram pays Rs.20,000 as Zakat. Find his annual savings.

Sol. Amount of Zakat paid = Rs.20,000

Rate of Zakat = 2.5%

Total saving =?

Let total saving be 'x'

Then

2.5% of total saving = amount of Zakat

2.5% of x = 20,000

$$\frac{2.5}{100}\times x = 20,000$$

Multiply both sides by $\frac{100}{2.5}$

$$\frac{100}{2.5}\times\frac{2.5}{100}\times x = 20,000\times\frac{100}{2.5}$$

$$x = 20,000\times 40$$

Total saving = Rs.800,000

Q4. If Mr Salman earned Rs.224,000 by selling a rice crop and paid Ushr at the rate of 5%. What amount did he pay as Ushr?

Sol. Crop worth = Rs.224,000

Rate of Ushr = 5%

Amount of Ushr =?

Amount of Ushr = 5% of 224,000

Amount of Ushr =

$$\frac{5}{100}\times 224,000$$

Amount of Ushr = 5×2,240

Amount of Ushr = Rs.11,200

Q5. Haris sold mangoes for Rs.66,000 and paid 10% as Ushr. Find the amount of Ushr.

Sol. Mangoes worth = Rs.66,000
Rate of Ushr = 10%
Amount of Ushr =?
Amount of Ushr= 10% of 66,000
Amount of Ushr =

$$\frac{10}{100}\times 66,000$$

Amount of Ushr = 10×660
Amount of Ushr = Rs.6,600

Q6. Madeeha's annual savings are Rs.180,000. What is the amount of Zakat to be paid by her?

Sol. Annual saving = Rs.180,000
Rate of Zakat = 2.5%
Amount of Zakat = 2.5% of 180,000
Amount of Zakat =

$$\frac{2.5}{100}\times 180,000$$

Amount of Zakat = $2.5\times 1,800$
Amount of Zakat = Rs.4,500

Q7. The amount of Ushr paid is Rs.17,670 by a farmer at the rate of 10%. What is the total amount for which the Ushr has been paid?

Sol. Amount of Ushr paid = Rs.17,670
Rate of Ushr = 10%
Total amount =?
Let the total amount be 'x'
Then 10% of total amount = Ushr paid

$10\%\times x = 17,670$

$$\frac{10}{100}\times x = 17,670$$

$$\frac{1}{10}\times x = 17,670$$

Multiply 10 on both sides

$$10\times\frac{1}{10}\times x = 17,670\times 10$$

$x = 176,700$ **Ans.**

Q8. Calculate the amount payable as Ushr by a farmer who earned Rs.346,000 if the rate of Ushr is 5%.

Sol. Total amount = 346,000
Rate of Ushr= 5%
Amount of Ushr= 5% of 346,000

$$=\frac{5}{100}\times 346,000$$

$=5\times 3,460$

Amount of Ushr = Rs.17,300

Review Exercise – 5

Q1. Choose the correct option.

a) Safi bought one dozen eggs for Rs.72 and two eggs were rotten. He sold the eggs for Rs.60. find the percentage loss he suffered.
   i. 16%
   ii. 16.11%
   iii. **16.67%**
   iv. 12%

b) Haris bought a notebook for Rs.30 on Rs.5 discount. The marked price is ___
   i. Rs.25
   ii. Rs.30
   iii. **Rs.35**
   iv. Rs.20

c) _____ is based on the annual value of a house, land, cars, buildings, etc.
   i. **Property tax**
   ii. GST
   iii. Zakat
   iv. Ushr

d) According to Islam the fixed rate of Zakat is _____.
   i. 0.25%
   ii. 25%
   iii. **2.5%**
   iv. 25.5%

e) GST stands for:
   i. Generic sales tax
   ii. General sold tax
   iii. **General sales tax**
   iv. General standard tax

f) ____ is the Zakat paid by Mulims(farmer) on their agricultural products.
   i. Property tax
   ii. GST
   iii. Zakat
   iv. **Ushr**

g) ____ is based on yearly income of an individual.
   i. Property tax
   ii. Income tax
   iii. Value added tax
   iv. Commission

h) If Tahir sold a table for Rs.5000 and get commission of 5%. The amount of commission is:
   i. Rs.200
   ii. Rs.500
   iii. Rs.250
   iv. Rs.550

Q2. Find the profit or loss percentage.

a) Cost price= Rs.67,300
Selling price=Rs.65,200

b) Cost price=Rs.8,500
Selling price=Rs.8,650

Sol

a. Cost price = Rs.67,300
   Sale price = Rs.65,200

Loss = cost price – sale price
Loss = 67,300 – 65,200
Loss = 2,100

$$\text{Loss \%} = \frac{\text{loss}}{\text{cost price}} \times 100\%$$

$$\text{Loss \%} = \frac{2100}{67,300} \times 100\%$$

$$\text{Loss \%} = \frac{21}{673} \times 100\%$$

Loss % = 0.0312 ×100%
Loss % = 3.12 % **Ans.**

b. Cost price = Rs.8,500
   Sale price = Rs.8,650

Profit = sale price – cost price
Profit = 8,650 – 8,500
Profit = Rs.150

$$\text{Profit \%} = \frac{\text{profit}}{\text{cost price}} \times 100\%$$

$$\text{Profit \%} = \frac{150}{8,650} \times 100\%$$

$$\text{Profit \%} = \frac{15}{865} \times 100\%$$

Profit % = 0.01734 ×100%
Profit % = 1.734 % **Ans.**

Q3. Find the discount and percentage discount.

a) Marked price = Rs.7,845
Selling price = Rs.7,690

Sol. Marked price = Rs.7,845
Selling price = Rs.7,690
Discount = marked price – sale price
Discount = 7,845 – 7,690
Discount = Rs.155

$$\text{Discount\%} = \frac{\text{discount}}{\text{marked price}} \times 100\%$$

$$\text{Discount\%} = \frac{155}{7,845} \times 100\%$$

$$\text{Discount\%} = \frac{15500}{7,845}\%$$

Discount%= 1.976 % **Ans.**

Q4. Find Marked price if: Discount = Rs.900 Selling price = Rs.6,500

Sol. Sale price = Rs.6,500
Amount of discount = Rs.900
Marked price = sale price + amount of discount
Marked price = 6,500 + 900
Marked price = Rs.7,400 **Ans.**

Q5. A shopkeeper sold an oven for Rs.39,900 and earned 25% profit. Find the actual price of the oven.

Sol. Sale price of oven = Rs.39,900
Profit % = 25%
Cost price of oven =?
Let cost price be 'x'
Then

$$25\% \text{ of } x + x = 39,900$$

$$\frac{25}{100} \times x + x = 39,900$$

$$\frac{25x}{100} + \frac{x}{1} = 39,900$$

$$\frac{25x + 100x}{100} = 39,900 \quad \text{LCM}$$

Multiply 100 on both sides

$$100\times\frac{25x+100x}{100}=39,900\times100$$

$125x=3,990,000$

Divide both sides by 125

$$\frac{125x}{125}=\frac{3,990,000}{125}$$

$\Rightarrow x=31,920$

Q6. Sadia saves Rs.89,000 in a year. How much will she pay as Zakat?

Sol. Annual saving = Rs.889,000

Rate of Zakat = 2.5 %

Amount of Zakat = 2.5% of 89,000

Amount of Zakat =

$$\frac{2.5}{100}\times89,000$$

Amount of Zakat = 2.5×890

Amount of Zakat = Rs.2,225

Q7. Aqib has 2400 kg rice. The price of rice is Rs.45 per kg. find the Ushr that he will pay.

Sol. Quantity of rice = 2400kg

Price per kg = Rs.45

Amount of rice = 45 × 2400

Amount of rice = Rs.108,000

Rate of Ushr = 10%

Amount of Ushr = 10% of 108,000

Amount of Ushr =

$$\frac{10}{100}\times108,000$$

Amount of ushr = $10\times1,080$

Amount of Ushr = Rs.10,800

Q8. Umar bought a used car having some faults in it for Rs.450,000. He paid an amount of Rs.58,000 to get it repaired. He sold it then for Rs.440,000. Find his profit or loss percentage.

Sol. Cost price = Rs.450,000

Amount of repairing = Rs.58,000

Total cost = 450,000 + 58,000

Total cost = Rs.508,000

Sale price = Rs.440,000

Loss = cost price – sale price

Loss = 508,000 – 440,000

Loss = Rs.68,000

$$\text{Loss \%}=\frac{\text{loss}}{\text{cost price}}\times100\%$$

$$\text{Loss \%}=\frac{68,000}{508,000}\times100\%$$

$$\text{Loss \%}=\frac{68}{508}\times100\%$$

$$\text{Loss \%}=\frac{6800}{508}\%$$

Loss % = 13.385 % Ans.

Q9. A shopkeeper purchased a cupboard in Rs.18,900. He paid a tax of 4%. He sold that cupboard in Rs.21,400 and charge tax of 6%. How much value added tax he paid?

Sol. Cost price = Rs.18,900

Rate of tax = 4 %

Amount of tax=4 % of 18,900

$$\text{Amount of tax}=\frac{4}{100}\times18,900$$

Amount of tax = 4 × 189

Amount of tax = Rs.756

Sale price = Rs.21,400

Rate of tax charged = 6 %

Amount of tax charged by the shopkeeper = 6 % of 21,400

$$\Rightarrow\frac{6}{100}\times21,400$$

$\Rightarrow 6\times214$

Amount of tax charged by the shopkeeper = Rs.1,284

Value added tax = 1,284 – 756

Value added tax =Rs.528Ans.

Q10. Saad's yearly income is Rs.236,000. How much income tax he paid?

Sol. Yearly income = Rs.236,000

Rate of income tax = 5 %

Income tax paid = 5 % of 236,000

$$\Rightarrow\frac{5}{100}\times236,000\Rightarrow5\times2,360$$

Income tax paid = Rs.11,800

Q11. A shop was sold for Rs.2,555,750 through an agent. If the percentage of commission is 1.7%. Find the amount the agent received as commission.

Sol. Price of shop sold = Rs.2,555,750

Percentage of commission = 1.7 %

Amount of commission =

1.7 % of 2,555,750

$$\Rightarrow \frac{1.7}{100} \times 2,555,750$$

$$\Rightarrow \frac{1.7}{10} \times 2,555,75$$

$$\Rightarrow \frac{434,477.5}{10}$$

Amount of commission = Rs.43,447.75

Ans.

Unit – 6
Sets
Exercise – 6.1

Q1. Write the following sets in descriptive form;

a. A={January, June, July}

Sol.Descriptive form:

A is a set of names of months starting with "J"

b. B = {a, b, c, d, e}

Sol.Descriptive form:

B is a set of first five English alphabets

c. $C = \{-1, -2, -3, -4\}$

Sol.Descriptive form:

C is a set of first four negative integers

d. D = {Thursday, Saturday}

Sol.Descriptive form:

D is a set of weekdays just before and after Friday

e. E = {2, 4, 6, 8}

Sol.Descriptive form:

E is a set of first four positive even numbers

f. F = {14, 16, 18, ...}

Sol.Descriptive form:

F is a set of even numbers greater than 12

g. G = {1, 3, 5, 7, 9, ...}

Sol.Descriptive form:

G is a set of odd numbers

h. H = {10, 12, 14, 16, 20}

Sol.Descriptive form:

H is a set of even numbers between 8 and 22

i. E = {2, 4, 6, 8, ...}

Sol.Descriptive form:

E is a set of positive even numbers

j. R ={101, 103, 105, 107, 109}

Sol.Descriptive form:

R is a set of positive odd numbers between 100 and 110

k. A = {0, 1, 2, 3, 4, 5, ...}

Sol.Descriptive form:

A is a set of whole numbers

l. C = {a, e, i, o, u}

Sol.Descriptive form:

C is a set of vowels of English alphabets

m. D = {1, 4, 9, 16, 25}

Sol.Descriptive form:

D is a set of first five perfect square numbers

n. O = {1, 3, 5, 7, 9}

Sol.Descriptive form:

O is a set of first five odd numbers

o. B = {22, 33, 44, 55}

Sol.Descriptive form:

B is a set of multiples of 11 between 20 and 60

Q2. Write the following in tabular form;

a. A set of odd number between 30 and 60

Sol.Tabular form:

A = {31, 33, 35, 37, 39, 41, 43, 45, 47, 49,51, 53, 55, 57, 59}

b. A set of natural numbers less than 40

Sol.Tabular form:

B = {1, 2, 3, ... , 40}

c. A set of multiples of 12 less than 60

Sol.Tabular form:

C ={12, 24, 36, 48}

d. The set of common factors of 18, 30 and 42

Sol.Tabular form:

D ={1, 2, 3, 6}

e. The set of numbers which are divisible by both 3 and 4

Sol.Tabular form:

E ={12, 24, 36, ...}

f. The set of factors of 81 between 5 and 30

Sol.Tabular form:

F = {9, 27}

Q3. Which of the following pairs of sets are equal?

a. A = {a, c, t}, B ={c, a, t}

Sol. A = {a, c, t}, B ={c, a, t}

Set A and set B are equal sets. Because they have the same elements.

A = B

b. C ={22, 24, 26, 28}
D ={24, 26, 22, 28}

Sol. C ={22, 24, 26, 28}
D ={24, 26, 22, 28}

Set C and set D are equal sets. Because they have the same elements.

C = D

c. E ={1, 3, 5, 7}
F = {1, 3, 5, 7, 9, 11}

Sol. E ={1, 3, 5, 7}

F = {1, 3, 5, 7, 9, 11}

Set E and set F are not equal.

d. I = { }, J = ϕ, K= {ϕ} ,L={ }

Sol. I = { }, J = ϕ, K= {ϕ} ,L={ }

Set I, J and L are empty sets. Since these sets are equal.

I = J = L

e. G = {eraser, pen, marker}, H = {sharpener, scale}

Sol. G = {eraser, pen, marker} H = {sharpener, scale}

Set G and set H are not equal.

f. M = {Δ}, N = {Δ}

Sol. M = {Δ}, N = {Δ}

Set M and set N are equal sets. M = N

g. O = set of odd numbers between 4 and 10, P = {5, 7, 9}

Sol. O = set of odd numbers between 4 and 10

P = {5, 7, 9}

O = {5, 7, 9}, P ={5, 7, 9}

Set O and set P are equal sets. O = P

h. Q= {73, 79, 83,87}, R = set of prime numbers between 72 and 88

Sol. Q= {73, 79, 83,87},

R = set of prime numbers between 72 and 88

Q= {73, 79, 83,87}

R = Q= {73, 79, 83}

Set Q and set R are not equal.

Q4. Which of these pairs of sets are equivalent and which one are not?

a. A = {P, Q, R, S},
B = { February, March, April, May}

Sol. A = {P, Q, R, S},

B = { February, March, April, May}

Since n(A) = n(B)

So set A and set B are equivalent sets.

b. C = {Sweater, Scarf, Jacket},
D={Apples, Bananas, Peaches, Grapes}

Sol. C = {Sweater, Scarf, Jacket},

D={Apples, Bananas, Peaches, Grapes}

Since n(C) ≠ n(D)

So set C and set D are not equivalent set.

c. R = {ϕ}, S = ϕ

Sol. R = {ϕ}, S = ϕ

Since n(R) ≠ n(S)

So set R and set S are not equivalent set.

d. E = {a, b, c, d}, F = {a, b, c}

Sol. E = {a, b, c, d},
F = {a, b, c}

Since n(E) ≠ n(F)

So set E and set F are not equivalent set.

e. I = { }, J = ϕ

Sol. I = { }, J = ϕ

Since n(E) ≠ n(F)

So set E and set F are not equivalent set.

f. G = set of 5 rivers of Pakistan, H = set of odd multiples of 7 between 5 and 65

Sol. G = set of 5 rivers of Pakinstan

H = {7, 21, 35, 49, 63}

Since n(G) ≠ n(H)

So set G and set H are not equivalent set.

g. T = set of all multiples of 8, U = set of all even numbers

Sol. T = {8, 16, 24, ...}

U = {2, 4, 6, ...}

Since n(T) = n(U)

So set T and set U are equivalent sets.

Q5. If A = {1, 2, 3}, B = {2, 3, 4}, C = {3, 4, 5} and D = {1, 2, 3, 4} then which of the following statement are true?

a. $A \subseteq B$ **False**

b. $B \not\subset D$ **False**

c. $D \supset C$ **False**

d. $A \subset D$ **True**

e. $B \not\subset A$ **True**

f. $C \subset A$ **False**

Q6. If U = {a, b, c, ..., z}, S = {a, b, c, d, e}, T = {f, g, h, i} and R ={a, b, e}: then find.

a. S^c

Sol. U = {a, b, c, ..., z},

S = {a, b, c, d, e}

S^c =U\S

S^c = {a, b, c, ...,z}\{a,b, c, d, e}

S^c = {f, g, h, ..., z}

b. T^c

Sol. U = {a, b, c, ..., z}

T = {f, g, h, i}

T^c =U\T

T^c ={a, b, c, ..., z}\{f, g, h, i}

T^c ={a, b, c, d, e, j, k, l, ...,z}

c. R^c

Sol. U = {a, b, c, ..., z}

R ={a, b, e}

R^c =U\R

R^c ={a, b, c, ..., z}\{a, b, e}

R^c = {c, d, f, g, h, i, j, ..., z}

d. U^c

Sol. U = {a, b, c, ..., z}

U^c =U\U

U^c ={a,b,c, ..., z}\{a, b, c, ..., z}

$U^c = \phi$ or { }

Q7. If U = {0, 1, 2, ..., 20}, A = {0, 2, 4, ..., 18} and B = {3, 6, 9, .., 15}, then prove that:

a. $B^c = A$

Sol. U = {0, 1, 2, ..., 20} and

B = {3, 6, 9, .., 15}

B^c = U\B

B^c = {0,1;2 ...,20}\{3,6,9, ..,15}

B^c = {0,1,2,4,5,7,8,10,...,15}

$B^c \neq A$

b. $A^c = B$

Sol. U = {0, 1, 2, ..., 20},

A = {0, 2, 4, ..., 18}

A^c = U\A

A^c = {0, 1, 2, ..., 20}\{0, 2, 4, ..., 18}

A^c = {1, 3, 5, ..., 19}

$A^c \neq B$

c. $A \setminus B = A$

Sol. A = {0, 2, 4, ..., 18} and

B = {3, 6, 9, .., 15}

A\B={0, 2, 4, ..., 18}\{3, 6, 9, .., 15}

A\B={0, 2, 4, 8, 10, ..., 18}

$A \setminus B \neq A$

d. B\ A = B

Sol. A = {0, 2, 4, ..., 18} and

B = {3, 6, 9, .., 15}

B\A={3, 6, 9, .., 15}\{0, 2, 4, ..., 18}

B\A={3, 9, 15}

B\ A $\neq B$

Q8. Look at each pair of sets to separate the disjoint and overlapping sets.

a. A = {1, 2, 3, 4, 5},
B = {2, 4, 6}

Sol. $A \cap B$ ={1, 2, 3, 4, 5} $\cap$ {2, 4, 6}

$A \cap B$ ={2,4}

As $A \cap B \neq \phi$ so set A and set B are overlapping sets.

b. C = {1, 2, 3, ...}
D = {-1, -2, -3, -4}

Sol. $C \cap D = \{1, 2, 3, \ldots\} \cap \{-1, -2, -3, -4\}$

$C \cap D = \{\ \}$

$C \cap D = \phi$

So set C and D are disjoint.

c. S = set of first five multiples of 2,
D = set of all factors of 9

Sol. S={2, 4, 6, 8, 10}

D={1, 3, 9}

$S \cap D = \{2,4,6,8, 20\} \cap \{1,3,9\}$

$S \cap D = \{\ \}$

$S \cap D = \phi$

So set S and D are disjoint.

d. W = set of whole numbers, O = set of natural numbers which are neither prime nor composite

Sol. W={0, 1, 2, 3, ...}

N={1}

$W \cap N = \{0, 1, 2, 3, \ldots\} \cap \{1\}$

$W \cap N = \{1\}$

$W \cap N \neq \phi$ so set W and set N are overlapping sets.

e. X = set of natural numbers less than 5
Y = set of natural numbers greater than or equal to 5

Sol. X = {1,2,3,4}, Y={5,6,7, ...}

$X \cap Y = \{1,2,3,4\} \cap \{5,6,7, \ldots\}$

$X \cap Y = \{\ \}$

$X \cap Y \neq \phi$ so set X and set Y are disjoint sets.

Exercise – 6.2

Q1. Represent the following sets using tabular form.

a. N = the set of natural numbers

Sol. Tabular form of
N = the set of natural numbers
N = {1, 2, 3, ...}

b. W = the set of whole numbers

Sol. Tabular form of
W = the set of whole numbers
W = {0, 1, 2, 3, ...}

c. Z = the set of integers

Sol. Tabular form of
Z = the set of integers

$\{0, \pm 1, \pm 2 \pm 3, \ldots\}$

d. E = the set of even numbers

Sol. Tabular form of
E = the set of even numbers
E = {2, 4, 6, 8, ...}

e. O = the set of odd numbers

Sol. Tabular form of
O = the set of odd numbers
O = {1, 3, 5, 7, 9, ...}

f. P = the set of prime numbers

Sol. Tabular form of
P = the set of prime numbers
P = {2, 3, 5, 7, 11, ...}

g. C = the set of composite numbers

Sol. Tabular form of
C = the set of composite numbers
C = {4, 6, 8, 9, 10, ...}

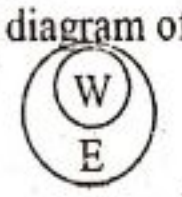
Q2. Use Venn diagrams to represent the relation between each of the given sets.

a. N and Z

Sol. Venn diagram of N and Z

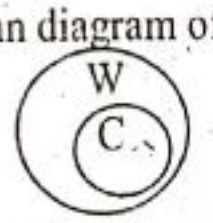
b. W and E

Sol. Venn diagram of W and E



c. C and W

Sol. Venn diagram of C and W



d. Q and N

Sol. Venn diagram of Q and N

c. W and N

Sol. Venn diagram of W and N

Exercise – 6.3

Q1. Define union of sets and find the union of the following sets.

Sol. Union of sets:

The union of two or more sets is a set which consists of all the elements of both set. The operation is done by combining the elements of two or more sets into a single set. The symbol used for union of sets is "$\cup$"

a. A = {2, 4, 6}, B = {1, 3, 5,7}

Sol.A = {2, 4, 6}, B = {1, 3, 5,7}

$A \cup B = \{2, 4, 6\} \cup \{1, 3, 5,7\}$

$A \cup B = \{1,2,3,4,5,6,7\}$

b. B = {a, b, c, d, e}
C = [c, d, e}

Sol. B = {a, b, c, d, e}

C = {c, d, e}

$B \cup C = \{a,b,c,d,e\} \cup \{c, d, e\}$

$B \cup C$ = {a, b, c, d, e}

c. C = {2, 4, 6, 8, 10},
D = {1, 5, 10}

Sol. C = {2, 4, 6, 8, 10},

D = {1, 5, 10}

$C \cup D = \{2,4,6,8,10\} \cup \{1,5,10\}$

$C \cup D = \{1,2,4,5,6,8,10\}$

d. $Z = \{0, \pm1, \pm2, \pm3, ...\}$

$X = \{-1, -2, -3\}$

Y = {1, 2, 3, 4, 5, 6, 7, 8}

Sol. $Z = \{0, \pm1, \pm2, \pm3, ...\}$

$X = \{-1, -2, -3\}$

Y = {1, 2, 3, 4, 5, 6, 7, 8}

$X \cup Y \cup Z = \{-1, -2, -3\} \cup$

{1, 2, 3, 4, 5, 6, 7, 8} $\cup$

$\{0, \pm1, \pm2, \pm3, ...\}$

$X \cup Y \cup Z = \{-3,-2,-1,0,1,2,...\}$

e. E = {0, 2, 4, 6, ...}
F = {4, 8, 12, 16}
N = {1, 2, 3, ...}

Sol. E = {0, 2, 4, 6, ...}
F = {4, 8, 12, 16}
N = {1, 2, 3, ...}

$E \cup F \cup N = \{0, 2, 4, 6, ...\} \cup \{4, 8,$ 12, 16} $\cup$ {1, 2, 3, ...}

$E \cup F \cup N = \{0,1,2,3,...\}$

Q2. Define intersection of sets and find the intersection of the following sets.

Sol. Intersection of sets:

The intersection of two given sets is a set which consists of all the common elements of both sets. The symbol for denoting the intersection of two sets is "$\cap$".

a. A = {0, 1, 2, 3}

$B = \{-3, -2, -1, 0\}$

Sol. A = {0, 1, 2, 3}

$B = \{-3, -2, -1, 0\}$

$A \cap B = \{0, 1, 2, 3\} \cap$

$\{-3, -2, -1, 0\}$

$A \cap B = \{0\}$ **Ans.**

b. P = {1, 2, 3, ...,10}
R = {1, 3, 5, 7, 9}

Sol. P = {1, 2, 3, ...,10}

R = {1, 3, 5, 7, 9}

$P \cap R = \{1, 2, 3, ...,10\} \cap \{1,-3, 5, 7,$ 9}

$P \cap R = \{1, 3, 5, 7, 9\}$ **Ans.**

c. S = {2, 6, 10, 14, 16}
T = {4, 8, 12, 16}

Sol. S = {2, 6, 10, 14, 16}

T = {4, 8, 12, 16}

$S \cap T = \{2, 6, 10, 14, 16\} \cap \{4, 8, 12,$ 16}

$S \cap T = \{16\}$ **Ans.**

d. X = {3, 5, 7, 9}
Y = {1, 2, 3} W = {0, 1, 2,...}

Sol. X = {3, 5, 7, 9}

Y = {1, 2, 3} W = {0, 1, 2,...}

$X \cap Y \cap W = \{3, 5, 7, 9\} \cap \{1, 2, 3\}$ $\cap$ {0, 1, 2,...}

$X \cap Y \cap W = \{3\}$ **Ans.**

e. L = {a, f, g}, M = {g, h, p, r, s, m},
N = {l, m, n, o

Sol. L = {a, f, g}, M = {g, h, p, r, s, m},

N = {l, m, n, o}

$L \cap M \cap N$ = {a,f,g} $\cap$ {g,h,p,r,s,m} $\cap$ {l,m,n,o}

$L \cap M \cap N = \{\}$ **Ans.**

Q3. If E = set of even numbers and W = set of whole numbers, then find and $E \cap W$.

Sol. E = {2, 4, 6, 8, ...}

W = {0, 1, 2, 3, ...}

$E \cup W = \{2,4,6,8,...\} \cup \{0,1,2,3,...\}$

$E \cup W = \{0,1,2,3,...\}$

$E \cap W = \{2,4,6,8,...\} \cap \{0,1,2,3,...\}$

$E \cap W = \{2,4,6,8,...\}$

Q4. If P = set of prime numbers and Z = set of integers, then find $P \cup Z$ **and** $P \cap Z$

Sol. P = {2,3,5,7,11,...}

$Z = \{0, \pm1, \pm2, \pm3, ...\}$

$P \cup Z = \{2,3,5,7,11,...\} \cup \{0, \pm1, \pm2, \pm3, ...\}$

$P \cup Z = \{0, \pm1, \pm2, \pm3, ...\}$

$P \cap Z = \{2,3,5,7,11,...\} \cap \{0, \pm1, \pm2, \pm3, ...\}$

$P \cap Z = \{2,3,5,7,11,...\}$

Q5. Define difference of sets. If S = {2, 3, 4}, Q = {0, 2, 4} and O = {3, 7, 9}, then find:

a. $S - Q$

Sol. S = {2,3,4}, Q = {0,2,4}

S – Q = {2,3,4} – {0,2,4}

S – Q = {3} **Ans.**

b. S – O

Sol. S = {2,3,4}, O = {3,7,9}

S – O = {2,3,4} – {3,7,9}

S – O = {2, 4} **Ans.**

c. Q – O

Sol. Q = {0,2,4}, O = {3,7,9}

Q – O = {0, 2, 4} – {3,7,9}

Q – O = {0, 2, 4} **Ans.**

d. Q – S

Sol. S = {2,3,4}, Q = {0,2,4}

Q – S = {2,3,4} – {0,2,4}

Q – S = {3} **Ans.**

e. O – S

Sol. S = {2,3,4}, O = {3,7,9}

O – S = {3,7,9} – {2, 3, 4}

O – S = {7; 9} **Ans.**

f. O – Q

Sol. Q = {0,2,4}, O = {3,7,9}

O – Q = {3, 7, 9} – {0, 2, 4}

O – Q = {3, 7, 9} **Ans.**

Q6. If A = {3, 5, 7, 9}, B = {2, 3, 4, 5} and C = {1, 5, 10, 15}, then find:

a. $A \cup B \cup C$

Sol. A = {3, 5, 7, 9}, B = {2, 3, 4, 5} and C = {1, 5, 10, 15}

$A \cup B \cup C = \{3, 5, 7, 9\} \cup \{2, 3, 4, 5\} \cup \{1, 5, 10, 15\}$

$A \cup B \cup C = \{1, 2, 3, 4, 5, 7, 9, 10, 15\}$

b. $A \cap B \cap C$

Sol. A = {3, 5, 7, 9}, B = {2, 3, 4, 5} and C = {1, 5, 10, 15}

$A \cap B \cap C = \{3, 5, 7, 9\} \cap \{2, 3, 4, 5\} \cap \{1, 5, 10, 15\}$

$A \cap B \cap C = \{5\}$

Q7. If X = {1, 2, 3, ..., 20}, Y = {2, 4, 6, ...} and W = {0, 1, 2, 3, ...}, then find:

a. $X \cup Y \cup W$

Sol. X = {1,2,3, ...,20}, Y={2,4, 6, ...} and W={0, 1, 2, 3, ...}

$X \cup Y \cup W = \{1,2,3, ...,20\} \cup \{2,4, 6, ...\} \cup \{0, 1, 2, 3, ...\}$

$X \cup Y \cup W = \{0, 1, 2, 3, ...\}$

b. $X \cap Y \cap W$

Sol. X = {1,2,3, ...,20}, Y={2,4, 6, ...} and W={0, 1, 2, 3, ...}

$X \cap Y \cap W = \{1,2,3, ...,20\} \cap \{2,4, 6, ...\} \cap \{0, 1, 2, 3, ...\}$

$X \cap Y \cap W = \{2, 4, 6,...,20\}$

Q8. If L = {1, 3, 4, 5, 6, 7, 8} and M = ϕ**, then find:**

a) $L \cup M$

Sol. L = {1, 3, 4, 5, 6, 7, 8} and M = ϕ

$L \cup M = \{1,3,4,5,6,7,8\} \cup \phi$

$L \cup M = \{1,3,4,5,6,7,8\}$

b) $L \cap M$

Sol. L = {1, 3, 4, 5, 6, 7, 8} and M = ϕ

$L \cap M = \{1,3,4,5,6,7,8\} \cap \phi$

$L \cap M = \phi$

Q9. If U = {1, 2, 3, ..., 20}, C = {1, 3, 5, 7, 9, 11} and D = {2, 4, 6, 8, 10}, then verify the following:

a. $C' \cup C = U$

Sol. U = {1,2,3,...,20},
C = {1, 3, 5, 7, 9, 11} and
C' = U\C
C' ={1,2,3,...,20}\{1,3,5,7,9,11}
C' = {2,4,6,8,10,12,13,14,...}
$C' \cup C$ = {2,4,6,8,10,12,13,14,...} ∪ {1, 3, 5, 7, 9, 11}
$C' \cup C$ = {1,2,3,...,20}
$C' \cup C = U$ **Proved.**

b. $D \cap D' = \phi$

Sol. U = {1,2,3,...,20},
D = {2, 4, 6, 8, 10}
D' = U\D
D' = {1,2,3,...,20}\{2,4,6,8,10}
D' = {1,3,5,7,9,11,12,...,20}
$D \cap D'$ ={2, 4, 6, 8, 10} ∩ {1,3,5,7,9,11,12,...,20}
$D \cap D'$ ={ }
$D \cap D' = \phi$ **Proved.**

c. $U' = \phi$

Sol. U = {1,2,3,...,20},
U' =U\U
U' ={1,2,3,...,20}\{1,2,3,...,20}
U' = { }
$U' = \phi$ **Proved.**

d. $\phi' = U$

Sol. U = {1,2,3,...,20},
ϕ' = U\ϕ ϕ' = U\{ }
ϕ' = {1,2,3,...,20}\{ }
ϕ' = {1,2,3,...,20}
$\phi' = U$ **Proved.**

e. $U' \cup C = C$

Sol. U = {1,2,3,...,20},
C = {1, 3, 5, 7, 9, 11}
U' =U\U
U' ={1,2,3,...,20}\{1,2,3,...,20}
U' = { }
$U' = \phi$
$U' \cup C = \phi \cup$ {1,3,5,7,9,11}
$U' \cup C$ = {1,3,5,7,9,11}
$U' \cup C = C$ **Proved.**

f. $(C \cup D)^c = C^c \cap D^c$

Sol. U = {1,2,3,...,20},
C = {1, 3, 5, 7, 9, 11} and
D = {2, 4, 6, 8, 10}
Taking LHS = $(C \cup D)^c$
$C \cup D$ ={1,3,5,7,9,11} ∪ {2,4,6,8,10}
$C \cup D$ ={1,2,3...,11}
$(C \cup D)^c$ = U\$C \cup D$
$(C \cup D)^c$ ={1,2,3,...,20}\{1,2,3...,11}
$(C \cup D)^c$ ={12,13,14,...,20}
Now taking RHS= $C^c \cap D^c$
First we find C^c *and* D^c
C' = U\C
C' ={1,2,3,...,20}\{1,3,5,7,9,11}
C' = {2,4,6,8,10,12,13,14,...}
Now D' = U\D
D' = {1,2,3,...,20}\{2,4,6,8,10}
D' = {1,3,5,7,9,11,12,...,20}
$C^c \cap D^c$
={2,4,6,8,10,12,13,14,...} ∩ {1,3,5,7,9,11,12,...,20}
$C^c \cap D^c$ ={12,13,14,...,20}
$(C \cup D)^c = C^c \cap D^c$ **Proved.**

g. $C \cup \phi = C$

Sol. C = {1, 3, 5, 7, 9, 11}
$C \cup \phi$ = {1, 3, 5, 7, 9, 11} ∪ ϕ
$C \cup \phi$ = {'}
$C \cup \phi = C$ **Proved.**

h. $(C \cap D)^c = C^c \cup D^c$

Sol. U = {1,2,3,...,20},
C = {1, 3, 5, 7, 9, 11} and
D = {2, 4, 6, 8, 10}
Taking LHS = $(C \cap D)^c$

$C \cap D = \{1,3,5,7,9,11\} \cap \{2,4,6,8,10\}$

$C \cap D = \{\ \}$

$C \cap D = \phi$

$(C \cap D)^c = U \setminus \{\ \}$

$(C \cap D)^c = \{1,2,3,\ldots,20\} \setminus \{\ \}$

$(C \cap D)^c = \{1,2,3,\ldots,20\}$

Now taking RHS $= C^c \cup D^c$

First we find C^c *and* D^c

$C' = U \setminus C$

$C' = \{1,2,3,\ldots,20\} \setminus \{1,3,5,7,9,11\}$

$C' = \{2,4,6,8,10,12,13,14,\ldots\}$

Now $D' = U \setminus D$

$D' = \{1,2,3,\ldots,20\} \setminus \{2,4,6,8,10\}$

$D' = \{1,3,5,7,9,11,12,\ldots,20\}$

$C^c \cup D^c = \{2,4,6,8,10,12,13,14,\ldots\}$
$\cup \{1,3,5,7,9,11,12,\ldots,20\}$

$C^c \cup D^c = \{1,2,3,\ldots,20\}$

$(C \cap D)^c = C^c \cup D^c$ **Proved.**

Review Exercise – 6

Q1. Choose the correct option.

a. In ___ form, the common characteristic of all the members or elements of a particular set are described.
   i. Tabular
   ii. Descriptive
   iii. Set builder
   iv. Complement

b. The symbol for denoting union of sets is ___.
   i. $\cap$
   ii. $\cup$
   iii. $\wedge$
   iv. $\vee$

c. The _____ of two given sets is the set which consists of all the common elements of both sets.
   i. Intersection
   ii. Union
   iii. Difference
   iv. Complement

d. $A \cup \phi =$ _____
   i. A
   ii. U
   iii. ϕ
   iv. A

e. Two sets A and B are said to be _____, if they have no common elements.
   i. Overlapping set
   ii. Disjoint set
   iii. Universal set
   iv. Null set

f. A _____ is the set of all elements of the sets which are under consideration in a particular context.
   i. Universal set
   ii. Disjoint set
   iii. Equivalent set
   iv. Overlapping set

Q2. Write the following sets in tabular form.

a. The set of five 2D shapes with 4 sides

Sol. Tabular form:

A = {square, rectangle, trapezium, kite, rhombus}

b. The set of prime numbers

Sol. Tabular form:

B = {2, 3, 5, 7, 11, …}

c. The set of first five multiples of 3.

Sol. Tabular form:

C = {3, 6, 9, 12, 15}

d. The set of all factors of 45 which are even

Sol. Tabular form:

D = { }

e. The set of composite numbers less than 40.

Sol. Tabular form:

E = {4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21, 22, 24, 25, 26, 27, 28, 30, 32, 33, 34, 35, 36, 38, 39}

f. The set of odd numbers less than 18.

Sol. Tabular form:

F = {1, 3, 5, 7, 9,11,13,15,17}

Q3. Write each of the following in descriptive form.

a. A = {1, 2, 3, ...}

Sol. descriptive form:

A is a set of Natural numbers

b. B = {1, 2, 3, 4, 5, 6}

Sol. descriptive form:

B is a set of first six Natural numbers

c. C = {5, 10, 15, 20, 25, 30}

Sol. descriptive form:

C is a set of first six multiples of 5

d. C = {3, 5, 7, 11}

Sol. descriptive form:

C is a set of first four Prime numbers

e. D = {5, 10, 15, 20}

Sol. descriptive form:

D is a set of first four multiples of 5

Q4. If U = {1, 3, 5, 7, 9, ..}, then find

A^c, B^c, C^c, D^c

a. A = {2, 5, 7}

Sol. A = {2, 5, 7}

U = {1, 3, 5, 7, 9, ..}

A^c = U\A

A^c = {1, 3, 5, 7, 9, ..}\{2, 5, 7}

A^c = {1, 3, 9, 11, 13, ...} **Ans.**

b. B = {1, 3, 6, 9, 12}

Sol. B = {1, 3, 6, 9, 12}

U = {1, 3, 5, 7, 9, ..}

B^c = U\B

B^c = {1,3,5,7,9,..}\{1,3,6,9,12}

B^c = {5, 11, 13, 15, ...} **Ans.**

c. C = {0, 1, 2, 3, ...}

Sol. C = {0, 1, 2, 3, ...}

U = {1, 3, 5, 7, 9, ..}

C^c = U\C

C^c = {1,3,5,7,9,...}\{0,1,2,3,...}

C^c = { } **Ans.**

d. D = {1, 2, 3, 4, 5, 6, 7}

Sol. D = {1, 2, 3, 4, 5, 6, 7}

U = {1, 3, 5, 7, 9, ..}

D^c = U\D

D^c = {1, 3, 5, 7, 9, ..}\{1, 2, 3, 4, 5, 6, 7}

D^c = {9, 11, 13, 15, ...} **Ans.**

Q5. If X = {5, 10, 15, 20, ...} and Y = {10, 20, 30, ...}, then find:

a. $X \cup Y$

Sol. X = {5, 10, 15, 20, ...} and Y = {10, 20, 30, ...}

$X \cup Y$ = {5, 10, 15, 20, ...} ∪ {10, 20, 30,...}

$X \cup Y$ = {5,10,15,20,25,30,...}

b. $Y \cup X$

Sol. X = {5, 10, 15, 20, ...} and Y = {10, 20, 30, ...}

$Y \cup X$ = {10, 20, 30,...} ∪ {5, 10, 15, 20, ...}

$Y \cup X$ = {5,10,15,20,25,30,...}

c. $X \cap Y$

Sol. X = {5, 10, 15, 20, ...} and Y = {10, 20, 30, ...}

$X \cap Y$ = {5, 10, 15, 20, ...} ∩ {10, 20, 30,...}

$X \cap Y$ = {10, 20, 30,...}

d. $Y \cap X$

Sol. X = {5, 10, 15, 20, ...} and Y = {10, 20, 30, ...}

$Y \cap X$ = {10, 20, 30,...} ∩ {5, 10, 15, 20, ...}

$Y \cap X$ = {10, 20, 30,...}

Q6. If U = set of whole numbers and N = set of natural numbers, then verify that:

a. U^c

Sol. U = {0, 1, 2, 3, ...}

U^c = U\U

U^c = {0,1,2,3,...}\{0,1,2,3, ...}

U^c = { }

b. N^c

Sol. U = {0, 1, 2, 3, ...}

N = {1, 2, 3, ...}

N^c = U\N

N^c = {0, 1, 2, 3, ...}\{1, 2, 3, ...}

N^c = { 0 }

c. $N \cap N^c$

Sol. U = {0, 1, 2, 3, ...}

$N = \{1, 2, 3, \ldots\}$

$N^c = U \setminus N$

$N^c = \{0, 1, 2, 3, \ldots\} \setminus \{1, 2, 3, \ldots\}$

$N^c = \{0\}$

$N \cap N^c = \{1,2,3,\ldots\} \cap \{0\}$

$N \cap N^c = \{\ \}$

d. $N \cup N^c$

Sol. $U = \{0, 1, 2, 3, \ldots\}$

$N = \{1, 2, 3, \ldots\}$

$N^c = U \setminus N$

$N^c = \{0, 1, 2, 3, \ldots\} \setminus \{1, 2, 3, \ldots\}$

$N^c = \{0\}$

$N \cup N^c = \{1,2,3,\ldots\} \cup \{0\}$

$N \cup N^c = \{0, 1, 2, 3, \ldots\}$

Q3. Write each of the following in descriptive form.

a. A = {1, 2, 3, ...}

Sol. descriptive form:

A is a set of Natural numbers

b. B = {1, 2, 3, 4, 5, 6}

Sol. descriptive form:

B is a set of first six Natural numbers

c. C = {5, 10, 15, 20, 25, 30}

Sol. descriptive form:

C is a set of first six multiples of 5

d. C = {3, 5, 7, 11}

Sol. descriptive form:

C is a set of first four Prime numbers

e. D = {5, 10, 15, 20}

Sol. descriptive form:

D is a set of first four multiples of 5

Q4. If U = {1, 3, 5, 7, 9, ..}, then find A^c, B^c, C^c, D^c

a. A = {2, 5, 7}

Sol. A = {2, 5, 7}

U = {1, 3, 5, 7, 9, ..}

A^c = U\A

A^c = {1, 3, 5, 7, 9, ..}\{2, 5, 7}

A^c = {1, 3, 9, 11, 13, ...} **Ans.**

b. B = {1, 3, 6, 9, 12}.

Sol. B = {1, 3, 6, 9, 12}

U = {1, 3, 5, 7, 9, ..}

B^c = U\B

B^c = {1,3,5,7,9,..}\{1,3,6,9,12}

B^c = {5, 11, 13, 15, ...} **Ans.**

c. C = {0, 1, 2, 3, ...}

Sol. C = {0, 1, 2, 3, ...}

U = {1, 3, 5, 7, 9, ..}

C^c = U\C

C^c = {1,3,5,7,9,...}\{0,1,2,3,...}

C^c = { } **Ans.**

d. D = {1, 2, 3, 4, 5, 6, 7}

Sol. D = {1, 2, 3, 4, 5, 6, 7}

U = {1, 3, 5, 7, 9, ..}

D^c = U\D

D^c = {1, 3, 5, 7, 9, ..}\{1, 2, 3, 4, 5, 6, 7}

D^c = {9, 11, 13, 15, ...} **Ans.**

Q5. If X = {5, 10, 15, 20, ...} and Y = {10, 20, 30, ...}, then find:

a. $X \cup Y$

Sol. X = {5, 10, 15, 20, ...} and Y = {10, 20, 30, ...}

$X \cup Y$ = {5, 10, 15, 20, ...} ∪ {10, 20, 30,...}

$X \cup Y$ = {5,10,15,20,25,30,...}

b. $Y \cup X$

Sol. X = {5, 10, 15, 20, ...} and Y = {10, 20, 30, ...}

$Y \cup X$ = {10, 20, 30,...} ∪ {5, 10, 15, 20, ...}

$Y \cup X$ = {5,10,15,20,25,30,...}

c. $X \cap Y$

Sol. X = {5, 10, 15, 20, ...} and Y = {10, 20, 30, ...}

$X \cap Y$ = {5, 10, 15, 20, ...} ∩ {10, 20, 30,...}

$X \cap Y$ = {10, 20, 30,...}

d. $Y \cap X$

Sol. X = {5, 10, 15, 20, ...} and Y = {10, 20, 30, ...}

$Y \cap X$ = {10, 20, 30,...} ∩ {5, 10, 15, 20, ...}

$Y \cap X$ = {10, 20, 30,...}

Q6. If U = set of whole numbers and N = set of natural numbers, then verify that:

a. U^c

Sol. U = {0, 1, 2, 3, ...}

U^c = U\U

U^c = {0,1,2,3,...}\{0,1,2,3, ...}

U^c = { }

b. N^c

Sol. U = {0, 1, 2, 3, ...}

N = {1, 2, 3, ...}

N^c = U\N

N^c = {0, 1, 2, 3, ...}\{1, 2, 3, ...}

N^c = { 0 }

c. $N \cap N^c$

Sol. U = {0, 1, 2, 3, ...}

Unit – 7
Algebraic Expressions
Exercise 7.1

Q1. Identify the term-to-term rule for the following patterns and write the next three terms.

a. **7,10,13,16, ___, ___, ___**

Sol. 7,10,13,16, ___, ___, ___.

The term-to-term rule of this pattern is:

Adding 3 to previous term.

The next three terms are:

19, 22, 25.

b. **100000, 10000, 1000, ___, ___, ___.**

Sol. 100000, 10000, 1000, ___, ___, ___.

The term-to-term rule of this pattern is:

Dividing previous term by 10

The next three terms are:

100, 10, 10.

c. **78125, 15625, 3125, ___, ___, ___.**

Sol. 78125, 15625, 3125, ___, ___, ___.

The term-to-term rule of this pattern is:

Dividing previous term by 5

The next three terms are:

625, 125, 25.

d. **6, 12, 24, 48, ___, ___, ___.**

Sol. 6, 12, 24, 48, ___, ___, ___.

The term-to-term rule of this pattern is:

Multiplying previous term by 2

The next three terms are:

96, 192, 384.

e. **120, 105, 90, ___, ___, ___.**

Sol. 120, 105, 90, ___, ___, ___.

The term-to-term rule of this pattern is:

Subtracting 15 form previous term.

The next three terms are:

75, 60, 45.

Q2. Identify the position-to-term rule for the following patterns and fins.

a) **10th term**

b) **18th term**

c) **67th term**

a. **21, 22, 23, 24, ...**

Sol. 21, 22, 23, 24, ...

Terms	Position	Rule
21	1	20 + 1
22	2	20 + 2
23	3	20 + 3
24	4	20 + 4

10^{th} tem: 20 + 10 = 30

18^{th} term: 20 + 18 = 38

67^{th} term: 20 + 67 = 87

b. **5,10, 15, 20, 25, 30, 35, ..**

Sol. 5,10, 15, 20, 25, 30, 35, ..

Terms	Position	Rule
5	1	5×1
10	2	5×2
15	3	5×3
20	4	5×4
25	5	5×5
30	6	5×6
35	7	5×7

10^{th} tem: 5 × 10 = 50

18^{th} term: 5 × 18 = 90

67^{th} term: 5 × 67 = 335

c. **30, 45, 60, 75, 90, 105, ...**

Sol. 30, 45, 60, 75, 90, 105, ...

Terms	Position	Rule
30	1	15 × 2
45	2	15 × 3
60	3	15 × 4
75	4	15 × 5
90	5	15 × 6
105	6	15 × 7

10^{th} tem: 15 × 11 = 165

18^{th} term: 15 × 19 = 285

67^{th} term: 15 × 68= 1,020

Q3. If the nth term of a sequence is 2n+5, find the 12^{th} term of this sequence?

Sol. The nth term of the sequence = 2n + 5

12^{th} term =?

Put n = 12

2n + 5 = 2(12) + 5

2n + 5 = 24 + 5 = 29 Ans.

Q4. If the nth term of the sequence is 3n, find the 8^{th} term of this sequence?

Sol. The nth term of the sequence = 3n

8^{th}term =?

Put n = 8

3n = 3(8)

3n = 24 Ans.

Q5. If the nth term of a sequence is 4n+2, find:

a) The 9^{th} term of this sequence.

Sol. The nth term of the sequence = 4n + 2

9^{th} term =?

Put n = 9

4n + 2 = 4(9) + 2

4n + 2 = 36 + 2 = 38Ans.

b) The 12^{th} term of this sequence.

Sol. The nth term of the sequence = 4n + 2

12^{th} term =?

Put n = 12

4n + 2 = 4(12) + 2

4n + 2 = 48 + 2 = 50Ans.

c) The 26^{th} term of this sequence.

Sol. The nth term of the sequence = 4n + 2

26^{th} term =?

Put n = 26

4n + 2 = 4(26) + 2

4n + 2 = 104 + 2 = 106Ans.

d) The 50^{th} term of this sequence.

Sol. The nth term of the sequence = 4n + 2

50^{th} term =?

Put n = 50

4n + 2 = 4(50) + 2

4n + 2 = 200 + 2 = 202Ans.

Exercise – 7.2

Q1. Write the term of the following algebraic expressions separately.

a) 6a + 8b

Sol. 6a + 8b

There are two terms:

6a and 8b.

b) 3y – 2x – 5

Sol. 3y – 2x – 5

There are three terms:

3y, – 2x and – 5.

c) 5x – y + 7

Sol. 5x – y + 7

There are three terms:

5x, 7 and – y.

d) $3x^2 + y^2$

Sol. $3x^2 + y^2$

There are two terms:

$3x^2$ *and* y^2

e) 7bc – d

Sol. 7bc – d

There are two terms:

7bc and – d.

f) $13y^3 + y + 3$

Sol. $13y^3 + y + 3$

There are three terms:

$13y^3$, y *and* 3

g) $5x^3 + 3x^2 + 7$

Sol. $5x^3 + 3x^2 + 7$

There are three terms:

$5x^3$, $3x^2$ *and* 7

h) $a^2 - b^2 + 3$

Sol. $a^2 - b^2 + 3$

There are three terms:

a^2, b^2 *and* 3

i) uv + uvw + 4w

Sol.uv + uvw + 4w

There are three terms:

uv, uvw and 4w.

Q2. Complete the table.

Sol.

Algebraic expression	Variables	Coefficient	Exponent
u^2+v-5	u and v	1	2, 1
$3a^2+b+8$	a, b	3, 1	2, 1
$4x+6y^2-4$	x, y	4, 6	1, 2
$\frac{1}{3}y^4+y+1$	y	$\frac{1}{3}$, 1	4, 1
$8a^2-7a^3+a^2$	a	8, -7	2, 3, 2

Exercise – 7.3

Q1. Identify which of the following are the terms of a polynomial. Give reason.

a) 5xy + 6yz, zx

Sol. 5xy + 6yz, zx

These are all the terms of a polynomial.

Reason: All the exponents of the variables are whole numbers.

b) $7x^2, 3y^2 - 8$

Sol. $7x^2, 3y^2 - 8$

These are all the terms of a polynomial.

Reason: All the exponents of the variables are whole numbers.

c) $p^2, q^2 - r^2$

Sol. $p^2, q^2 - r^2$

These are all the terms of a polynomial.

Reason: All the exponents of the variables are whole numbers.

d) $5xyz, 2yz, -8xy^{-2}$

Sol. $5xyz, 2yz, -8xy^{-2}$

These are not the terms of a polynomial.

Reason: All the exponents of the variables are whole numbers.

e) $-4ab, a, -5bc$

Sol. $-4ab, a, -5bc$

These are all the terms of a polynomial.

Reason: All the exponents of the variables are whole numbers.

f) 7ab, 6ca, -8ac

Sol. 7ab, 6ca, -8ac

These are all the terms of a polynomial.

Reason: All the exponents of the variables are whole numbers.

Q2. Which of the following expressions are polynomials?

a) 10 – 13x

Sol. 10 – 13x

This is a polynomial because all the exponents of the variables are whole numbers.

b) $z + z^2 + z^5 - 7$

Sol. $z + z^2 + z^5 - 7$

This is a polynomial because all the exponents of the variables are whole numbers.

c) $1 + \frac{1}{a} + \frac{1}{a^2} + \frac{1}{a^3} + \frac{1}{a^4}$

Sol. $1 + \frac{1}{a} + \frac{1}{a^2} + \frac{1}{a^3} + \frac{1}{a^4}$

This is not a polynomial because all the exponents of the variables are not whole numbers.

d) $\frac{m^3}{m^4}$

Sol. $\frac{m^3}{m^4}$

This is not a polynomial because all the exponents of the variables are not whole numbers.

e) $\frac{1}{2}-\frac{5}{u}$

Sol. $\frac{1}{2}-\frac{5}{u}$

This is not a polynomial because all the exponents of the variables are not whole numbers.

f) **1 + 5m**

Sol. 1 + 5m

This is a polynomial because all the exponents of the variables are whole numbers.

g) $1+5u+4u^2$

Sol. $1+5u+4u^2$

This is a polynomial because all the exponents of the variables are whole numbers.

Q3. Sort out the monomials, binomials and trinomials.

Sol.

Monomials	Binomials	Trinomials
4ab	u^2-v^2	$5a^2+b^2-7$
mn	3xy + zx	5ab − 7ca+2
7abc	$-3xy-7yz$	7 + u + v
$2a\div b$	mn + m	$2p^2-p-k$
	$-3m+t$	ax^2+bx-7
	$1+a\div z$	1 + a + z

Q4. Identify the degree of the following polynomials.

a) $y+3+3y^2$

Sol. $y+3+3y^2$

Degree is the highest exponent of a variable in a polynomial. Here the highest exponent is 2, so the degree of this polynomial is 2.

b) $3a^2+a-2$

Sol. $3a^2+a-2$

Degree is the highest exponent of a variable in a polynomial. Here the highest exponent is 2, so the degree of this polynomial is 2.

c) l^3+l^2+l

Sol. l^3+l^2+l

Degree is the highest exponent of a variable in a polynomial. Here the highest exponent is 3, so the degree of this polynomial is 3.

d) $b^4+b^3+b^2$

Sol. $b^4+b^3+b^2$

Degree is the highest exponent of a variable in a polynomial. Here the highest exponent is 4, so the degree of this polynomial is 4.

e) **5a**

Sol. 5a

Degree is the highest exponent of a variable in a polynomial. Here the highest exponent is 1, so the degree of this polynomial is 1.

f) $2x^2-5x+1$

Sol. $2x^2-5x+1$

Degree is the highest exponent of a variable in a polynomial. Here the highest exponent is 2, so the degree of this polynomial is 2.

g) $3l^3-4l^2$

Sol. $3l^3-4l^2$

Degree is the highest exponent of a variable in a polynomial. Here the highest exponent is 3, so the degree of this polynomial is 3.

h) $10a^4-5a^3+a^2+a$

Sol. $10a^4-5a^3+a^2+a$

Degree is the highest exponent of a variable in a polynomial. Here the highest exponent is 4, so the degree of this polynomial is 4.

Exercise – 7.4

Q1. Solve the following.

a) $(x^2+3x-6)+(-2x^2+x-2)$

Sol. $(x^2+3x-6)+(-2x^2+x-2)$

$\Rightarrow x^2+3x-6-2x^2+x-2$

$\Rightarrow -x^2+4x-8$ **Ans.**

b) $(3x^2-4+3x)+2y+(x+y)$

Sol. $(3x^2-4+3x)+2y+(x+y)$

$\Rightarrow 3x^2-4+3x+2y+x+y$

$\Rightarrow 3x^2+4x+3y-4$ **Ans.**

c) $(5x^4-3x^2+4)+(6x^3-4x^2-7)$

Sol. $(5x^4-3x^2+4)+(6x^3-4x^2-7)$

$\Rightarrow 5x^4-3x^2+4+6x^3-4x^2-7$

$\Rightarrow 5x^4+6x^3-7x^2-3$ **Ans.**

d) $(5x^3-7x^2+3x-4)+(8x^3+2x^2+3x--7)$

Sol. $(5x^3-7x^2+3x-4)+(8x^3+2x^2+3x-7)$

$\Rightarrow 5x^3-7x^2+3x-4+8x^3+2x^2+3x-7$

$\Rightarrow 13x^3-5x^2+6x-3$ **Ans.**

e) $(6x^2+7x-4)+(7x^2+9x+8)$

Sol. $(6x^2+7x-4)+(7x^2+9x+8)$

$\Rightarrow 6x^2+7x-4+7x^2+9x+8$

$\Rightarrow 13x^2+16x+4$ **Ans.**

f) $(2x^2y-5xy+3y^2)+(7xy-6y^2+5x^2y)$

Sol. $(2x^2y-5xy+3y^2)+(7xy-6y^2+5x^2y)$

$\Rightarrow 2x^2y-5xy+3y^2+5x^2y+7xy-6y^2$

$\Rightarrow 7x^2y+2xy-3y^2$ **Ans.**

g) $(4x^3-5x-8)+(6x^2-3x+8)$

Sol. $(4x^3-5x-8)+(6x^2-3x+8)$

$\Rightarrow 4x^3-5x-8+6x^2-3x+8$

$\Rightarrow 10x^2-8x$ **Ans.**

h) $(9x^5-6x^3+7x^2)+(7x^3-6x^5+2x^2)$

Sol. $(9x^5-6x^3+7x^2)+(7x^3-6x^5+2x^2)$

$\Rightarrow 9x^5-6x^3+7x^2+-6x^5+7x^3+2x^2$

$=3x^5+x^3+9x^2$ **Ans.**

i) $(x^2+3xy-9)+(-2y^2+5xy+6)$

Sol. $(x^2+3xy-9)+(-2y^2+5xy+6)$

$\Rightarrow x^2+3xy-9-2y^2+5xy+6$

$\Rightarrow x^2+8xy-2y^2-3$ **Ans.**

j) $(4x^3-9x+3)+(5x^2-4x+7)$

Sol. $(4x^3-9x+3)+(5x^2-4x+7)$

$\Rightarrow 4x^3-9x+3+5x^2-4x+7$

$\Rightarrow 4x^3+5x^2-13x+10$ **Ans.**

Q2. Solve the following polynomials.

a) $-3ab-7ab$

Sol. $-3ab-7ab$

$\Rightarrow -3ab-7ab-10ab$ **Ans.**

b) $(-u^2-v)-(9u^2+4v)$

Sol. $(-u^2-v)-(9u^2+4v)$

$\Rightarrow -u^2-v-9u^2-4v$

$\Rightarrow -10u^2-5v$ **Ans.**

c) $(3x-5y^2-5)-(-6x+2y^2+3)$

Sol. $(3x-5y^2-5)-(-6x+2y^2+3)$

$\Rightarrow 3x-5y^2-5+6x-2y^2-3$

$\Rightarrow 9x-7y^2-8$ **Ans.**

d) $(x^2-5x+9)-(-10x^2+3x-2)$

Sol. $(x^2-5x+9)-(-10x^2+3x-2)$

$\Rightarrow x^2-5x+9+10x^2-3x+2$

$\Rightarrow 11x^2-8x+11$ **Ans.**

e) $(6x+8y-z)-(5x-2y-z)$

Sol. $(6x+8y-z)-(5x-2y-z)$

$\Rightarrow 6x+8y-z-5x+2y+z$

$\Rightarrow x+10y$ **Ans.**

f) $(7-2x^2)-(8x^2-8y)$

Sol. $(7-2x^2)-(8x^2-8y)$

$\Rightarrow 7-2x^2-8x^2+8y$

$\Rightarrow -10x^2+8y+7$ **Ans.**

g) $(3x^2-5x+7)-(5x^2-2x-1)$

Sol. $(3x^2-5x+7)-(5x^2-2x-1)$

$\Rightarrow 3x^2-5x+7-5x^2+2x+1$

$\Rightarrow -2x^2=3x+8$ **Ans.**

h) $(7a^3+9a-1)-(2a^3-5a+9)$

Sol. $(7a^3+9a-1)-(2a^3-5a+9)$

$\Rightarrow 7a^3+9a-1-2a^3+5a-9$

$\Rightarrow 5a^3+14a-10$ **Ans.**

Q3. How much is -8x less than 12x?

Sol. $12x-(-8x)$

$\Rightarrow 12x+8x=20x$ **Ans.**

Q4. How much is 4v + z greater than 7v – 2z?

Sol. $(4v+z)-(7v-2z)$

$\Rightarrow 4v+z-7v+2z$

$\Rightarrow -3v+3z$ **Ans.**

Q5. What should be added to $2l^2-m^2+n^2$ to get $l^2+m^2+n^2$?

Sol.

$(l^2+m^2+n^2)-(2l^2-m^2+n^2)$

$\Rightarrow l^2+m^2+n^2-2l^2+m^2-n^2$

$\Rightarrow -l^2+2m^2$ **Ans.**

Q6. Subtract $a^2+b^2+c^2$ from $4a^2+2b^2-3c^2$ and add the result into $5a^2-6b^2$.

Sol. Subtracting $a^2+b^2+c^2$ from $4a^2+2b^2-3c^2$

$(4a^2+2b^2-3c^2)-(a^2+b^2+c^2)$

$\Rightarrow 4a^2+2b^2-3c^2-a^2-b^2-c^2$

$\Rightarrow 3a^2+b^2-4c^2$

Now adding the result into $5a^2-6b^2$

$\Rightarrow 3a^2+b^2-4c^2+5a^2-6b^2$

$\Rightarrow 8a^2-5b^2-4c^2$ **Ans.**

Q7. Subtract x – 5y – z from the sum of 2x – y + z and x + y – 5z.

Sol. First we find the sum of 2x – y + z and x + y – 5z

$\Rightarrow 2x-y+z+x+y-5z$

$\Rightarrow 3x-4z$

Now Subtract x – 5y – z from 3x – 4z

$\Rightarrow (3x-4z)-(x-5y-z)$

$\Rightarrow 3x-4z-x+5y+z$

$\Rightarrow 2x+5y-3z$ **Ans.**

Q8. The sum of two expressions is $5u^2+2uv-v^2$. If one of them is $2u^2+3v^2$, find the other?

Sol. To find the other expression we subtract $2u^2+3v^2$ from $5u^2+2uv-v^2$

$\Rightarrow (5u^2+2uv-v^2)-(2u^2+3v^2)$

$\Rightarrow 5u^2+2uv-v^2-2u^2-3v^2$

$\Rightarrow 3u^2+2uv-4v^2$ *Ans.*

Q9. Subtract $2x^2y-3y^2$ from $3x^2-5x^2y+2y^2$ and subtract the result from the sum of two expressions $3xy^2+5y^2-2x^2y$ and $x^2y+5x^2-3xy^2$.

Sol. Subtract $2x^2y-3y^2$ from $3x^2-5x^2y+2y^2$

$\Rightarrow (3x^2-5x^2y+2y^2)$

$-(2x^2y-3y^2)$

$\Rightarrow 3x^2-5x^2y+2y^2-2x^2y+3y^2$

$\Rightarrow 3x^2-7x^2y+5y^2$

The sum of $3xy^2+5y^2-2x^2y$ and $x^2y+5x^2-3xy^2$

$\Rightarrow 3xy^2+5y^2-2x^2y$

$+x^2y+5x^2-3xy^2$

$\Rightarrow 5x^2-x^2y+5y^2$

Now subtract $3x^2-7x^2y+5y^2$

from $5x^2-x^2y+5y^2$

$\Rightarrow (5x^2-x^2y+5y^2)$

$-(3x^2-7x^2y+5y^2)$

$\Rightarrow 5x^2-x^2y+5y^2$

$-3x^2+7x^2y-5y^2$

$\Rightarrow 2x^2+6x^2y$ *Ans.*

Q10. If $A=x^2-xy+z$, $B=3x^2+4xy+4z$, $C=7x^2-6xy-7z$ then find:

a) A + B

Sol. $A=x^2-xy+z$

$B=3x^2+4xy+4z$

$A+B=(x^2-xy+z)$

$+(3x^2+4xy+4z)$

$A+B=x^2-xy+z$

$+3x^2+4xy+4z$

$A+B=4x^2+3xy+5z$ **Ans.**

b) A − B

Sol. $A=x^2-xy+z$

$B=3x^2+4xy+4z$

$A-B=(x^2-xy+z)$

$-(3x^2+4xy+4z)$

$A-B=x^2-xy+z$

$-3x^2-4xy-4z$

$A-B=-2x^2-5xy-3z$ **Ans.**

c) A + C

Sol. $A=x^2-xy+z$

$C=7x^2-6xy-7z$

$A+C=(x^2-xy+z)$

$+(7x^2-6xy-7z)$

$A+C=x^2-xy+z$

$+7x^2-6xy-7z$

$A+C=8x^2-7xy-6z$ **Ans.**

d) A + B − C

Sol. $A=x^2-xy+z$

$B=3x^2+4xy+4z$

$C=7x^2-6xy-7z$

Millat Notes

$$A+B-C=(x^2-xy+z)$$
$$+(3x^2+4xy+4z)$$
$$-(7x^2-6xy-7z)$$
$$A+B-C=x^2-xy+z$$
$$+3x^2+4xy+4z$$
$$-7x^2+6xy+7z$$
$$A+B-C=-3x^2+9xy+12z$$

e) A − B + C

Sol. A = $x^2 - xy + z$

B = $3x^2 + 4xy + 4z$

C = $7x^2 - 6xy - 7z$

$$A-B+C=(x^2-xy+z)$$
$$-(3x^2+4xy+4z)$$
$$+(7x^2-6xy-7z)$$
$$A-B+C=x^2-xy+z$$
$$-3x^2-4xy-4z$$
$$+7x^2-6xy-7z$$
$$A-B+C=5x^2-11xy-10z$$

f) A − B − C

Sol. A = $x^2 - xy + z$

B = $3x^2 + 4xy + 4z$

C = $7x^2 - 6xy - 7z$

$$A-B-C=(x^2-xy+z)$$
$$-(3x^2+4xy+4z)$$
$$-(7x^2-6xy-7z)$$
$$A-B-C=x^2-xy+z$$
$$-3x^2-4xy-4z$$
$$-7x^2+6xy+7z$$
$$A-B-C=-9x^2+xy+4z$$

Exercise – 7.5

Q1. Multiply the following polynomials.

a) $(x^3+3x^2-x),(x-2)$

Sol. $(x^3+3x^2-x),(x-2)$

$\Rightarrow(x^3+3x^2-x)(x-2)$

$\Rightarrow x^4-2x^3+3x^3-6x^2-x^2+2x$

$\Rightarrow x^4+x^3-7x^2+2x$ Ans.

b) $(-3x^2+2x),2y$ *and* $3+y$

Sol. $(-3x^2+2x),2y$ *and* $3+y$

$\Rightarrow(-3x^2+2x)2y(3+y)$

$\Rightarrow(-3x^2+2x)(6y+2y^2)$

$\Rightarrow -18x^2y-6x^2y^2$
$+12xy+4xy^2$ Ans.

c) $(7a^2-3a+3),(3a-4)$

Sol. $(7a^2-3a+3),(3a-4)$

$\Rightarrow(7a^2-3a+3)(3a-4)$

$\Rightarrow 21a^3-28a^2-9a^2+12a$
$+9a-12$

$\Rightarrow 21a^3-37a^2 21a-12$ Ans.

d) $(2x+5),(x+1)$

Sol. $(2x+5),(x+1)$

$\Rightarrow(2x+5)(x+1)$

$\Rightarrow 2x^2+2x+5x+5$

$\Rightarrow 2x^2+7x+5$ Ans.

e) $8u^2$ *and* $6u^2-4u+1$

Sol. $8u^2$ *and* $6u^2-4u+1$

$\Rightarrow 8u^2\left(6u^2-4u+1\right)$

$\Rightarrow 48u^4-32u^3+8u^2$ **Ans.**

f) $\left(6a^2-3a+3\right),\left(7a-4a^2\right)$

Sol. $\left(6a^2-3a+3\right),\left(7a-4a^2\right)$

$\Rightarrow\left(6a^2-3a+3\right)\left(7a-4a^2\right)$

$\Rightarrow 42a^3-24a^4-21a^2$

$+12a^3+21a-12a^2$

$\Rightarrow -24a^4+54a^3-33a^2+21a$ **Ans.**

g) $9y^3-6y-3$ *and* $7y^2-4y$

Sol. $9y^3-6y-3$ *and* $7y^2-4y$

$\Rightarrow\left(9y^3-6y-3\right)\left(7y^2-4y\right)$

$\Rightarrow 63y^5-36y^4-42y^3$

$+24y^2-21y^2+12y$

$\Rightarrow 63y^5-36y^4-42y^3$

$+45y^2+12y$ **Ans.**

h) $\left(4k^5-5k^3+k^2\right),\left(k^3-k^5\right)$

Sol. $\left(4k^5-5k^3+k^2\right),\left(k^3-k^5\right)$

$\Rightarrow\left(4k^5-5k^3+k^2\right)\left(k^3-k^5\right)$

$\Rightarrow 4k^8-4k^{10}-5k^6$

$+5k^8+k^5-k^7$

$\Rightarrow -4k^{10}+9k^8-k^7$

$-5k^6+k^5$ **Ans.**

i) $\left(4a-9\right),\left(4a^2+5\right)$

Sol. $\left(4a-9\right),\left(4a^2+5\right)$

$\Rightarrow\left(4a-9\right)\left(4a^2+5\right)$

$\Rightarrow 16a^3-36a^2+20a-45$ **Ans.**

j) $\left(5n-4\right),\left(6n^2-6n+6\right)$

Sol. $\left(5n-4\right),\left(6n^2-6n+6\right)$

$\Rightarrow\left(5n-4\right)\left(6n^2-6n+6\right)$

$\Rightarrow 30n^3-30n^2+30n$

$-24n^2+24n-24$

$\Rightarrow 30n^3-54n^2+54n-24$ **Ans.**

k) $\left(6x^2+3x\right),\left(6x^3+4x^2\right)$

Sol. $\left(6x^2+3x\right),\left(6x^3+4x^2\right)$

$\Rightarrow\left(6x^2+3x\right)\left(6x^3+4x^2\right)$

$\Rightarrow 36x^5+24x^4+18x^4+12x^3$

$\Rightarrow 36x^5+42x^4+12x^3$ **Ans.**

l) $\left(8n^2+4n\right),\left(6n^2+6n-1\right)$

Sol. $\left(8n^2+4n\right),\left(6n^2+6n-1\right)$

$\Rightarrow\left(8n^2+4n\right)\left(6n^2+6n-1\right)$

$\Rightarrow 48n^4+48n^3-8n^2$

$+24n^3+24n^2-4n$

$\Rightarrow 48n^4+72n^3+16n^2-4n$ **Ans.**

m) $\left(r^2+8\right),\left(4r^2+8r-9\right)$

Sol. $\left(r^2+8\right),\left(4r^2+8r-9\right)$

$\Rightarrow\left(r^2+8\right)\left(4r^2+8r-9\right)$

$\Rightarrow 4r^4+8r^3-9r^2$

$+32r^2+64r-72$

$\Rightarrow 4r^4+8r^3+23r^2$

$+64r-72$ **Ans.**

n) $\left(2a^3-5a+9\right),\left(9a-1\right)$

Sol. $\left(2a^3-5a+9\right),\left(9a-1\right)$

$\Rightarrow (2a^3-5a+9)(9a-1)$

$\Rightarrow 18a^4-2a^3-45a^2$
$+5a+81a-9$

$\Rightarrow 18a^4-2a^3-45a^2+86a-9$

o) $(8x^3+6x^2),(5x^2-8x)$

Sol. $(8x^3+6x^2),(5x^2-8x)$

$\Rightarrow (8x^3+6x^2)(5x^2-8x)$

$\Rightarrow 40x^5-64x^4+30x^4-48x^3$

$\Rightarrow 40x^5-34x^4-48x^3$ Ans.

p) $(5a+8b),(a-3b)$

Sol. $(5a+8b),(a-3b)$

$\Rightarrow (5a+8b)(a-3b)$

$\Rightarrow 5a^2-15ab+8ab-24b^2$

$\Rightarrow 5a^2-7ab-24b^2$ Ans.

q) $(2a^2+6a+3),(7a^2-6a+3)$

Sol. $(2a^2+6a+3),(7a^2-6a+3)$

$\Rightarrow (2a^2+6a+3)(7a^2-6a+3)$

$\Rightarrow 14a^4-12a^3+6a^2$
$+42a^3-36a^2+18a$
$+21a^2-18a+9$

$\Rightarrow 14a^4+30a^3-9a^2+9$ Ans.

r) $(7u^3+8u-6u^2),(6u^4+4u^3+3u^2)$

Sol. $\Rightarrow (7u^3+8u-6u^2)(6u^4+4u^3+3u^2)$

$\Rightarrow 42u^7+28u^6+21u^5$
$+48u^5+32u^4+24u^3$
$-36u^6-24u^5-18u^4$

$\Rightarrow 42u^7-8u^6+45u^5$
$+14u^4+24u^3$ Ans.

s) $(8v^3+7v-3v^2),(3v^2+4v)$

Sol. $(8v^3+7v-3v^2),(3v^2+4v)$

$\Rightarrow (8v^3+7v-3v^2)(3v^2+4v)$

$\Rightarrow 24v^5+32v^4+21v^3+28v^2$
$-9v^4-12v^3$

$\Rightarrow 24v^5+23v^4+9v^3+28v^2$ Ans.

t) $(8m^2+4m+6),(6m^2-5m)$

Sol. $(8m^2+4m+6),(6m^2-5m)$

$\Rightarrow (8m^2+4m+6)(6m^2-5m)$

$\Rightarrow 48m^4-40m^3+24m^3$
$-20m^2+36m^2-30m$

$\Rightarrow 48m^4-16m^3+16m^2-30m$

u) $(6l^2+2l+3),(3l^2+6)$

Sol. $(6l^2+2l+3),(3l^2+6)$

$\Rightarrow (6l^2+2l+3)(3l^2+6)$

$\Rightarrow 18l^4+36l^2+6l^3$
$+12l+9l^2+18$

$\Rightarrow 18l^4+6l^3+45l^2$
$+12l+18$ ans.

Exercise – 7.6

Q1. Simplify the following.

a) $[5x+\{(4x+2)(3x-4)\}]$

Sol. $[5x+\{(4x+2)(3x-4)\}]$

$\Rightarrow [5x+\{12x^2-16x+6x-8\}]$

$\Rightarrow [5x+12x^2-16x+6x-8]$

$\Rightarrow 12x^2-5x-8$ **Ans.**

b) $4\{x^2+3x(2x+1)\}$

Sol. $4\{x^2+3x(2x+1)\}$

$\Rightarrow 4\{x^2+6x^2+3x\}$

$\Rightarrow 4x^2+24x^2+12x$

$\Rightarrow 28x^2+12x$ **Ans.**

c) $2a\left[6a^2-\{3a+(2a^2-a)\}\right]$

Sol. $2a\left[6a^2-\{3a+(2a^2-a)\}\right]$

$\Rightarrow 2a\left[6a^2-\{3a+2a^2-a\}\right]$

$\Rightarrow 2a\left[6a^2-3a-2a^2+a\right]$

$\Rightarrow 2a\left[4a^2-2a\right]$

$\Rightarrow 8a^3-4a^2$ **Ans.**

d) $\left[-15u^2-2v\{v-4v(3v-2v)\}\right]$

Sol. $\left[-15u^2-2v\{v-4v(3v-2v)\}\right]$

$\Rightarrow\left[-15u^2-2v\{v-4v(v)\}\right]$

$\Rightarrow\left[-15u^2-2v\{v-4v^2\}\right]$

$\Rightarrow\left[-15u^2-2v^2+8v^3\right]$

$\Rightarrow 8v^3-17u^2$ **Ans.**

e) $\left[5x(x+y)+\{x-(2x-y)\}\right]$

Sol. $\left[5x(x+y)+\{x-(2x-y)\}\right]$

$\Rightarrow\left[5x(x+y)+\{x-2x+y\}\right]$

$\Rightarrow\left[5x^2+5xy-x+y\right]$

$\Rightarrow 5x^2+5xy-x+y$ **Ans.**

f) $7y-\left[2y^2-\{2y(3y^2+y+1)\}\right]$

Sol. $7y-\left[2y^2-\{2y(3y^2+y+1)\}\right]$

$\Rightarrow 7y-\left[2y^2-\{6y^3+2y^2+2y\}\right]$

$\Rightarrow 7y-\left[2y^2-6y^3-2y^2-2y\right]$

$\Rightarrow 7y+6y^3+2y$

$\Rightarrow 6y^3+9y$ **Ans.**

g) $3m^2-\left[(2m^2-m+1)(m^2+m)-\{2m(m+1)\}\right]$

Sol. $3m^2-\left[\begin{matrix}(2m^2-m+1)(m^2+m)\\-\{2m(m+1)\}\end{matrix}\right]$

$\Rightarrow 3m^2-\left[\begin{matrix}(2m^2-m+1)(m^2+m)\\-\{2m^2+2m\}\end{matrix}\right]$

$\Rightarrow 3m^2-\left[\begin{matrix}(2m^2-m+1)(m^2+m)\\-2m^2-2m\end{matrix}\right]$

$\Rightarrow 3m^2-\left[\begin{matrix}2m^4+2m^3-m^3-m^2\\+m^2+m-2m^2-2m\end{matrix}\right]$

$\Rightarrow 3m^2-\left[2m^4+m^3-2m^2-m\right]$

$\Rightarrow 3m^2-2m^4-m^3+2m^2+m$

$\Rightarrow -2m^4-m^3+5m^2+m$ **Ans.**

h) $6k^2-\left[(2k^2-k)+\{(k^2+k)(k+3)\}\right]$

Sol. $6k^2-\left[(2k^2-k)+\{(k^2+k)(k+3)\}\right]$

$\Rightarrow 6k^2-\left[\begin{matrix}(2k^2-k)+\\\{k^3+3k^2+k^2+3k\}\end{matrix}\right]$

$\Rightarrow 6k^2-\left[\begin{matrix}2k^2-k+k^3\\+4k^2+3k\end{matrix}\right]$

$\Rightarrow 6k^2-\left[k^3+6k^2+2k\right]$

$\Rightarrow 6k^2-k^3-6k^2-2k$

$\Rightarrow -k^3-2k$ **Ans.**

i) $8t^2-\left[(2t^2-u)(u^2+u+3)-6t^2(u^3+1)\right]$

Sol. $8u^2-\left[(2u^2-u)(u^2+u+3)-6u^2(u^3+1)\right]$

$\Rightarrow 8u^2-\begin{bmatrix}(2u^2-u)(u^2+u+3)\\-6u^5-6u^2\end{bmatrix}$

$\Rightarrow 8u^2-\begin{bmatrix}2u^4+2u^3+6u^2-u^3\\-u^2-3u-6u^5-6u^2\end{bmatrix}$

$\Rightarrow 8u^2-\begin{bmatrix}-6u^5+2u^4+u^3\\-u^2-3u\end{bmatrix}$

$\Rightarrow 8u^2+6u^5-2u^4-u^3+u^2+3u$

$\Rightarrow 6u^5-2u^4-u^3+9u^2+3u$ **Ans.**

j) $2h^2-\left[2v^2(v+1)(v^2+v)-\{4v^2(v+1)\}\right]$

Sol. $2h^2-\left[2v^2(v+1)(v^2+v)-\{4v^2(v+1)\}\right]$

$\Rightarrow 21v^2-\begin{bmatrix}2v^2(v+1)(v^2+v)\\-\{4v^3+4v^2\}\end{bmatrix}$

$\Rightarrow 21v^2-\begin{bmatrix}2v^2+v^3+v^2+v^2\\+v-4v^3-4v^2\end{bmatrix}$

$\Rightarrow 21v^2-\left[v-3v^3\right]$

$\Rightarrow 21v^2-v+3v^3$

$\Rightarrow 3v^3+21v^2-v$ **Ans.**

k) $\{64x-(12x-5x)\}\div 3$

Sol. $\{64x-(12x-5x)\}\div 3$

$\Rightarrow\{64x-12x+5x\}\div 3$

$\Rightarrow\{57x\}\div 3$

$\Rightarrow \frac{57x}{3}$ **Ans.**

l) $\left(12x^2+5x^2\right)\div 4x$

Sol. $\left(12x^2+5x^2\right)\div 4x$

$\Rightarrow\left(17x^2\right)+4x$

$\Rightarrow \frac{17x^2}{4x}$ *or* $\frac{17x}{4}$ **Ans.**

Exercise – 7.7

Q1. Use the identity; find the square of the following binomials.

a. a + b

Sol. a + b

Taking square $(a+b)^2$

Using identity

$(a+b)^2=a^2+2ab+b^2$

Thus $(a+b)^2=a^2+2ab+b^2$

b. 5a + 4b

Sol. 5a + 4b

Taking square $(5a+4b)^2$

Using identity

$(a+b)^2=a^2+2ab+b^2$

$\Rightarrow (5a+4b)^2=(5a)^2$

$+2(5a)(4b)+(4b)^2$

$\Rightarrow (5a+4b)^2$

$=25a^2+40ab+16b^2$ **Ans.**

c. x – y

Sol. x – y

Taking square $(x-y)^2$

Using identity

$(a-b)^2=a^2-2ab+b^2$

$\Rightarrow (x-y)^2=(x)^2$

$-2(x)(y)+(y)^2$

$\Rightarrow (x-y)^2=x^2-2xy+y^2$ **Ans.**

d. 7a – b

Sol. 7a – b

Taking square $(7a-b)^2$

Using identity

$$(a-b)^2 = a^2 - 2ab + b^2$$

$$\Rightarrow (7a-b)^2 = (7a)^2 - 2(7a)(b) + (b)^2$$

$$\Rightarrow (7a-b)^2 = 49a^2 - 14ab + b^2 \text{ Ans.}$$

e. 4c + 3d

Sol. 4c + 3d

Taking square $(4c+3d)^2$

Using identity

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$\Rightarrow (4c+3d)^2 = (4c)^2 + 2(4c)(3d) + (3d)^2$$

$$\Rightarrow (4c+3d)^2 = 16c^2 + 24cd + 9d^2 \text{ Ans.}$$

f. 2m – n

Sol. 2m – n

Taking square $(2m-n)^2$

Using identity

$$(a-b)^2 = a^2 - 2ab + b^2$$

$$\Rightarrow (2m-n)^2 = (2m)^2 - 2(2m)(n) + (n)^2$$

$$\Rightarrow (2m-n)^2 = 4m^2 - 4mn + n^2 \text{ Ans.}$$

g. 6x – 2y

Sol. 6x – 2y

Taking square $(6x-2y)^2$

Using identity

$$(a-b)^2 = a^2 - 2ab + b^2$$

$$\Rightarrow (6x-2y)^2 = (6x)^2 - 2(6x)(2y) + (2y)^2$$

$$\Rightarrow (6x-2y)^2 = 36x^2 - 24xy + 4y^2 \text{ Ans.}$$

h. 5x + 7y

Sol. 5x + 7y

Taking square $(5x+7y)^2$

Using identity

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$\Rightarrow (5x+7y)^2 = (5x)^2 + 2(5x)(7y) + (7y)^2$$

$$\Rightarrow (5x+7y)^2 = 25x^2 + 70xy + 49y^2 \text{ Ans.}$$

Q2. Find the product of the following binomials by using the identity.

a. (2x + y)(2x – y)

Sol. (2x + y)(2x – y)

Using identity

$$(a+b)(a-b) = a^2 - b^2$$

$$\Rightarrow (2x+y)(2x-y) = (2x)^2 - (y)^2$$

$$\Rightarrow (2x+y)(2x-y) = 4x^2 - y^2 \text{ Ans.}$$

b. (4a – 5)(4a + 5)

Sol. (4a – 5)(4a + 5)

Using identity

$$(a+b)(a-b) = a^2 - b^2$$

$$\Rightarrow (4a-5)(4a+5) = (4a)^2 - (5)^2$$

$$\Rightarrow (4a-5)(4a+5)$$

$$=16a^2-25 \text{ Ans.}$$

c. (6a + 7b) (6a – 7b)

Sol. (6a + 7b) (6a – 7b)

Using identity

$$(a+b)(a-b)=a^2-b^2$$

$$\Rightarrow (6a+7b)(6a-7b)$$

$$=(6a)^2-(7b)^2$$

$$\Rightarrow (6a+7b)(6a-7b)$$

$$=36a^2-49b^2 \text{ Ans.}$$

d. $\left(m+\frac{1}{2}n\right)\left(m-\frac{1}{2}n\right)$

Sol. $\left(m+\frac{1}{2}n\right)\left(m-\frac{1}{2}n\right)$

Using identity

$$(a+b)(a-b)=a^2-b^2$$

$$\Rightarrow \left(m+\frac{1}{2}n\right)\left(m-\frac{1}{2}n\right)$$

$$=(m)^2-\left(\frac{1}{2}n\right)^2$$

$$\Rightarrow \left(m+\frac{1}{2}n\right)\left(m-\frac{1}{2}n\right)$$

$$=m^2-\frac{1}{4}n^2 \text{ Ans.}$$

e. $\left(\frac{7}{2}c-2d\right)\left(\frac{7}{2}c+2d\right)$

Sol. $\left(\frac{7}{2}c-2d\right)\left(\frac{7}{2}c+2d\right)$

Using identity

$$(a+b)(a-b)=a^2-b^2$$

$$\Rightarrow \left(\frac{7}{2}c-2d\right)\left(\frac{7}{2}c+2d\right)$$

$$=\left(\frac{7}{2}c\right)^2-(2d)^2$$

$$\Rightarrow \left(\frac{7}{2}c-2d\right)\left(\frac{7}{2}c+2d\right)$$

$$=\frac{49}{4}c^2-4d^2 \text{ Ans.}$$

f. (11a – 11b)(11a + 11b)

Sol. (11a – 11b)(11a + 11b)

Using identity

$$(a+b)(a-b)=a^2-b^2$$

$$\Rightarrow (11a-11b)(11a+11b)$$

$$=(11a)^2-(11b)^2$$

$$\Rightarrow (11a-11b)(11a+11b)$$

$$=121a^2-121b^2 \text{ Ans.}$$

Q3. Find $a^2 + b^2$, if a – b = 8 and ab = 3

Sol. a – b = 8 and ab = 3

Using identity

$$(a-b)^2=a^2-2ab+b^2$$

Now by putting values

$$\Rightarrow (8)^2=a^2-2(3)+b^2$$

$$\Rightarrow 64=a^2-6+b^2$$

Adding 6 on both sides

$$\Rightarrow 64+6=a^2-6+b^2+6$$

$$\Rightarrow 70=a^2+b^2$$

$$\Rightarrow a^2+b^2=70 \text{ Ans.}$$

Q4. Find $x^2+\frac{1}{x^2}$ if $x-\frac{1}{x}=4$

Sol. $x-\frac{1}{x}=4$

Taking square on both sides

$$\Rightarrow\left(x-\frac{1}{x}\right)^2=(4)^2$$

Using identity

$$(a-b)^2=a^2-2ab+b^2$$

For a = x, and $b=\frac{1}{x}$

$$(x)^2-2(x)\left(\frac{1}{x}\right)+\left(\frac{1}{x}\right)^2=16$$

$$\Rightarrow x^2-2+\frac{1}{x^2}=16$$

Adding 2 on both sides

$$\Rightarrow x^2-2+\frac{1}{x^2}+2=16+2$$

$$\Rightarrow x^2+\frac{1}{x^2}=18\ \textbf{Ans.}$$

Exercise – 7.8

Q1. Factorize the following by taking common factors.

a) a^4-2a^2

Sol. a^4-2a^2

Taking 'a^2' as common

$$a^4-2a^2=a^2\left(a^2-2\right)\ \textbf{Ans.}$$

b) $ab-bc$

Sol. $ab-bc$

Taking 'b' as common

$$\Rightarrow ab-bc=b(a-c)\ \textbf{Ans.}$$

c) $2xy-4xy-6xy$

Sol. $2xy-4xy-6xy$

$2xy-10xy=-8xy$ **Ans.**

d) $32xy-16x$

Sol. $32xy-16x$

Taking "16x" as common

$$\Rightarrow 16x(2y-1)\ \textbf{Ans.}$$

e) $7a^2b+ab-7a^2c-ac$

Sol. $7a^2b+ab-7a^2c-ac$

Re-arranging the terms

$$\Rightarrow 7a^2b-7a^2c+ab-ac$$

Taking "7a^2" and "a" as common

$$\Rightarrow 7a^2(b-c)+a(b-c)$$

Now taking (b–c) as common

$$\Rightarrow (b-c)\left(7a^2+a\right)\ \textbf{Ans.}$$

f) $6x^4-2x^2y+3x^4y^2-x^2y^3$

Sol. $6x^4-2x^2y+3x^4y^2-x^2y^3$

Re-arranging the terms

$$\Rightarrow 6x^4+3x^4y^2-2x^2y-x^2y^3$$

Taking "$3x^4$" and "$-x^2y$" as common

$$\Rightarrow 3x^4\left(2+y^2\right)-x^2y\left(2+y^2\right)$$

Now taking $\left(2+y^2\right)$ as common

$$\Rightarrow\left(3x^4-x^2y\right)\left(2+y^2\right)\ \textbf{Ans.}$$

g) 6x + 9y + 18z

Sol. 6x + 9y + 18z

Taking "3" as common

3(2x + 3y + 6z) **Ans.**

h) $x\left(x^2-y^2\right)-5x(x-y)$

Sol. $x\left(x^2-y^2\right)-5x(x-y)$

$$\Rightarrow x(x+y)(x-y)-5x(x-y)$$

Taking $(x-y)$ as common

$$\Rightarrow(x-y)\left(x(x+y)-5x\right)$$

Now taking "x" as common

$$\Rightarrow x(x-y)(x+y-5)\ \textbf{Ans.}$$

i) $\left(a^2+bc\right)-(b+c)a$

Sol. $\left(a^2+bc\right)-(b+c)a$

$$\Rightarrow a^2+bc-ab-ac$$

Re-arranging the terms

$\Rightarrow a^2 - ab - ac + bc$

Taking "a" and "$-c$" as common

$\Rightarrow a(a-b)-c(a-b)$

Now taking $(a-b)$ as common

$\Rightarrow (a-b)(a-c)$ **Ans.**

Q2. Factorize the following using algebraic identities.

a. $4x^2 - 9$

Sol. $4x^2 - 9$

$\Rightarrow (2x)^2 - (3)^2$

Using identity

$a^2 - b^2 = (a+b)(a-b)$

For a = 2x and b = 3

$\Rightarrow (2x)^2 - (3)^2$

$= (2x+3)(2x-3)$ **Ans.**

b. $81a^2 - b^2$

Sol. $81a^2 - b^2$

$\Rightarrow (9a)^2 - (b)^2$

Using identity

$a^2 - b^2 = (a+b)(a-b)$

For a = 9a and b = b

$\Rightarrow (9a)^2 - (b)^2$

$= (9a+b)(9a-b)$ **Ans.**

c. $4y^2 - 16$

Sol. $4y^2 - 16$

$\Rightarrow (2y)^2 - (4)^2$

Using identity

$a^2 - b^2 = (a+b)(a-b)$

For a = 2y and b = 4

$\Rightarrow (2y)^2 - (4)^2$

$= (2y+4)(2y-4)$ **Ans.**

d. $5u^2 - 80v^2$

Sol. $5u^2 - 80v^2$

Taking 5 as common

$5(u^2 - 16v^2)$

$\Rightarrow 5\left[(u)^2 - (4v)^2\right]$

Using identity

$a^2 - b^2 = (a+b)(a-b)$

For a = u and b = 4v

$\Rightarrow 5\left[(u)^2 - (4v)^2\right]$

$= 5\left[(u+4v)(u-4v)\right]$ **Ans.**

e. $(a+b)^2 + c^2$

Sol. $(a+b)^2 + c^2$

Using identity

$a^2 - b^2 = (a+b)(a-b)$

For a = a + b and b = c

$\Rightarrow (a+b)^2 - c^2$

$= (a+b+c)(a+b-c)$ **Ans.**

f. $100x^2 - 81$

Sol. $100x^2 - 81$

$\Rightarrow (10x)^2 - (9)^2$

Using identity

$a^2 - b^2 = (a+b)(a-b)$

For a = 10x and b = 9

$\Rightarrow (10x)^2 - (9)^2$

$= (10x+9)(10x-9)$ **Ans.**

g. $16x^2 - 49y^2$

Sol. $16x^2 - 49y^2$

$\Rightarrow (4x)^2 - (7y)^2$

Using identity

$a^2 - b^2 = (a+b)(a-b)$

For a = 4x and b = 7y

$\Rightarrow (4x)^2-(7y)^2$

$=(4x+7y)(4x-7y)$ **Ans.**

h. $\left(\frac{4}{x}\right)^2-(y+9)^2$

Sol. $\left(\frac{4}{x}\right)^2-(y+9)^2$

Using identity

$a^2-b^2=(a+b)(a-b)$

For $a=\frac{4}{x}$ and $b=y+9$

$\Rightarrow \left(\frac{4}{x}\right)^2-(y+9)^2$

$=\left(\frac{4}{x}+y+9\right)\left(\frac{4}{x}-(y+9)\right)$

$\Rightarrow \left(\frac{4}{x}\right)^2-(y+9)^2$

$=\left(\frac{4}{x}+y+9\right)\left(\frac{4}{x}-y-9\right)$ **Ans.**

i. a^4-b^4

Sol. a^4-b^4

$\Rightarrow (a^2)^2-(b^2)^2$

Using identity

$a^2-b^2=(a+b)(a-b)$

For $a=a^2$ and $b=b^2$

$\Rightarrow (a^2)^2-(b^2)^2$

$=(a^2+b^2)(a^2-b^2)$

Again using identity

$a^2-b^2=(a+b)(a-b)$

$\Rightarrow (a^2)^2-(b^2)^2$

$=(a^2+b^2)(a+b)(a-b)$ **Ans.**

j. $4x^2+12xy+9y^2$

Sol. $4x^2+12xy+9y^2$

$\Rightarrow (2x)^2+2(2x)(3y)+(3y)^2$

Using identity

$a^2+2ab+b^2=(a+b)^2$

$\Rightarrow (2x)^2+2(2x)(3y)+(3y)^2$

$=(2x+3y)^2$ **Ans.**

k. a^2-2a+1

Sol. a^2-2a+1

$\Rightarrow (a)^2-2(a)(1)+(1)^2$

Using identity

$a^2-2ab+b^2=(a-b)^2$

$\Rightarrow (a)^2-2(a)(1)+(1)^2$

$=(a-1)^2$ **Ans.**

l. $\frac{a^4}{b^2}-8ab+16\frac{b^4}{a^2}$

Sol. $\frac{a^4}{b^2}-8ab+16\frac{b^4}{a^2}$

$\Rightarrow \left(\frac{a^2}{b}\right)^2-2\left(\frac{a^2}{b}\right)\left(4\frac{b^2}{a}\right)+\left(4\frac{b^2}{a}\right)^2$

Using identity

$a^2-2ab+b^2=(a-b)^2$

$\Rightarrow \left(\frac{a^2}{b}\right)^2-2\left(\frac{a^2}{b}\right)\left(4\frac{b^2}{a}\right)+\left(4\frac{b^2}{a}\right)^2$

$=\left(\frac{a^2}{b}-4\frac{b^2}{a}\right)^2$ **Ans.**

Millat Notes

m. $1+14n+49n^2$

Sol. $1+14n+49n^2$

$\Rightarrow (1)^2+2(1)(7n)+(7n)^2$

Using identity

$a^2+2ab+b^2=(a+b)^2$

$\Rightarrow (1)^2+2(1)(7n)+(7n)^2$

$=(1+7n)^2$ **Ans.**

n. $25a^2-10ab+b^2$

Sol. $25a^2-10ab+b^2$

$\Rightarrow (5a)^2-2(5a)(b)+(b)^2$

Using identity

$a^2-2ab+b^2=(a-b)^2$

$\Rightarrow (5a)^2-2(5a)(b)+(b)^2$

$=(5a-b)^2$ **ans.**

o. $9a^2+30ab+25b^2$

Sol. $9a^2+30ab+25b^2$

$\Rightarrow (3a)^2-2(3a)(5b)+(5b)^2$

Using identity

$a^2+2ab+b^2=(a+b)^2$

$\Rightarrow (3a)^2-2(3a)(5b)+(5b)^2$

$=(3a-5b)^2$ **ans.**

p. $81x^2+72xy+16y^2$

Sol. $81x^2+72xy+16y^2$

$\Rightarrow (9x)^2-2(9x)(4y)+(4y)^2$

Using identity

$a^2+2ab+b^2=(a+b)^2$

q. $4x^2-12+9\frac{1}{x^2}$

Sol. $4x^2-12+9\frac{1}{x^2}$

$\Rightarrow (2x)^2-2(2x)\left(\frac{3}{x}\right)+\left(\frac{3}{x}\right)^2$

Using identity

$a^2-2ab+b^2=(a-b)^2$

$\Rightarrow (2x)^2-2(2x)\left(\frac{3}{x}\right)+\left(\frac{3}{x}\right)^2$

$=\left(2x-\frac{3}{x}\right)^2$ **Ans.**

r. $4x^2-36x^2yz+81x^2y^2z^2$

Sol. $4x^2-36x^2yz+81x^2y^2z^2$

Taking "x^2" as common

$\Rightarrow x^2\left(4-36yz+81y^2z^2\right)$

$\Rightarrow x^2\left[(2)^2-2(2)(9yz)+(9yz)^2\right]$

Using identity

$a^2-2ab+b^2=(a-b)^2$

$\Rightarrow x^2\left[(2)^2-2(2)(9yz)+(9yz)^2\right]$

$=x^2(2-9yz)^2$ **Ans.**

Q3. Factorize the following by making groups.

a. $a^2+8a+4a+32$

Sol. $a^2+8a+4a+32$

Regrouping the terms

$\Rightarrow (a^2+8a)+(4a+32)$

$\Rightarrow (a^2+8a)+(4a+32)$

Taking "a" and "4" as common

$\Rightarrow a(a+8)+4(a+8)$

Taking $(a+8)$ as common

$\Rightarrow (a+8)(a+4)$ **Ans.**

b. $x^2+3x-5x-15$

Sol. $x^2+3x-5x-15$

Regrouping the terms

$\Rightarrow (x^2+3x)+(-5x-15)$

Taking "x" and "-5" as common

$\Rightarrow x(x+3)-5(x+3)$

Taking $(x+3)$ as common

$\Rightarrow (x+3)(x-5)$ **Ans.**

c. $7x^2+49x+7x+x^2$

Sol. $7x^2+49x+7x+x^2$

Taking "x" as common

$\Rightarrow 8x^2+56x$

Taking "8x" as common

$\Rightarrow 8x(x+7)$ **Ans.**

d. $9-9n-n+n^2$

Sol. $9-9n-n+n^2$

Regrouping the terms

$\Rightarrow (9-9n)+(-n+n^2)$

Taking "9" and "-n" as common

$\Rightarrow 9(1-n)-n(1-n)$

Taking $(1-n)$ as common

$\Rightarrow (9-n)(1-n)$ **Ans.**

e. $ax+bx-ay-by$

Sol. $ax+bx-ay-by$

Regrouping the terms

$\Rightarrow (ax+bx)+(-ay-by)$

Taking "x" and "-y" as common

$\Rightarrow x(a+b)-y(a+b)$

Taking $(a+b)$ as common

$\Rightarrow (x-y)(a+b)$ **Ans.**

f. $25a^2+3b^2+15b+5a^2b$

Sol. $25a^2+3b^2+15b+5a^2b$

Regrouping the terms

$\Rightarrow (25a^2+15b)+(5a^2b+3b^2)$

Taking "5" and "b" as common

$\Rightarrow 5(5a^2+3b)+b(5a^2+3b)$

Taking $(5a^2+3b)$ as common

$\Rightarrow (5+b)(5a^2+3b)$ **Ans.**

g. $x^2-6xy-3x^2y+18xy^2$

Sol. $x^2-6xy-3x^2y+18xy^2$

Regrouping the terms

$\Rightarrow (x^2-6xy)+(-3x^2y+18xy^2)$

Taking "x" and "-3xy" as common

$\Rightarrow x(x-6y)-3xy(x-6y)$

Taking $(x-6y)$ as common

$\Rightarrow (x-3xy)(x-6y)$ **Ans.**

h. $a^2-2a+ab-2b$

Sol. $a^2-2a+ab-2b$

Regrouping the terms

$\Rightarrow (a^2-2a)+(ab-2b)$

Taking "a" and "b" as common

$\Rightarrow a(a-2)+b(a-2)$

Taking $(a-2)$ as common

$\Rightarrow (a+b)(a-2)$ **Ans.**

i. $c^2-7c+5c-35$

Sol. $c^2-7c+5c-35$

Regrouping the terms

$\Rightarrow (c^2-7c)+(5c-35)$

Taking "c" and "5" as common

$\Rightarrow c(c-7)+5(c-7)$

Taking $(c-7)$ as common

$\Rightarrow (c+5)(c-7)$ Ans.

Exercise – 7.9

Q1. Factorize the following by middle term breaking method.

a. $2x^2 + 5x + 2$

Sol. $2x^2 + 5x + 2$

In order to factorize

$2x^2 + 5x + 2$, we have to find two numbers such that their sum is +5 and their product is

$(2) \times (+2) = +4$

Clearly, $(4) \times (1) = +4$

And $+4 + 1 = +5$

$\Rightarrow 2x^2 + 1x + 4x + 2$

Taking "x" and "2" as common

$\Rightarrow x(2x+1) + 2(2x+1)$

Taking $(2x+1)$ as common

$\Rightarrow (x+2)(2x+1)$ Ans.

b. $x^2 - 9x + 18$

Sol. $x^2 - 9x + 18$

$\Rightarrow x^2 - 9x + 18$

$\Rightarrow x^2 - 3x - 6x + 18$

Taking "x" and "-6" as common

$\Rightarrow x(x-3) - 6(x-3)$

Taking $(x-3)$ as common

$\Rightarrow (x-3)(x-6)$ Ans.

c. $x^2 + 3x - 4$

Sol. $x^2 + 3x - 4$

$\Rightarrow x^2 + 3x - 4$

$\Rightarrow x^2 + x - 4x - 4$

Taking "x" and "-4" as common

$\Rightarrow x(x+1) - 4(x+1)$

Taking $(x+1)$ as common

$\Rightarrow (x-4)(x+1)$ Ans.

d. $x^2 - 12x + 35$

Sol. $x^2 - 12x + 35$

$\Rightarrow x^2 - 12x + 35$

$\Rightarrow x^2 - 5x - 7x + 35$

Taking "x" and "-7" as common

$\Rightarrow x(x-5) - 7(x-5)$

Taking $(x-5)$ as common

$\Rightarrow (x-5)(x-7)$ Ans.

e. $x^2 + 5x + 4$

Sol. $x^2 + 5x + 4$

$\Rightarrow x^2 + 5x + 4$

$\Rightarrow x^2 + 1x + 4x + 4$

Taking "x" and "4" as common

$\Rightarrow x(x+1) + 4(x+1)$

Taking $(x+1)$ as common

$\Rightarrow (x+1)(x+4)$ Ans.

f. $9x^2 + 6x + 1$

Sol. $9x^2 + 6x + 1$

$\Rightarrow 9x^2 + 6x + 1$

$\Rightarrow 9x^2 + 3x + 3x + 1$

Taking "3x" and "1" as common

$\Rightarrow 3x(3x+1) + 1(3x+1)$

Taking $(3x+1)$ as common

$\Rightarrow (3x+1)(3x+1)$ Ans.

g. $2x^2 + 7x + 3$

Sol. $2x^2 + 7x + 3$

$\Rightarrow 2x^2 + 7x + 3$

$\Rightarrow 2x^2 + 1x + 6x + 3$

Taking "x" and "3" as common

$\Rightarrow x(2x+1) + 3(2x+1)$

Taking $(2x+1)$ as common

$\Rightarrow (2x+1)(x+3)$ **Ans.**

Review Exercise – 7

Q1. Choose the correct option.

a) ____ are those alphabets or letters which are used to represent unknown quantities in arithmetic and algebra.
   i. **Variable**
   ii. Coefficient
   iii. Constant
   iv. exponents

b) The value of a ____ is not fixed.
   i. Coefficient
   ii. **Variable**
   iii. Constant
   iv. Exponents

c) ____ is the number which represents repeated multiplication of the same variable.
   i. Coefficient
   ii. Variable
   iii. Constant
   iv. Exponent

d) In the expression $2x^2 + 3x - 1$, the constant is ____
   i. x
   ii. **-1**
   iii. 2
   iv. 3

e) In any polynomial the highest exponent/power of the variable is called _.
   i. **Degree**
   ii. Coefficient
   iii. Power
   iv. Term

f) Polynomials have variable whose exponents are must be the ____ numbers.
   i. **Whole**
   ii. Integers
   iii. Even
   iv. Odd

g) Polynomials which contain only two terms are known as _____.
   i. Monomial
   ii. **Binomials**
   iii. Trinomials
   iv. Quadrinomials

Q2. If the nth term of a sequence is 5n – 2, find the 7^{th} term of this sequence.

Sol. The nth term of the sequence is 5n – 2

To find the 7^{th} term:

Put n = 7

5n – 2 = 5 (7) – 2

5n – 2 = 35 – 2 = 33Ans.

Q3. If the nth term of the sequence is 8n + 1, find the 15^{th} term of this sequence.

Sol. The nth term of the sequence is 8n + 1

To find the 15^{th} term:

Put n = 15

8n + 1 = 8 (15) + 1

8n + 1 = 120 + 1 = 121 Ans.

Q4. Find the sum of the following polynomials.

a) a^2, $a^2 - b^2$ and $a^2 - b^2 + c^2$

Sol. The sum of a^2, $a^2 - b^2$ and $a^2 - b^2 + c^2$

$\Rightarrow a^2 + a^2 - b^2 + a^2 - b^2 + c^2$

$\Rightarrow 3a^2 - 2b^2 + c^2$ Ans.

b) $uv^2 + 4u^2v$, $-6u^2v - 2uv^2 + 1$

Sol. The sum of $uv^2 + 4u^2v$, $-6u^2v - 2uv^2 + 1$

$\Rightarrow uv^2 + 4u^2v - 6u^2v - 2uv^2 + 1$

$\Rightarrow -2u^2v - uv^2 + 1$ Ans.

c) $6x^2 + 4y - 6z^2$, $-6x - 7y - z$ and $7x^2 + 9y$

Sol. The sum of $6x^2 + 4y - 6z^2$, $-6x - 7y - z$ and $7x^2 + 9y$

$\Rightarrow 6x^2+4y-6z^2-6x$

$-7y-z+7x^2+9y$

$\Rightarrow 13x^2-6x+6y-6z^2-z$

d) $6u^2-8v+9w^2$ and $-2u^2+2v$

Sol. The sum of $6u^2-8v+9w^2$ and $-2u^2+2v$

$\Rightarrow 6u^2-8v+9w^2-2u^2+2v$

$\Rightarrow 4u^2-6v+9w^2$ **Ans.**

Q5. Solve the following.

a) Subtract $4x^2-5y^2$ from $3x^2-6y^2$

Sol. To Subtract $4x^2-5y^2$ from $3x^2-6y^2$

$\Rightarrow (3x^2-6y^2)-(4x^2-5y^2)$

$\Rightarrow 3x^2-6y^2-4x^2+5y^2$

$\Rightarrow -x^2-y^2$ **Ans.**

b) Subtract $99l-4m+5n$ from $15l-8m-9n$

Sol. To subtract $99l-4m+5n$ from $15l-8m-9n$

$\Rightarrow (15l-8m-9n)$

$-(99l-4m+5n)$

$\Rightarrow 15l-8m-9n-99l+4m-5n$

$\Rightarrow -84l-4m-14n$ **Ans.**

c) Subtract $10x^4-12y^4+15x-16y$ from $17x^4-13y^4-31x-16y$

Sol. To subtract $10x^4-12y^4+15x-16y$ from $17x^4-13y^4-31x-16y$

$\Rightarrow (17x^4-13y^4-31x-16y)$

$-(10x^4-12y^4+15x-16y)$

$\Rightarrow 17x^4-13y^4-31x-\cancel{16y}$

$-10x^4+12y^4-15x+\cancel{16y}$

$\Rightarrow 7x^4-y^4-46x$ **Ans.**

d) Subtract $3a^2+ab-bc-3c$ from $9a^2-5bc+6ab-4c$

Sol. To subtract $3a^2+ab-bc-3c$ from $9a^2-5bc+6ab-4c$

$\Rightarrow (9a^2-5bc+6ab-4c)$

$-(3a^2+ab-bc-3c)$

$\Rightarrow 9a^2-5bc+6ab-4c$

$-3a^2-ab+bc+3c$

$\Rightarrow 6a^2-4bc+5ab-c$ *Ans.*

Q6. Find the product of the following.

a) x^2, x^3 *and* x

Sol. x^2, x^3 *and* x

$\Rightarrow x^2\times x^3\times x=x^{2+3+1}$

$=x^6$ **Ans**

b) $(5-9a)$ *and* $(4a^2+6a-3)$

Sol. $(5-9a)$ *and* $(4a^2+6a-3)$

$\Rightarrow (5-9a)(4a^2+6a-3)$

$\Rightarrow 20a^2+30a-15-36a^3$

$-54a^2+27a$

$\Rightarrow -36a^3-34a^2+57a-15$ **Ans**

c) $3x(2+4x)$ *and* $(6x^2-2x)$

Sol. $3x(2+4x)$ *and* $(6x^2-2x)$

$\Rightarrow 3x(2+4x)(6x^2-2x)$

$\Rightarrow 3x(12x^2-4x+24x^3-8x^2)$

$\Rightarrow 36x^3-12x^2+72x^4-24x^3$

$\Rightarrow 72x^4+12x^3-12x^2$ **Ans.**

d) $(6x^3-4x^2+x-9)$ *and* $(3x^2+7x)$

Sol. $(6x^3-4x^2+x-9)$ *and* $(3x^2+7x)$

$\Rightarrow (6x^3-4x^2+x-9)(3x^2+7x)$

$\Rightarrow 18x^5+42x^4-12x^4-28x^3$
$+3x^3+7x^2-27x^2-63x$

$\Rightarrow 18x^5+30x^4-25x^3$
$-20x^2-63x$ **Ans.**

Q7. Simplify the following.

a. $\left[12a^2-\left\{a^2-5a\left(5a^3-a\right)\right\}\right]$

Sol. $\left[12a^2-\left\{a^2-5a\left(5a^3-a\right)\right\}\right]$

$\Rightarrow \left[12a^2-\left\{a^2-25a^4+5a^2\right\}\right]$

$\Rightarrow \left[12a^2-a^2+25a^4-5a^2\right]$

$\Rightarrow 25a^4+6a^2$ **Ans.**

b. $7u^2-\left[2u-\left\{3u\left(2u+3u\right)\right\}\right]$

Sol. $7u^2-\left[2u-\left\{3u\left(2u+3u\right)\right\}\right]$

$\Rightarrow 7u^2-\left[2u-\left\{3u\left(5u\right)\right\}\right]$

$\Rightarrow 7u^2-\left[2u-\left\{15u^2\right\}\right]$

$\Rightarrow 7u^2-\left[2u-15u^2\right]$

$\Rightarrow 7u^2-2u+15u^2$

$\Rightarrow 22u^2-2u$ **Ans.**

c. $11a-\left\{2\left(a^2-a\right)+4a^2-7a\right\}+6a^2$

Sol. $11a-\left\{2\left(a^2-a\right)+4a^2-7a\right\}+6a^2$

$\Rightarrow 11a-\left\{2a^2-2a+4a^2-7a\right\}+6a^2$

$\Rightarrow 11a-\left\{6a^2-9a\right\}+6a^2$

$\Rightarrow 11a-6a^2+9a+6a^2$

$\Rightarrow 20a$ **Ans.**

d. $13(u+v)+\left\{8(u-v)-3(u+6u-u)\right\}$

Sol.

$13(u+v)+\left\{8(u-v)-3(u+6u-u)\right\}$

$\Rightarrow 13u+13v$

$+\left\{8u-8v-3u-18u+3u\right\}$

$\Rightarrow 13u+13v+8u-8v$

$-3u-18u+3u$

$\Rightarrow -5u+13v$ **Ans.**

Q8. Factorize the following.

a. $p^2+7p-2p-14$

Sol. $p^2+7p-2p-14$

Taking "p" and "-2" as common

$\Rightarrow p(p+7)-2(p+7)$

Taking $(p+7)$ as common

$\Rightarrow (p+7)(p-2)$ **Ans.**

b. $2ab-6bc-a+3c$

Sol. $2ab-6bc-a+3c$

Taking "2b" and "-1" as common

$\Rightarrow 2b(a-3c)-1(a-3c)$

Taking $(a-3c)$ as common

$\Rightarrow (a-3c)(2b-1)$ **Ans.**

c. $y^2+3y-6y-18$

Sol. $y^2+3y-6y-18$

Taking "y" and "-6" as common

$\Rightarrow y(y+3)-6(y+3)$

Taking $(y+3)$ as common

$\Rightarrow (y+3)(y-6)$ **Ans.**

d. $x^2-6xy-3x+18y$

Sol. $x^2-6xy-3x+18y$

Taking "x" and "-3" as common

$\Rightarrow x(x-6y)-3(x-6y)$

Taking $(x-6y)$ as common

$\Rightarrow (x-6y)(x-3)$ **Ans.**

e. $a^2-2a+ab-2b$

Sol. $a^2-2a+ab-2b$

Taking "a" and "b" as common

$\Rightarrow a(a-2)+b(a-2)$

Taking $(a-2)$ as common

$\Rightarrow (a-2)(a+b)$ **Ans.**

f. $x^2-8x+16$

Sol. $x^2-8x+16$

$\Rightarrow x^2-4x-4x+16$

Taking "x" and "-4" as common

$\Rightarrow x(x-4)-4(x-4)$

Taking $(x-4)$ as common

$\Rightarrow (x-4)(x-4)$ **Ans./**

g. $5x^2+11x+2$

Sol. $5x^2+11x+2$

$\Rightarrow 5x^2+1x+10x+2$

Taking "x" and "2" as common

$\Rightarrow x(5x+1)+2(5x+1)$

Taking $(5x+1)$ as common

$\Rightarrow (5x+1)(x+2)$ **Ans.**

h. $3x^2-8x+4$

Sol. $3x^2-8x+4$

$\Rightarrow 3x^2-2x-6x+4$

Taking "x" and "-2" as common

$\Rightarrow x(3x-2)-2(3x-2)$

Taking $(3x-2)$ as common

$\Rightarrow (3x-2)(x-2)$ **Ans.**

i. $4x^2+7x+3$

Sol. $4x^2+7x+3$

$\Rightarrow 4x^2+4x+3x+3$

Taking "4x" and "3" as common

$\Rightarrow 4x(x+1)+3(x+1)$

Taking $(x+1)$ as common

$\Rightarrow (x+1)(4x+3)$ **ans.**

Unit – 8
Linear Equations and coordinate System
Exercise – 8.1

Q1. Solve the following linear equations using the balancing method. Also verify the solution.

a) $8x+\frac{1}{2}=-10$

Sol. $8x+\frac{1}{2}=-10$

Subtract $\frac{1}{2}$ from both sides.

$\Rightarrow 8x+\frac{1}{2}-\frac{1}{2}=-10-\frac{1}{2}$

$\Rightarrow 8x=\frac{-10}{1}-\frac{1}{2}$

$\Rightarrow 8x=\frac{-20-1}{2}$

$\Rightarrow 8x=\frac{-21}{2}$

Divide both sides by 8

$\Rightarrow \frac{8x}{8}=\frac{-21}{2}\div 8$

$\Rightarrow x=\frac{-21}{2}\times\frac{1}{8}$

$$\Rightarrow x = \frac{-21\times 1}{2\times 8} \Rightarrow x = \frac{-21}{16}$$

Verification:

$8x + \frac{1}{2} = -10$ · Put $x = \frac{-21}{16}$

$$\Rightarrow 8\left(\frac{-21}{16_2}\right) + \frac{1}{2} = -10$$

$$\Rightarrow \frac{-21}{2} + \frac{1}{2} = -10$$

$$\Rightarrow \frac{-1+1}{2} = -10 \Rightarrow \frac{-20}{2} = -10$$

$$\Rightarrow -10 = -10 \text{ Verified.}$$

So the solution is $\Rightarrow x = \frac{-21}{16}$ Ans.

b) $-99x = 33$

Sol. $-99x = 33$

Divide both sides by -99

$$\Rightarrow \frac{-99x}{-99} = \frac{33^{1}}{-99_{-3}}$$

$$\Rightarrow x = \frac{1}{-3}$$

Verification:

$-99x = 33$ Put $\Rightarrow x = \frac{1}{-3}$

$$\Rightarrow -99^{33}\left(\frac{1}{-3}\right) = 33$$

$\Rightarrow 33 = 33$ Verified.

So the solution is $\Rightarrow x = \frac{1}{-3}$ Ans.

c) $7 - 5x = \frac{-3}{4}$

Sol. $7 - 5x = \frac{-3}{4}$

Subtract 7 from both sides

$$\Rightarrow 7 - 5x - 7 = \frac{-3}{4} - 7$$

$$\Rightarrow -5x = \frac{-3}{4} - \frac{7}{1}$$

$$\Rightarrow -5x = \frac{-3-28}{4} = \frac{-31}{4}$$

Divide both sides by -5

$$\Rightarrow \frac{-5x}{-5} = \frac{-31}{4} \div (-5)$$

$$\Rightarrow x = \frac{-31}{4} \times \frac{1}{-5}$$

$$\Rightarrow x = \frac{31}{20}$$

Verification:

$7 - 5x = \frac{-3}{4}$ Put $x = \frac{31}{20}$

$$\Rightarrow 7 - 5\left(\frac{31}{20_4}\right) = \frac{-3}{4}$$

$$\Rightarrow \frac{7}{1} - \frac{31}{4} = \frac{-3}{4}$$

$$\Rightarrow \frac{7-31}{4} = \frac{-3}{4}$$

$$\Rightarrow \frac{-3}{4} = \frac{-3}{4} \text{ Verified.}$$

So the solution is

$$\Rightarrow x = \frac{31}{20}$$

d) $\frac{32x}{4} + \frac{16x}{5} = 10$

Sol. $\frac{32x}{4} + \frac{16x}{5} = 10$

$$\Rightarrow \frac{160x + 64x}{20} = 10$$

$$\Rightarrow \frac{224x}{20} = 10$$

Multiply both sides by 20

$$\Rightarrow \frac{224x}{20} \times 20 = 10 \times 20$$

$$\Rightarrow 224x = 200$$

Divide both sides by 224

$$\Rightarrow \frac{224x}{224} = \frac{200}{224}$$

$$\Rightarrow x = \frac{25}{28}$$

Verification:

$\frac{32x}{4} + \frac{16x}{5} = 10$ Put $x = \frac{25}{28}$

$$\Rightarrow \frac{32\left(\frac{25}{28}\right)}{4} + \frac{16\left(\frac{25}{28}\right)}{5} = 10$$

$$\Rightarrow \frac{800}{112} + \frac{400}{140} = 10$$

$$\Rightarrow \frac{800\times 5}{112\times 5} + \frac{400\times 4}{140\times 4} = 10$$

$$\Rightarrow \frac{4000}{560} + \frac{1600}{560} = 10$$

$$\Rightarrow \frac{4000+1600}{560} = 10$$

$$\Rightarrow \frac{5600}{560} = 10$$

$\Rightarrow 10 = 10$ **Verified**

So the solution is $x = \frac{25}{28}$

e) $2-11x = 5x-4$

Sol. $2-11x = 5x-4$

Subtracting 2 from both sides

$\Rightarrow 2-11x-2 = 5x-4-2$

$\Rightarrow -11x = 5x-6$

Subtracting 5x from both sides

$\Rightarrow -11x-5x = 5x-6-5x$

$\Rightarrow -16x = -6$

Divide both sides by -16

$$\Rightarrow \frac{-16x}{-16} = \frac{-6}{-16}$$

$$\Rightarrow x = \frac{3}{8}$$

Verification:

$\Rightarrow 2-11x = 5x-4$

$\Rightarrow 2-11\left(\frac{3}{8}\right) = 5\left(\frac{3}{8}\right)-4$

$\Rightarrow 2-\frac{33}{8} = \frac{15}{8}-4$

$\Rightarrow \frac{2\times 8}{1\times 8} - \frac{33}{8} = \frac{15}{8} - \frac{4\times 8}{1\times 8}$

$\Rightarrow \frac{16}{8} - \frac{33}{8} = \frac{15}{8} - \frac{32}{8}$

$\Rightarrow \frac{16-33}{8} = \frac{15-32}{8}$

$\Rightarrow \frac{-17}{8} = \frac{-17}{8}$ **Verified.**

So the solution is $x = \frac{3}{8}$

f) $4(x-3) = 4(3x+1)$

Sol. $4(x-3) = 4(3x+1)$

$\Rightarrow 4x-12 = 12x+4$

Adding 12 on both sides

$\Rightarrow 4x-12+12 = 12x+4+12$

$\Rightarrow 4x = 12x+16$

Subtracting 12x from both sides

$\Rightarrow 4x-12x = 12x+16-12x$

$\Rightarrow -8x = 16$

Divide both sides – 8

$$\Rightarrow \frac{-8x}{-8} = \frac{16}{-8}$$

$\Rightarrow x = -2$

Verification:

$4(x-3) = 4(3x+1)$

Put x = – 2

$\Rightarrow 4((-2)-3) = 4(3(-2)+1)$

$\Rightarrow 4(-5) = 4(-6+1)$

$\Rightarrow -20 = 4(-5)$

$\Rightarrow -20 = -20$ **Verified.**

So the solution is $x = -2$

g) $0.34x + 2.4 = 6.5x$

Sol. $0.34x + 2.4 = 6.5x$

Subtracting 2.4 from both sides

$\Rightarrow 0.34x + 2.4 - 2.4 = 6.5x - 2.4$

$\Rightarrow 0.34x = 6.5x - 2.4$

Subtracting 6.5x from both sides.

$\Rightarrow 0.34x - 6.5x = 6.5x - 2.4 - 6.5x$

$\Rightarrow -6.16x = -2.4$

Divide both sides by – 6.16

$\Rightarrow \frac{-6.16x}{-6.16} = \frac{-2.4}{-6.16}$

$\Rightarrow x = 0.39$

Verification:

$0.34x + 2.4 = 6.5x$

Put x = 0.39

$\Rightarrow 0.34(0.39) + 2.4 = 6.5(0.39)$

$\Rightarrow 0.13 + 2.4 = 2.53$

$\Rightarrow 2.53 = 2.53$ **Verified.**

So the solution is x = 0.39

h) $7(x+4) = 2(5x-4)$

Sol. $7(x+4) = 2(5x-4)$

$\Rightarrow 7x + 28 = 10x - 8$

Subtracting 28 from both sides

$\Rightarrow 7x + 28 - 28 = 10x - 8 - 28$

$\Rightarrow 7x = 10x - 36$

Subtracting 10 from both sides.

$\Rightarrow 7x - 10x = 10x - 36 - 10x$

$\Rightarrow -3x = -36$

Dividing both sides by – 3

$\Rightarrow \frac{-3x}{-3} = \frac{-36}{-3}$

$\Rightarrow x = 12$

Verification:

$7(x+4) = 2(5x-4)$

Put x = 12

$\Rightarrow 7(12+4) = 2(5(12)-4)$

$\Rightarrow 7(16) = 2(60-4)$

$\Rightarrow 112 = 2(56)$

$\Rightarrow 112 = 112$ **Verified.**

So the solution is x = 12

i) $\frac{0.3x-4}{5x-4} = \frac{0.6}{0.5}$

Sol. $\frac{0.3x-4}{5x-4} = \frac{0.6}{0.5}$

By cross multiplication

$\Rightarrow 0.5(0.3x-4) = 0.6(5x-4)$

$\Rightarrow 0.15x - 2 = 3x - 2.4$

Adding 2 on both sides

$\Rightarrow 0.15x - 2 + 2 = 3x - 2.4 + 2$

$\Rightarrow 0.15x = 3x - 0.4$

Subtracting 3x from both sides

$\Rightarrow 0.15x - 3x = 3x - 0.4 - 3x$

$\Rightarrow -2.85x = -0.4$

Dividing both sides by – 2.85

$\Rightarrow \frac{-2.85x}{-2.85} = \frac{-0.4}{-2.85}$

$\Rightarrow x = 0.14$

Verification:

$\frac{0.3x-4}{5x-4} = \frac{0.6}{0.5}$ Put x = 0.14

$\Rightarrow \frac{0.3(0.14)-4}{5(0.14)-4} = \frac{0.6}{0.5}$

$\Rightarrow \frac{0.042-4}{0.7-4} = \frac{0.6}{0.5}$

$\Rightarrow \frac{-3.958}{-3.3} = \frac{0.6}{0.5}$

$\Rightarrow 1.2 = 1.2$ **Verified.**

So the solution is x = 0.14

j) $7+4(3x-1)=2x-3$

Sol. $7+4(3x-1)=2x-3$

$\Rightarrow 7+12x-4=2x-3$

$\Rightarrow 12x+3=2x-3$

Subtracting 3 from both sides

$\Rightarrow 12x-3+3=2x-3-3$

$\Rightarrow 12x=2x-6$

Subtracting 2x from both sides

$\Rightarrow 12x-2x=2x-6-2x$

$\Rightarrow 10x=-6$

Dividing both sides by 10

$\Rightarrow \frac{10x}{10}=\frac{-6}{10}$

$\Rightarrow x=-0.6$

Verification:

$7+4(3x-1)=2x-3$

Put x = – 0.6

$\Rightarrow 7+4(3(-0.6)-1)=2(-0.6)-3$

$\Rightarrow 7+4(-1.8-1)=-1.2-3$

$\Rightarrow 7+4(-2.8)=-4.2$

$\Rightarrow 7-11.2=-4.2$

$\Rightarrow -4.2=-4.2$ **Verified.**

So the solution is x = – 0.6

k) $\frac{5x-0.3}{7x-2.1}=\frac{5}{6}$

Sol. $\frac{5x-0.3}{7x-2.1}=\frac{5}{6}$

By cross multiplication

$\Rightarrow 6(5x-0.3)=5(7x-2.1)$

$\Rightarrow 30x-1.8=35x-10.5$

Adding 1.5 to both sides

$\Rightarrow 30x-1.8+1.8=35x-10.5+1.8$

$\Rightarrow 30x=35x-8.7$

Subtracting 35x from both sides

$\Rightarrow 30x-35x=35x-8.7-35x$

$\Rightarrow -5x=-8.7$

Divide both sides by – 5x

$\Rightarrow \frac{-5x}{-5}=\frac{-8.7}{-5}$

$\Rightarrow x=1.74$

Verification:

$\frac{5x-0.3}{7x-2.1}=\frac{5}{6}$ Put x = 1.74

$\Rightarrow \frac{5(1.74)-0.3}{7(1.74)-2.1}=\frac{5}{6}$

$\Rightarrow \frac{8.7-0.3}{12.18-2.1}=\frac{5}{6}$

$\Rightarrow \frac{8.4}{10.08}=\frac{5}{6}$

$\Rightarrow 0.833=0.833$ **Verified.**

So the solution is x = 1.74

Q2. Solve the following linear equations using the transposition method. Also verify the solution.

a) $5x-7=44$

Sol. $5x-7=44$

$\Rightarrow 5x=44+7$

$\Rightarrow 5x=51$

$\Rightarrow x=\frac{51}{5}$

Verification:

$\Rightarrow \cancel{5}\left(\frac{51}{\cancel{5}}\right)-7=44$

$\Rightarrow 51-7=44$

$\Rightarrow 44=44$ **Verified.**

So the solution is $x=\frac{51}{5}$

b) $14x=28$

Sol. $14x=28$

$\Rightarrow x=\frac{28}{14}$

Verification:

$$\Rightarrow 14\left(\frac{28}{14}\right)=28$$

$$\Rightarrow 28=28 \text{ Verified.}$$

So the solution is $x=\frac{28}{14}$

c) $\frac{2(x-2)}{2x+4}=\frac{8}{3}$

Sol. $\frac{2(x-2)}{2x+4}=\frac{8}{3}$

By cross multiplication

$$\Rightarrow 3(2(x-2))=8(2x+4)$$

$$\Rightarrow 6(x-2)=16x+32$$

$$\Rightarrow 6x-12=16x+32$$

$$\Rightarrow 6x-16x=32+12$$

$$\Rightarrow -10x=44$$

$$\Rightarrow x=\frac{44}{-10}$$

$$\Rightarrow x=-4.4$$

Verification:

$$\frac{2(x-2)}{2x+4}=\frac{8}{3}$$

Put $x=-4.4$

$$\Rightarrow \frac{2(-4.4-2)}{2(-4.4)+4}=\frac{8}{3}$$

$$\Rightarrow \frac{2(-6.4)}{-8.8+4}=\frac{8}{3}$$

$$\Rightarrow \frac{-12.8}{-4.8}=\frac{8}{3}$$

$$\Rightarrow \frac{8}{3}=\frac{8}{3} \text{ Verified.}$$

So the solution is $x=-4.4$

d) $\frac{2x-2}{3x-3}=1\frac{1}{3}$

Sol. $\frac{2x-2}{3x-3}=1\frac{1}{3}$

$$\frac{2x-2}{3x-3}=\frac{4}{3}$$

By cross multiplication

$$\Rightarrow 3(2x-2)=4(3x-3)$$

$$\Rightarrow 6x-6=12x-12$$

$$\Rightarrow 6x-12x=-12+6$$

$$\Rightarrow -6x=-6$$

$$\Rightarrow x=\frac{-6}{-6} \qquad \Rightarrow x=1$$

Verification:

$\frac{2x-2}{3x-3}=\frac{4}{3}$ Put $x=1$

$$\Rightarrow \frac{2(1)-2}{3(1)-3}=\frac{4}{3}$$

$$\Rightarrow \frac{2-2}{3-3}=\frac{4}{3}$$

$$\Rightarrow \frac{0}{0}=\frac{4}{3} \text{ Not Verified.}$$

So the question has no solution.

e) $\frac{0.8x}{3.4x+0.1}=1\frac{1}{3}$

Sol. $\frac{0.8x}{3.4x+0.1}=1\frac{1}{3}$

$$\Rightarrow \frac{0.8x}{3.4x+0.1}=\frac{4}{3}$$

By cross multiplication

$$\Rightarrow 4(3.4x+0.1)=3(0.8x)$$

$$\Rightarrow 13.6x+0.4=2.4x$$

$$\Rightarrow 13.6x-2.4x=-0.4$$

$$\Rightarrow 11.2x=-0.4$$

$$\Rightarrow x=\frac{-0.4}{11.2}$$

$$x=0.036$$

Verification:

$$\Rightarrow \frac{0.8x}{3.4x+0.1}=\frac{4}{3}$$

$$\Rightarrow \frac{0.8(0.036)}{3.4(0.036)+0.1}=\frac{4}{3}$$

$$\Rightarrow \frac{0.0288}{0.1224+0.1}=\frac{4}{3}$$

$$\Rightarrow \frac{0.0288}{0.2224}=\frac{4}{3}$$

$\Rightarrow 1.33 = .1.33$ **Verified.**

So the solution is $x = 0.036$

f) $\dfrac{(4y+6)}{(5y+7)}=\dfrac{1}{2}$

Sol. $\dfrac{(4y+6)}{(5y+7)}=\dfrac{1}{2}$

By cross multiplication

$$\Rightarrow 2(4y+6)=1(5y+7)$$

$$\Rightarrow 8y+12=5y+7$$

$$\Rightarrow 8y-5y=7-12$$

$$\Rightarrow 3y=-5$$

$$\Rightarrow y=\frac{-5}{3}$$

Verification:

$\dfrac{(4y+6)}{(5y+7)}=\dfrac{1}{2}$ Put $y=\dfrac{-5}{3}$

$$\Rightarrow \frac{\left(4\left(\frac{-5}{3}\right)+6\right)}{\left(5\left(\frac{-5}{3}\right)+7\right)}=\frac{1}{2}$$

$$\Rightarrow \frac{\left(\frac{-20}{3}+\frac{6}{1}\right)}{\left(\frac{-25}{3}+\frac{7}{1}\right)}=\frac{1}{2}$$

$$\Rightarrow \frac{\left(\frac{-20+18}{3}\right)}{\left(\frac{-25+21}{3}\right)}=\frac{1}{2}$$

$$\Rightarrow \frac{-2/3}{-4/3}=\frac{1}{2}$$

$\Rightarrow \dfrac{2}{4}=\dfrac{1}{2} \Rightarrow \dfrac{1}{2}=\dfrac{1}{2}$ **Verified.**

So the solution is $y=\dfrac{-5}{3}$

Exercise – 8.2

Q1. The sum of four consecutive multiples of 6 is 84. Find the four multiples.

Sol. Let the four consecutive multiples of 6 be:

6x, 6(x+1), 6(x+2), 6(x+3)

According to question

$$\Rightarrow 6x+6(x+1)+6(x+2)+6(x+3)=84$$

$$\Rightarrow 6x+6x+6+6x+12+6x+18=84$$

$$\Rightarrow 24x+36=84$$

Subtract 36 from both sides

$$\Rightarrow 24x+36-36=84-36$$

$$\Rightarrow 24x=48$$

Divide both sides by 24

$$\Rightarrow \frac{24x}{24}=\frac{48}{24}$$

$$\Rightarrow x=2$$

Thus the required four multiples of 6:

6x = 6(2) = 12

6(x+1) = 6(2+1) = 6(3) = 18

6(x+2) = 6(2+2) = 6(4) = 24

6(x+3) =6(2+3) = 6(5) = 30

Q2. The difference between the digits of a 2-digit number is 4. If the places of the digits are interchanged, the sum of the original number and new number is 110. Find the number.

Sol. Let the unit digit be 'x'

Then the ten's digit be 'x – 4'

Original number = 10(x – 4) + x
Original number = 10x – 40 + x
Original number = 11x – 40
When digits are interchanged
New number = 10(x) + x – 4
New number = 10x + x – 4
New number = 11x – 4
According to condition
Original number + New number = 110

$$\Rightarrow 11x-40+11x-4=110$$
$$\Rightarrow 22x-44=110$$
$$\Rightarrow 22x=110+44=154$$

Divide both sides by 22

$$\Rightarrow \frac{22x}{22}=\frac{154}{22}$$
$$\Rightarrow x=7$$

Unit digit number x = 7
Ten's digit number x – 4 = 7 – 4 = 3
The number = 37 Ans.

Q3. If 990 is decreased by 3 times a number, it results in the number decreased by 30. Find the number.

Sol. Let the required number be 'x'
According to question
990 – 3x = x – 30

$$\Rightarrow -3x-x=-30-990$$
$$\Rightarrow -4x=-1020$$

Divide both sides by –4

$$\Rightarrow \frac{-4x}{-4}=\frac{-1020}{-4}$$
$$\Rightarrow x=255 \text{ Ans.}$$

Q4. Find the number if two fifths of it increased by 2 is half of it.

Sol. Let the required number be 'x'
According to question

$$\Rightarrow \frac{2}{5}x+2=\frac{x}{2}$$

Arranging the terms

$$\Rightarrow \frac{2x}{5}-\frac{x}{2}=-2$$
$$\Rightarrow \frac{2x\times 2}{5\times 2}-\frac{x\times 5}{2\times 5}=-2$$
$$\Rightarrow \frac{4x}{10}-\frac{5x}{10}=-2$$
$$\Rightarrow \frac{4x-5x}{10}=-2$$
$$\Rightarrow \frac{-x}{10}=-2 \text{ Multiply by 10}$$
$$\Rightarrow \cancel{10}\times\frac{-x}{\cancel{10}}=-2\times 10$$
$$\Rightarrow -x=-20$$
$$\Rightarrow x=20 \text{ Ans.}$$

Q5. In a library, $\frac{2}{5}$ of the total books are Hadith books. Three fourths of the remaining books are Mathematics books. The 642 books remaining are on other subjects. Find the total number of books in the library.

Sol. Let the total number of books be 'x'

Hadith books = $\frac{2}{5}x$

Mathematics books = $\frac{3}{4}\left(x-\frac{2x}{5}\right)$

Other subject books = 642
Now

$$\Rightarrow x=\frac{2x}{5}+\frac{3}{4}\left(x-\frac{2x}{5}\right)+642$$
$$\Rightarrow x=\frac{2x}{5}+\frac{3}{4}\left(\frac{5x-2x}{5}\right)+642$$
$$\Rightarrow x=\frac{2x}{5}+\frac{3}{4}\left(\frac{3x}{5}\right)+642$$
$$\Rightarrow x=\frac{2x}{5}+\frac{9x}{20}+642$$

$$\Rightarrow x=\frac{2x\times 4}{5\times 4}+\frac{9x}{20}+642$$

$$\Rightarrow x=\frac{8x}{20}+\frac{9x}{20}+642$$

$$\Rightarrow x=\frac{8x+9x}{20}+642$$

$$\Rightarrow x=\frac{17x}{20}+642$$

$$\Rightarrow x-\frac{17x}{20}=642$$

$$\Rightarrow \frac{20x-17x}{20}=642$$

$$\Rightarrow \frac{3x}{20}=642 \quad \text{Multiply by 20}$$

$$\Rightarrow \frac{3x}{20}(20)=642(20)$$

$$\Rightarrow 3x=12840$$

$$\Rightarrow \frac{3x}{3}=\frac{12840}{3}$$

$$\Rightarrow x=4280 \text{ Ans.}$$

Total books = 4280

Q6. The second angle in a triangle is two third of the first angle. The third is 36 less than twice the second angle. Find the angles.

Sol. Let the first angle be 'x'

Then the second angle = $\frac{2}{3}x$

The third angle = $2\left(\frac{2}{3}x\right)-36$

Sum of angles of triangle =180

$$\Rightarrow x+\frac{2}{3}x+2\left(\frac{2}{3}x\right)-36=180$$

$$\Rightarrow \frac{x}{1}+\frac{2x}{3}+\frac{4x}{3}-36=180$$

$$\Rightarrow \frac{3x}{3}+\frac{2x}{3}+\frac{4x}{3}-36=180$$

$$\Rightarrow \frac{3x+2x+4x}{3}=180+36$$

$$\Rightarrow \frac{9x}{3}=216$$

$$\Rightarrow 3x=216$$

Divide both sides by 3

$$\Rightarrow \frac{3x}{3}=\frac{216}{3}$$

$$\Rightarrow x=72$$

1st angle = 72^0

2nd angle = $\frac{2}{3}x=\frac{2}{3}(72)=48^0$

3rd angle = $2\left(\frac{2}{3}x\right)-36=2(48)-36$

3rd angle = $96-36=60^0$

Q7. The difference in measure of two supplementary angles is 40^0. Find the angles.

Sol. Let the first angle be 'x'

Then the 2nd angle be 'x – 40'

The angles are supplementary

$$\Rightarrow x+x-40=180$$

$$\Rightarrow 2x=180+40$$

$$\Rightarrow 2x=220$$

$$\Rightarrow x=110$$

Thus 1st angle x = 110^0

2nd angle = $110-40=70^0$

Q8. Noor is 5 years older than Omair. After 4 years, Omair will be half as old as Noor. Find their present ages.

Sol. Let age of Omair be 'x'

Then Noor age = x + 5

After 4 years their ages:

Omair's age = x + 4

Noor's age = x + 5 + 4 = x + 9

According to question

$$\Rightarrow 2(x+4)=x+9$$

$$\Rightarrow 2x+8=x+9$$

$$\Rightarrow 2x-x=9-8$$

$\Rightarrow x = 1$

Omair's age = 1 year

Noor's age = x + 5 = 1 + 5 = 6 years

Exercise – 8.3

Q1. Identify the linear equation in two variables. Justify your answer.

a) $6x + 3 = 0$

Sol. $6x + 3 = 0$

This is linear equation in one variable i.e. 'x'

b) $7x - 7y = 9$

Sol. $7x - 7y = 9$

This is linear equation in two variable i.e. 'x and y'

c) $2x - 3y = 14$

Sol. $2x - 3y = 14$

This is linear equation in two variable i.e. 'x and y'

d) $2x^2 + 5y = 3$

Sol. $2x^2 + 5y = 3$

This is not linear equation because of x^2

e) $6x - 8y^2 = 12$

Sol. $6x - 8y^2 = 12$

This is not linear equation because of y^2

f) $8x - 2y = 10$

Sol. $8x - 2y = 10$

This is linear equation in two variable i.e. 'x and y'

g) $16x^3 + 2 = 8$

Sol. $16x^3 + 2 = 8$

This is not linear equation because of x^3

Q2. Construct a linear equation in two variables for the following.

a) 24 less than 2 times a number is equal to the 3 times another number.

Sol. Let the numbers be 'x and y'

2x – 24 = 3y Ans.

b) 15 added to a number equal to twice another number.

Sol. Let the numbers be 'x and y'

x + 15 = 2x Ans.

c) A number subtracted from 8 added to 4 times another number equals 20.

Sol. Let the numbers be 'x and y'

8 – x + 4y = 20 Ans.

d) 8 decreased by a number equal 5 added to another number.

Sol. Let the numbers be 'x and y'

x – 8 = 5 + y Ans.

e) Twice a number decreased by 7 equal five times another number.

Sol. Let the numbers be 'x and y'

2x – 7 = 5y Ans.

f) Thrice a number equals another number decreased by 2.

Sol. Let the numbers be 'x and y'

3x = y – 2 Ans.

Q3. The length of 7 silver chains and 3 golden chains is 27 metre. Construct a linear equation in two variables for this situation.

Sol. Let silver chain length = x

Gold chain length = y

Length of 7 silver chain and 3 gold chain is 27 meters

7x + 3y = 27 Ans.

Q4. The capacity of 8 buckets and 9 tubs is 121 litres altogether. Construct a linear equation in two variables for this situation.

Sol. Let capacity of bucket = x

Capacity of tub = y

The capacity of 8 buckets and 9 tubs is 121 litres

8x + 9y = 121 Ans.

Q5. The age of Hassaan added to thrice the age of Nida is 30 years. Construct a linear equation in two variables for this situation.

Sol. Let age of Hassaan = x
Age of Nide = y
The age of Hassaan added to thrice the age of Nida is 30 years
x + 3y = 30 **Ans.**

Q6. The price of 10 books and 3 notebooks is Rs.2950. construct a linear equation in two variables for this situation.

Sol. Let price of book = x
Price of notebook = y
The price of 10 books and 3 notebooks is Rs.2950
10x + 3y =2950 **Ans.**

Exercise – 8.4

Q1. Solve the following linear equations and find at least 5 solutions for each which satisfy the equations.

a) $2x - y = 1$

Sol. $2x - y = 1$

$\Rightarrow -y = 1 - 2x$

$\Rightarrow -y = -(2x - 1)$

$\Rightarrow y = 2x - 1$

Put x = 0

$\Rightarrow y = 2(0) - 1 = 0 - 1$

$\Rightarrow y = -1$

$(x, y) = (0, -1)$

Put x = 1

$\Rightarrow y = 2(1) - 1 = 2 - 1$

$\Rightarrow y = 1$

$(x, y) = (1, 1)$

Put x = 2

$\Rightarrow y = 2(2) - 1 = 4 - 1$

$\Rightarrow y = 3$

$(x, y) = (2, 3)$

Put x = 3

$\Rightarrow y = 2(3) - 1 = 6 - 1$

$\Rightarrow y = 5$

$(x, y) = (3, 5)$

Put x = 4

$\Rightarrow y = 2(4) - 1 = 8 - 1$

$\Rightarrow y = 7$

$(x, y) = (4, 7)$

x	0	1	2	3	4
y	−1	1	3	5	7

b) $x + y = 3$

Sol. $x + y = 3$

$\Rightarrow y = 3 - x$

Put x = 0

$\Rightarrow y = 3 - 0$

$\Rightarrow y = 3$

$(x, y) = (0, 3)$

Put x = 1

$\Rightarrow y = 3 - 1$

$\Rightarrow y = 2$

$(x, y) = (1, 2)$

Put x = 2

$\Rightarrow y = 3 - 2$

$\Rightarrow y = 1$

$(x, y) = (2, 1)$

Put x = 3

$\Rightarrow y = 3 - 3$

$\Rightarrow y = 0$

$(x, y) = (3, 0)$

Put x = 4

$\Rightarrow y = 3 - 4$

$\Rightarrow y = -1$

$(x,y)=(4,-1)$

x	0	1	2	3	4
y	3	2	1	0	−1

c) $3x+2y=-2$

Sol. $3x+2y=-2$

$\Rightarrow 2y=-2-3x$

$\Rightarrow y=\dfrac{-2-3x}{2}$ **Put x = 0**

$\Rightarrow y=\dfrac{-2-3(0)}{2}=\dfrac{-2-0}{2}=\dfrac{-2}{2}$

$\Rightarrow y=-1$

$(x,y)=(0,-1)$

Put x = 2

$\Rightarrow y=\dfrac{-2-3(2)}{2}=\dfrac{-2-6}{2}=\dfrac{-8}{2}$

$\Rightarrow y=-4$

$(x,y)=(2,-4)$

Put x = −2

$\Rightarrow y=\dfrac{-2-3(-2)}{2}=\dfrac{-2+6}{2}=\dfrac{4}{2}$

$\Rightarrow y=2$

$(x,y)=(-2,2)$

Put x = −4

$\Rightarrow y=\dfrac{-2-3(-4)}{2}=\dfrac{-2+12}{2}=\dfrac{10}{2}$

$\Rightarrow y=5$

$(x,y)=(-4,5)$

Put x = −6

$\Rightarrow y=\dfrac{-2-3(-6)}{2}=\dfrac{-2+18}{2}=\dfrac{16}{2}$

$\Rightarrow y=8$

$(x,y)=(-6,8)$

x	0	2	−2	−4	−6
y	−1	−4	2	5	8

d) $2x-y=-1$

Sol. $2x-y=-1$

$\Rightarrow 2x+1=y$

$\Rightarrow y=2x+1$

Put x = 0

$\Rightarrow y=2(0)+1=0+1$

$\Rightarrow y=1$

$(x,y)=(0,1)$

Put x = 1

$\Rightarrow y=2(1)+1=2+1$

$\Rightarrow y=3$

$(x,y)=(1,3)$

Put x = 2

$\Rightarrow y=2(2)+1=4+1$

$\Rightarrow y=5$

$(x,y)=(2,5)$

Put x = 3

$\Rightarrow y=2(3)+1=6+1$

$\Rightarrow y=7$

$(x,y)=(3,7)$

Put x = 4

$\Rightarrow y=2(4)+1=8+1$

$\Rightarrow y=9$

$(x,y)=(4,9)$

x	0	1	2	3	4
y	1	3	5	7	9

e) $2x+3y=10$

Sol. $2x+3y=10$

$\Rightarrow 3y=10-2x$

$\Rightarrow y=\dfrac{10-2x}{3}$

Put x = −1

$$\Rightarrow y=\frac{10-2(-1)}{3}=\frac{10+2}{2}=\frac{12}{3}$$

$$\Rightarrow y=4$$

$$(x,y)=(-1,4)$$

Put x = 2

$$\Rightarrow y=\frac{10-2(2)}{3}=\frac{10-4}{2}=\frac{6}{3}$$

$$\Rightarrow y=2$$

$$(x,y)=(2,2)$$

Put x = –7

$$\Rightarrow y=\frac{10-2(-7)}{3}=\frac{10+14}{2}=\frac{24}{3}$$

$$\Rightarrow y=8$$

$$(x,y)=(-7,8)$$

Put x = – 4

$$\Rightarrow y=\frac{10-2(-4)}{3}=\frac{10+8}{2}=\frac{18}{3}$$

$$\Rightarrow y=6$$

$$(x,y)=(-4,6)$$

Put x = 5

$$\Rightarrow y=\frac{10-2(5)}{3}=\frac{10-10}{2}=\frac{0}{3}$$

$$\Rightarrow y=0$$

$$(x,y)=(5,0)$$

x	–7	–4	–1	2	5
y	8	6	2	2	0

f) $3x + 4y = 18$

Sol. $3x + 4y = 18$

$$\Rightarrow 4y = 18 - 3x$$

$$\Rightarrow y = \frac{18-3x}{4}$$

Put x = 2

$$\Rightarrow y=\frac{18-3(2)}{4}=\frac{18-6}{4}=\frac{12}{4}$$

$$\Rightarrow y=3$$

$$(x,y)=(2,3)$$

Put x = – 2

$$\Rightarrow y=\frac{18-3(-2)}{4}=\frac{18+6}{4}=\frac{24}{4}$$

$$\Rightarrow y=6$$

$$(x,y)=(-2,6)$$

Put x = 6

$$\Rightarrow y=\frac{18-3(6)}{4}=\frac{18-18}{4}=\frac{0}{4}$$

$$\Rightarrow y=0$$

$$(x,y)=(6,0)$$

Put x = – 6

$$\Rightarrow y=\frac{18-3(-6)}{4}=\frac{18+18}{4}=\frac{36}{4}$$

$$\Rightarrow y=9$$

$$(x,y)=(-6,9)$$

Put x = – 10

$$\Rightarrow y=\frac{18-3(-10)}{4}=\frac{18+30}{4}=\frac{48}{4}$$

$$\Rightarrow y=12$$

$$(x,y)=(-10,12)$$

x	2	–2	6	–6	–10
y	3	6	0	9	12

g) $2x + y = 6$

Sol. $2x + y = 6$

$$\Rightarrow y = 6 - 2x$$

Put x = 0

$$\Rightarrow y=6-2(0)=6-0$$

$$\Rightarrow y=6$$

$$(x,y)=(0,6)$$

Put x = 1

$\Rightarrow y = 6-2(1) = 6-2$

$\Rightarrow y = 4$

$(x,y) = (1,4)$

Put x = 2

$\Rightarrow y = 6-2(2) = 6-4$

$\Rightarrow y = 2$

$(x,y) = (2,2)$

Put x = 3

$\Rightarrow y = 6-2(3) = 6-6$

$\Rightarrow y = 0$

$(x,y) = (3,0)$

Put x = 4

$\Rightarrow y = 6-2(4) = 6-8$

$\Rightarrow y = -2$

$(x,y) = (4,-2)$

x	0	1	2	3	4
y	6	4	2	0	−2

h) 3x + y = 4

Sol. 3x + y = 4

$\Rightarrow y = 4 - 3x$

Put x = 0

$\Rightarrow y = 4-3(0) = 4-0$

$\Rightarrow y = 4$

$(x,y) = (0,4)$

Put x = 1

$\Rightarrow y = 4-3(1) = 4-3$

$\Rightarrow y = 1$

$(x,y) = (1,1)$

Put x = 2

$\Rightarrow y = 4-3(2) = 4-6$

$\Rightarrow y = -2$

$(x,y) = (2,-2)$

Put x = 3

$\Rightarrow y = 4-3(3) = 4-9$

$\Rightarrow y = -5$

$(x,y) = (3,-5)$

Put x = 4

$\Rightarrow y = 4-3(4) = 4-12$

$\Rightarrow y = -8$

$(x,y) = (4,-8)$

x	0	1	2	3	4
y	4	1	−2	−5	−8

i) y = − 4x + 3

Sol. y = − 4x + 3

$\Rightarrow y = -4x + 3$

Put x = 0

$\Rightarrow y = -4(0) + 3 = 0 + 3$

$\Rightarrow y = 3$

$(x,y) = (0,3)$

Put x = 1

$\Rightarrow y = -4(1) + 3 = -4 + 3$

$\Rightarrow y = -1$

$(x,y) = (1,-1)$

Put x = − 1

$\Rightarrow y = -4(-1) + 3 = 4 + 3$

$\Rightarrow y = 7$

$(x,y) = (-1,7)$

Put x = 2

$\Rightarrow y = -4(2) + 3 = -8 + 3$

$\Rightarrow y = -5$

$(x,y) = (2,-5)$

Put x = − 2

$\Rightarrow y=-4(-2)+3=8+3$

$\Rightarrow y=11$

$(x,y)=(-2,11)$

x	-2	-1	0	1	2
y	11	7.	3	-1	-5

j) $y-2=x$

Sol. $y-2=x$

$\Rightarrow y=x+2$

Put x = 0

$\Rightarrow y=0+2 \quad \Rightarrow y=2$

$(x,y)=(0,2)$

Put x = 1

$\Rightarrow y=1+2 \quad \Rightarrow y=3$

$(x,y)=(1,3)$

Put x = 2

$\Rightarrow y=2+2 \quad \Rightarrow y=4$

$(x,y)=(2,4)$

Put x = 3

$\Rightarrow y=3+2 \quad \Rightarrow y=5$

$(x,y)=(3,5)$

Put x = 4

$\Rightarrow y=4+2 \quad \Rightarrow y=6$

$(x,y)=(4,6)$

x	0	1	2	3	4
y	2	3	4	5	6

k) $2x-y=8$

Sol. $2x-y=8$

$\Rightarrow 2x-8=y$

$\Rightarrow y=2x-8$

Put x = 0

$\Rightarrow y=2(0)-8=0-8$

$\Rightarrow y=-8$

$(x,y)=(0,-8)$

Put x = 1

$\Rightarrow y=2(1)-8=2-8$

$\Rightarrow y=-6$

$(x,y)=(1,-6)$

Put x = 2

$\Rightarrow y=2(2)-8=4-8$

$\Rightarrow y=-4$

$(x,y)=(2,-4)$

Put x = 3

$\Rightarrow y=2(3)-8=6-8$

$\Rightarrow y=-2$

$(x,y)=(3,-2)$

Put x = 4

$\Rightarrow y=2(4)-8=8-8$

$\Rightarrow y=0$

$(x,y)=(4,0)$

x	0	1	2	3	4
y	-8	-6	-4	-2	0

l) $-2x-y=-1$

Sol. $-2x-y=-1$

$\Rightarrow -2x+1=y$

$\Rightarrow y=1-2x$

Put x = 0

$\Rightarrow y=1-2(0)=1-0$

$\Rightarrow y=1$

$(x,y)=(0,1)$

Put x = 1

$\Rightarrow y=1-2(1)=1-2$

$\Rightarrow y=-1$

$(x,y)=(1,-1)$

Put x = -1

$\Rightarrow y = 1-2(-1) = 1+2$

$\Rightarrow y = 3$

$(x,y) = (-1,3)$

Put x = - 2

$\Rightarrow y = 1-2(-2) = 1+4$

$\Rightarrow y = 5$

$(x,y) = (-2,5)$

Put x = 2

$\Rightarrow y = 1-2(2) = 1-4$

$\Rightarrow y = -3$

$(x,y) = (2,-3)$

x	-2	-1	0	1	2
y	5	3	1	-1	-3

Exercise – 8.5

Q1. Identify the Quadrant in which each of these ordered pairs lies.

a) (1, 1) Quadrant: _1st_

b) $(1,-1)$ Quadrant: __4th_

c) $(4,2)$ Quadrant: __1st_

d) $(-2,-3)$ Quadrant: _3rd

e) $(2,1)$ Quadrant: _1st_

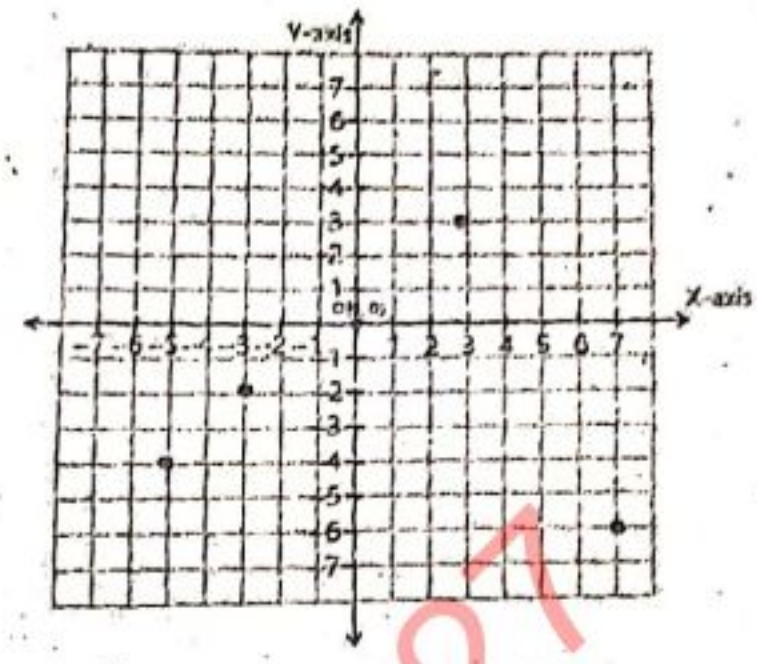
f) $(1,-9)$ Quadrant: __4th_

g) $(-5,2)$ Quadrant: _2nd_

h) $(3,-5)$ Quadrant: _4th_

i) $(-3,2)$ Quadrant: _2nd_

Q2. Identify the value of x and y and write the ordered pair for each point on the graph.

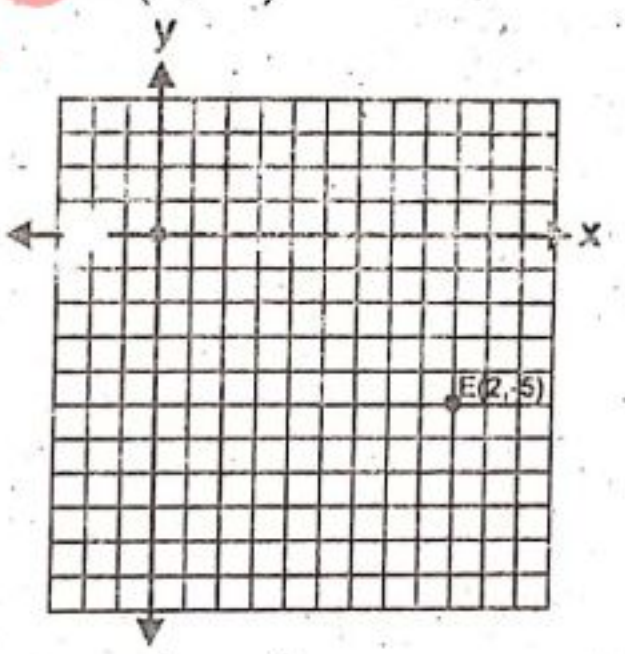


Sol. 1st Quadrant: (3, 3)
3rd Quadrant: (-3, -2) and (-5,-4)
4th Quadrant: (7, - 6)

Q3. Plot the following ordered pairs in the coordinate plane.

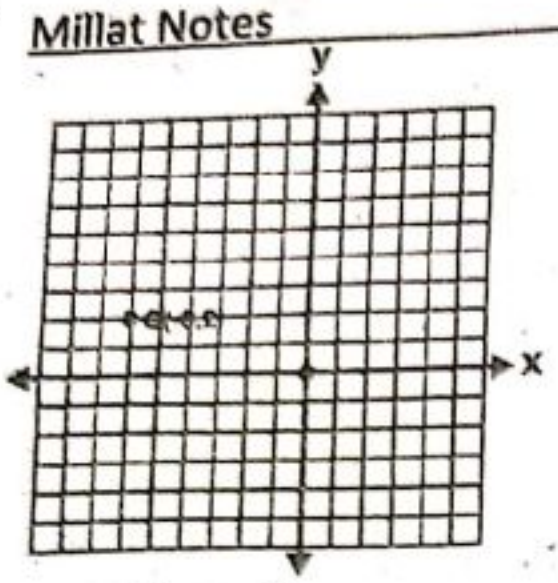
a) $E(9,-5)$

Sol. $E(9,-5)$



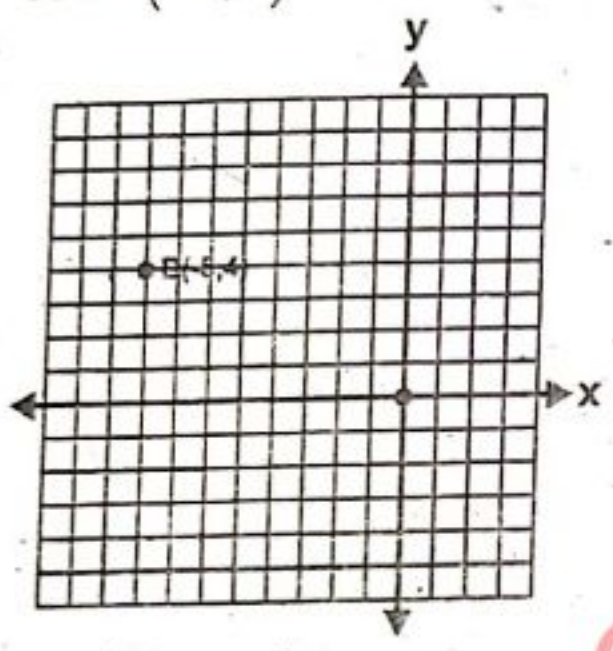
b) $Q(-6,2)$

Sol. $Q(-6,2)$



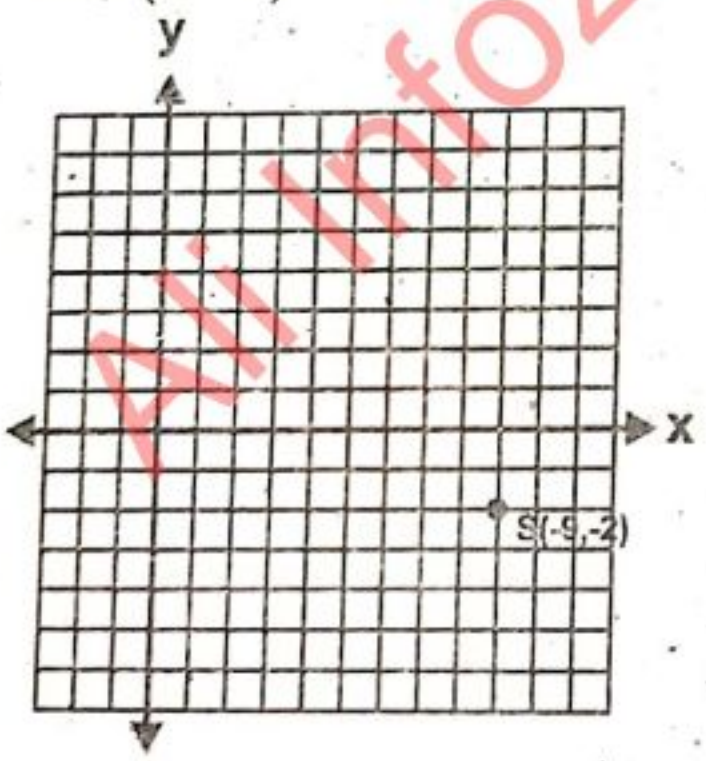
c) $D(-8,4)$

Sol. $D(-8,4)$



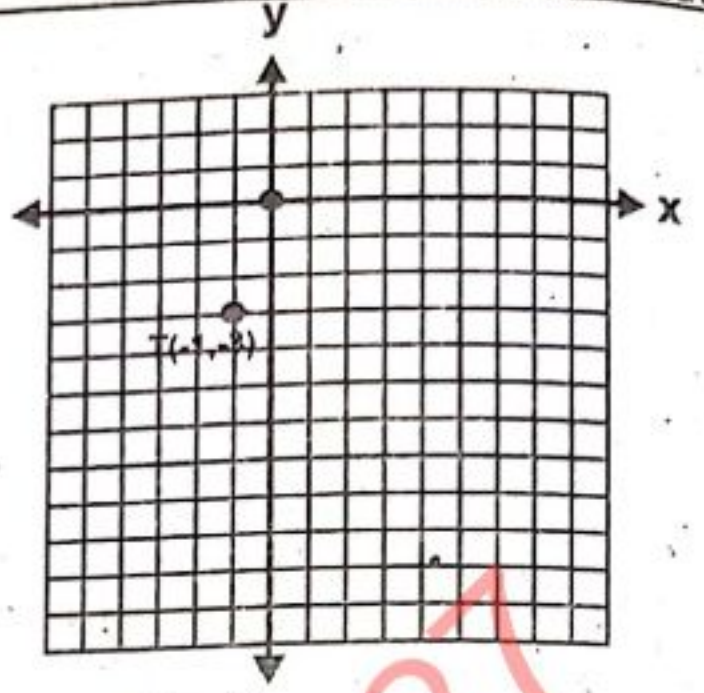
d) $S(9,-2)$

Sol. $S(9,-2)$



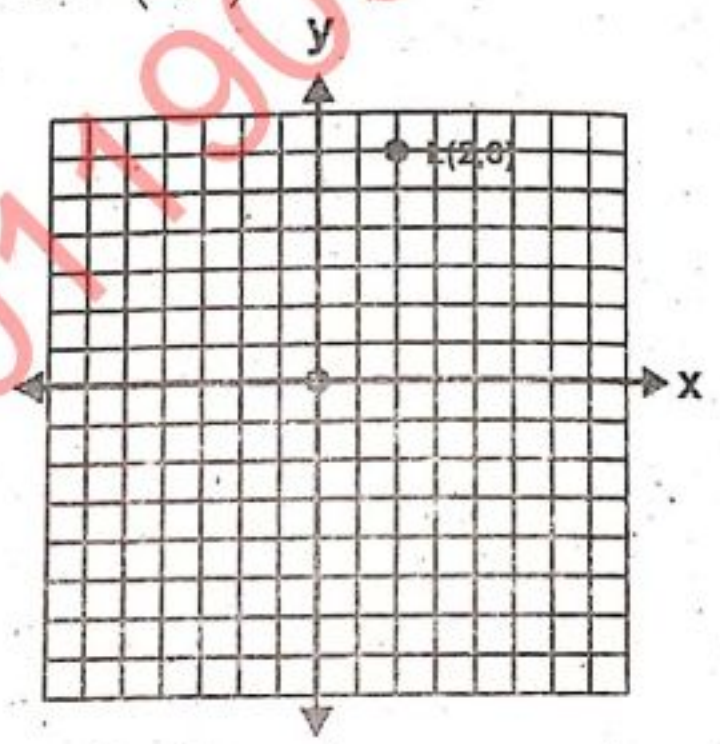
e) $T(-1,-3)$

Sol. $T(-1,-3)$



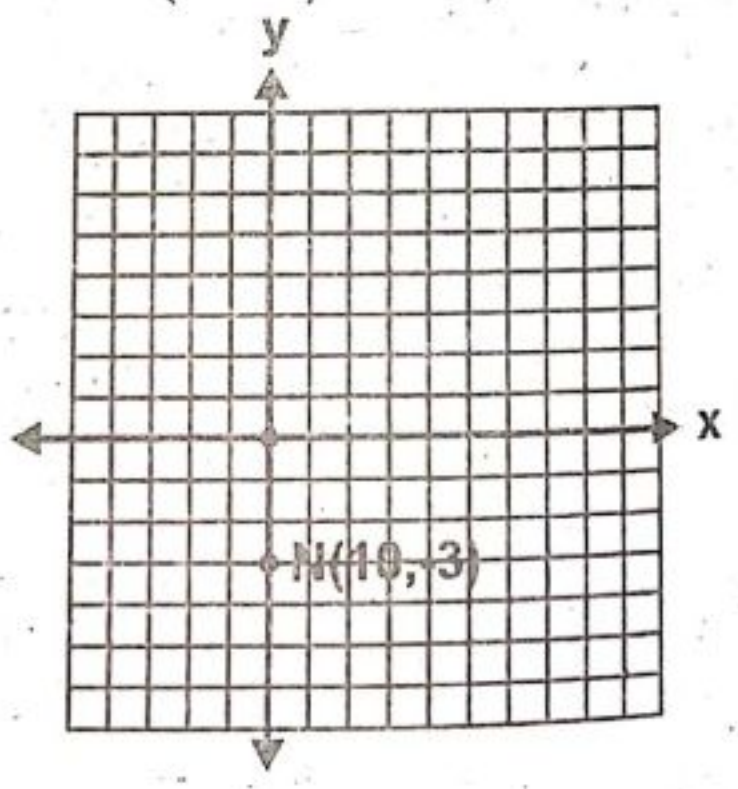
f) $L(2,6)$

Sol. $L(2,6)$



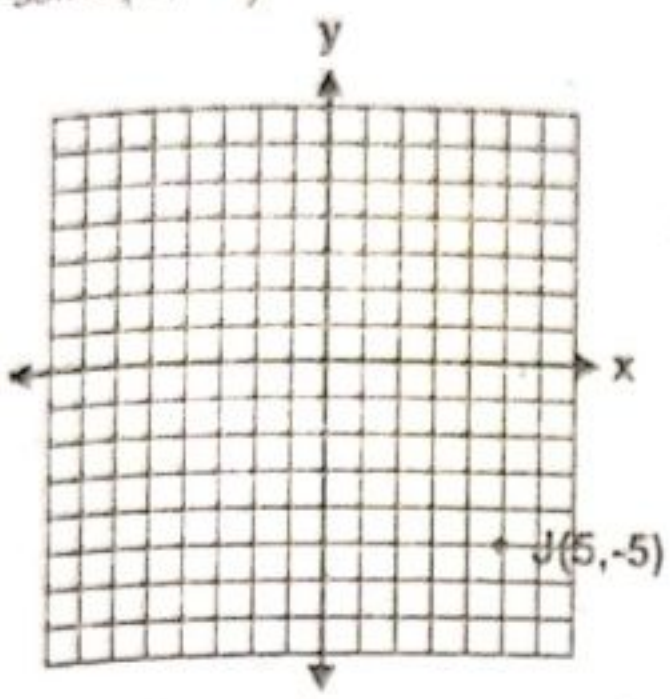
g) $N(0,-3)$

Sol. $N(0,-3)$



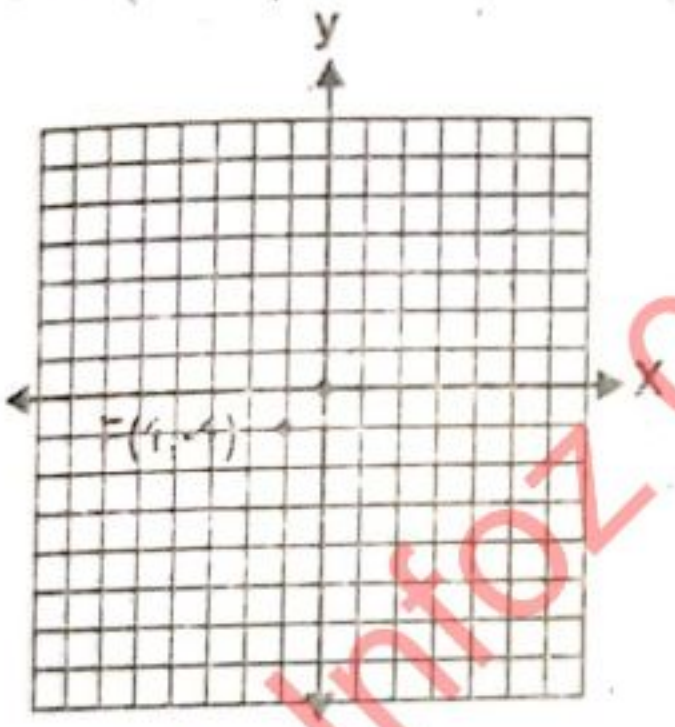
h) $J(5,-5)$

Sol. $J(5,-5)$



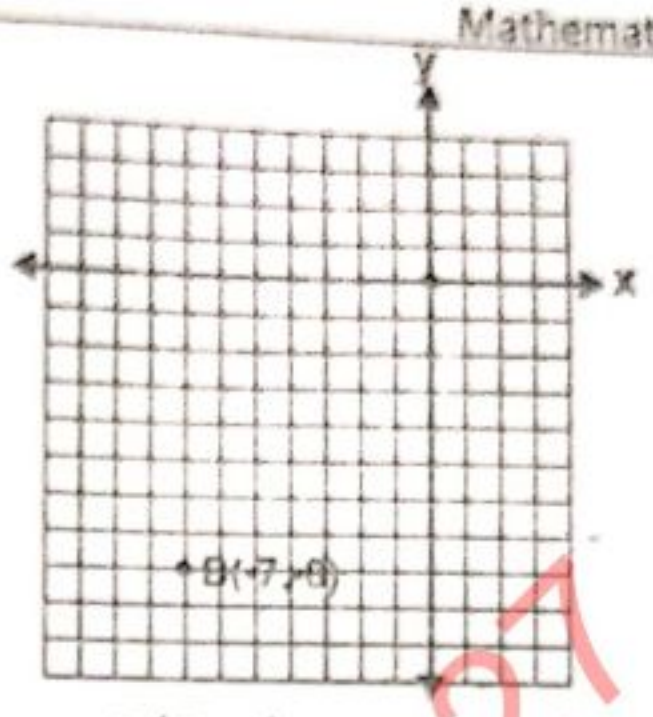
i) $F(-1,-1)$

Sol. $F(-1,-1)$



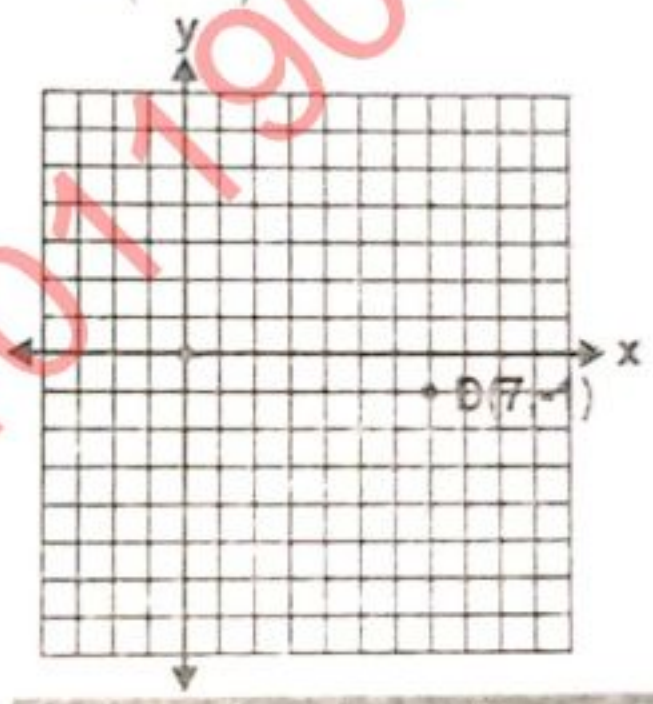
j) $B(-7,-8)$

Sol. $B(-7,-8)$



k) $D(7,-1)$

Sol. $D(7,-1)$



Exercise – 8.6

Q1. Identify which of these equations are for vertical lines and which are for horizontal lines. Then plot the graphs for the following linear equations in one variable.

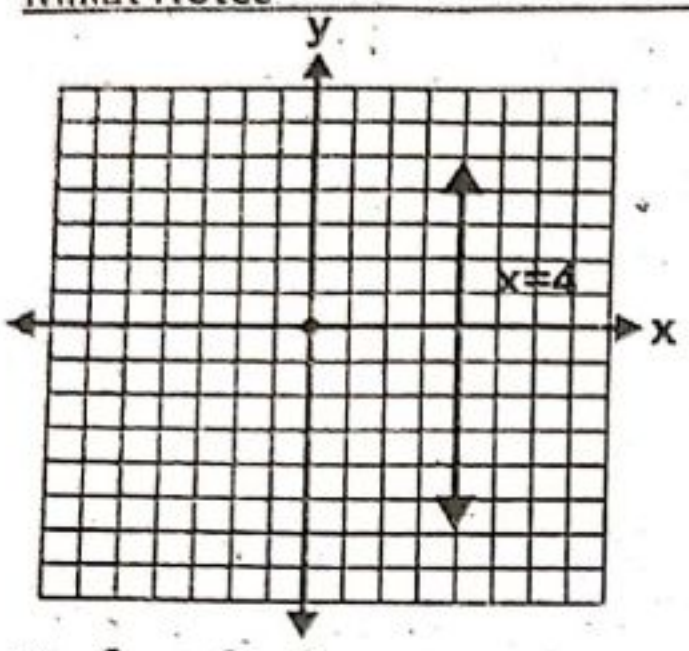
a) $2x-8=0$

Sol. $2x-8=0$

$\Rightarrow 2x=8$

$\Rightarrow \frac{2x}{2}=\frac{8}{2} \qquad \Rightarrow x=4$

This represent that this graph is vertical line, parallel to y-axis.



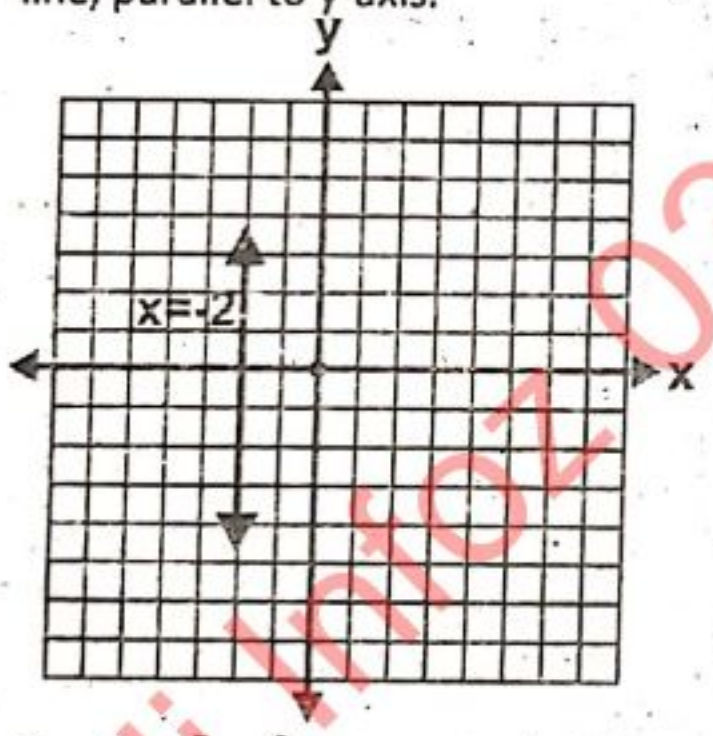
b) $3x+6=0$

Sol. $3x+6=0$

$\Rightarrow 3x=-6$

$\Rightarrow \frac{3x}{3}=\frac{-6}{3} \quad \Rightarrow x=-2$

This represent that this graph is vertical line, parallel to y-axis.

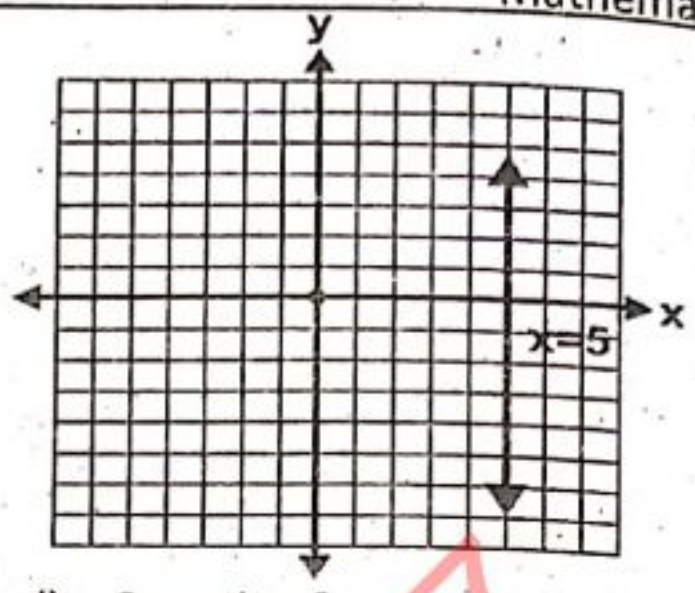


c) $x-5=0$

Sol. $x-5=0$

$\Rightarrow x=5$

This represent that this graph is vertical line, parallel to y-axis.



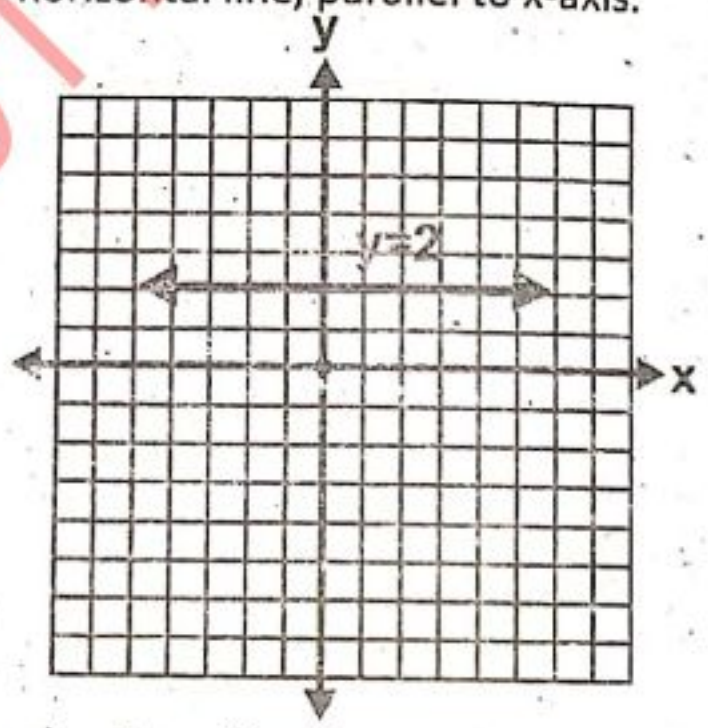
d) $2y-4=0$

Sol. $2y-4=0$

$\Rightarrow 2y=4$

$\Rightarrow \frac{2y}{2}=\frac{4}{2} \quad \Rightarrow y=2$

This represent that this graph is horizontal line, parallel to x-axis.



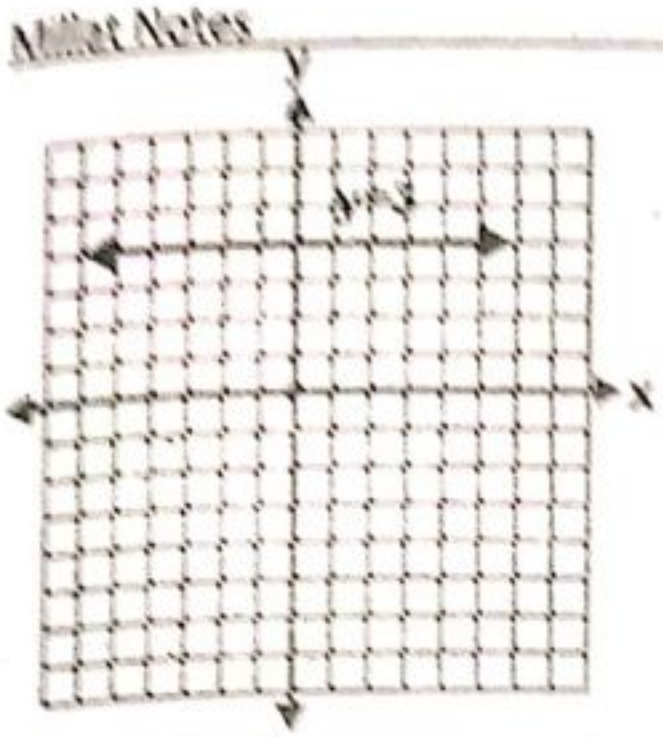
e) $3y-9=0$

Sol. $3y-9=0$

$\Rightarrow 3y=9$

$\Rightarrow \frac{3y}{3}=\frac{9}{3} \quad \Rightarrow y=3$

This represent that this graph is horizontal line, parallel to x-axis.

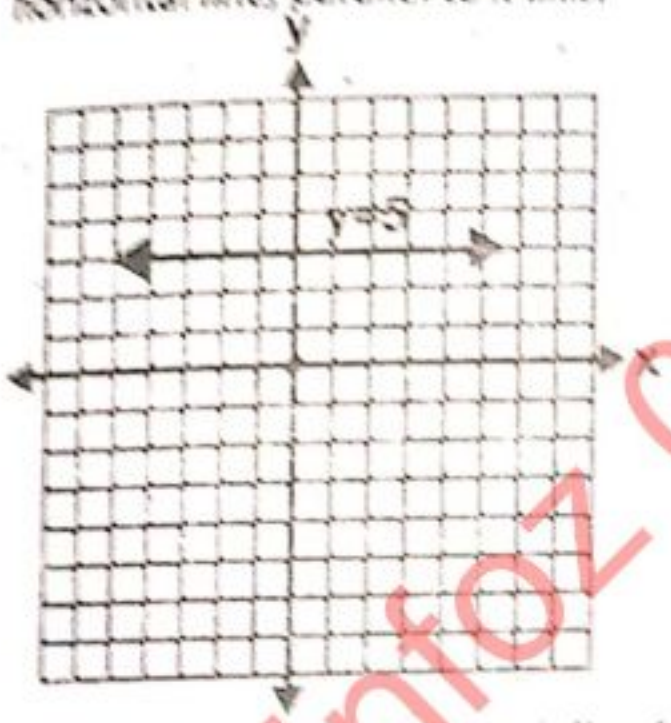


i) $y-5=0$

Sol. $y-5=0$

$\Rightarrow y=5$

This represent that this graph is horizontal line, parallel to x-axis.

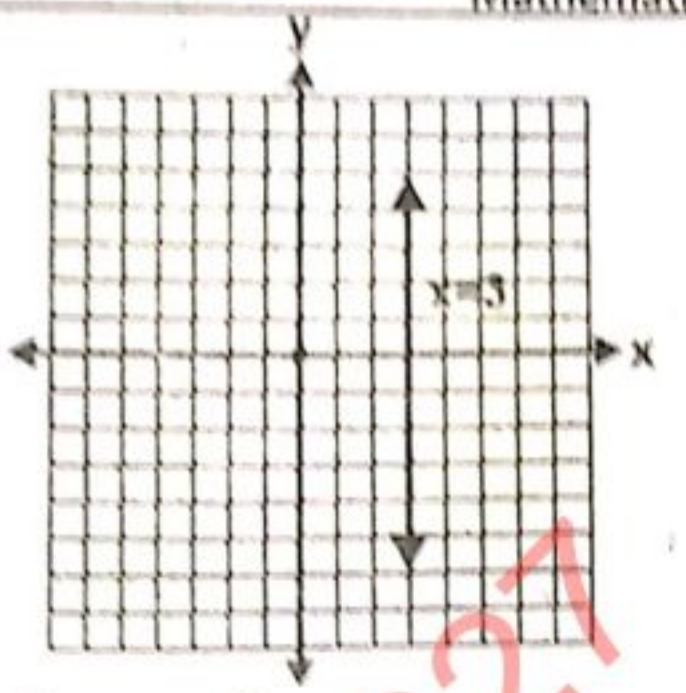


Q2. Draw the graphs of the following equations:

a) $x=3$

Sol. $x=3$

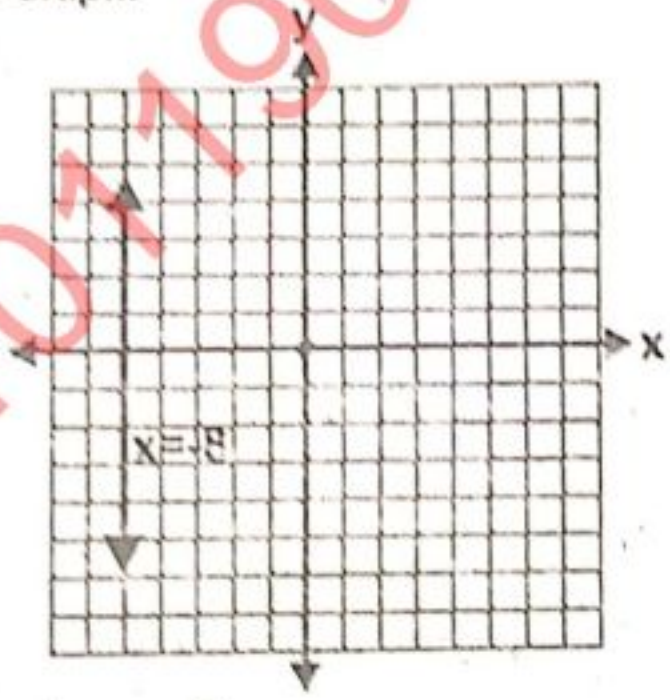
Graph:



b) $x=-8$

Sol. $x=-8$

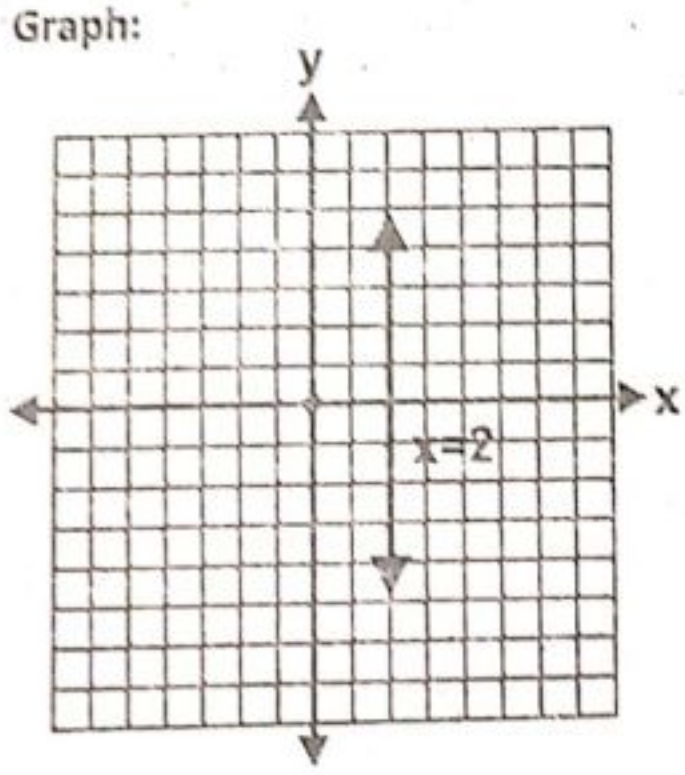
Graph:



c) $x=2$

Sol. $x=2$

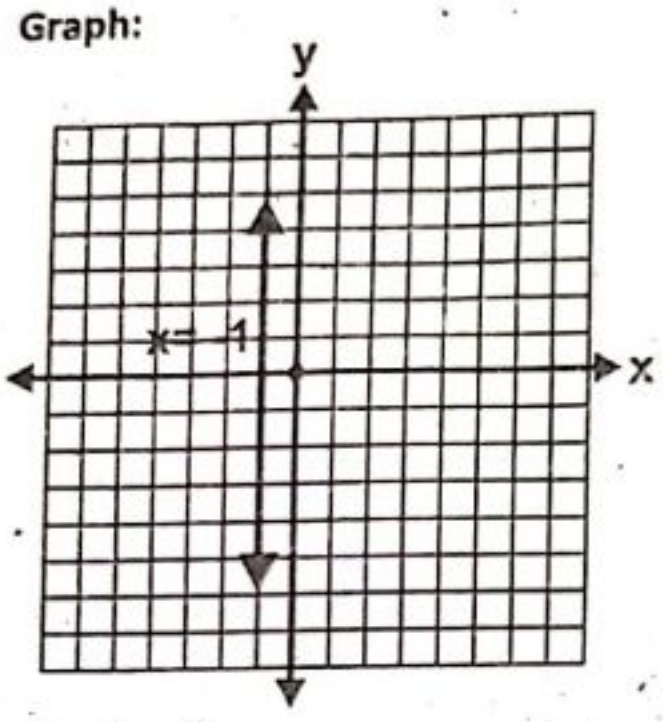
Graph:



d) $x=-1$

Sol. $x = -1$

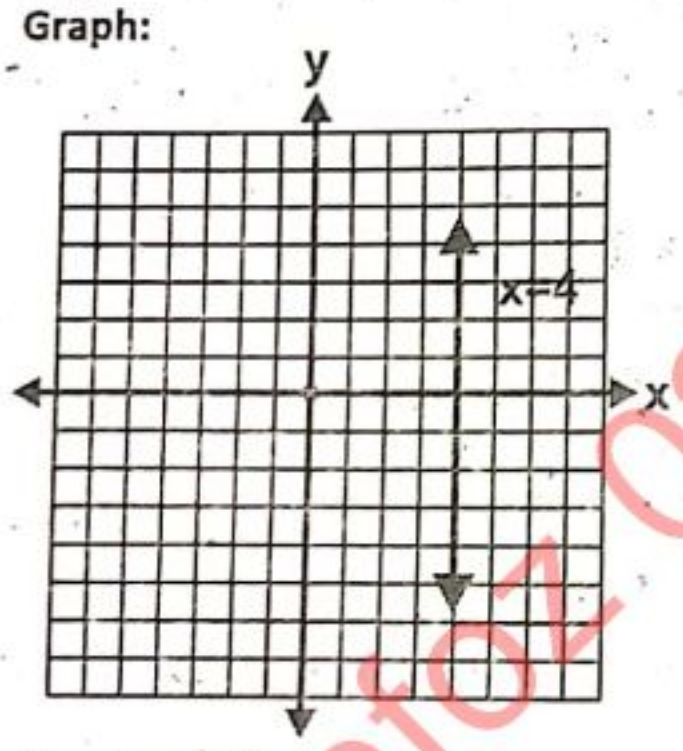
Graph:



e) $x = 4$

Sol. $x = 4$

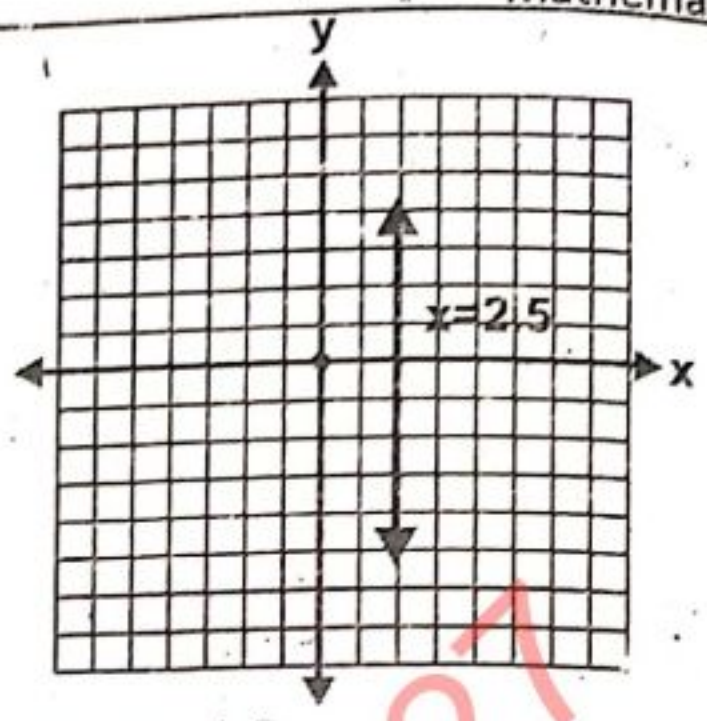
Graph:



f) $x = 2.5$

Sol. $x = 2.5$

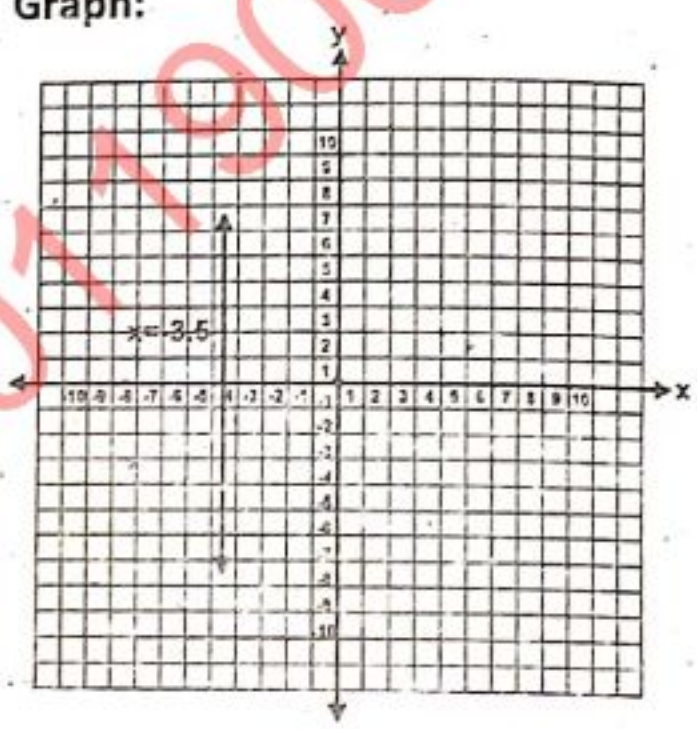
Graph:



g) $x = 4.5$

Sol. $x = 4.5$

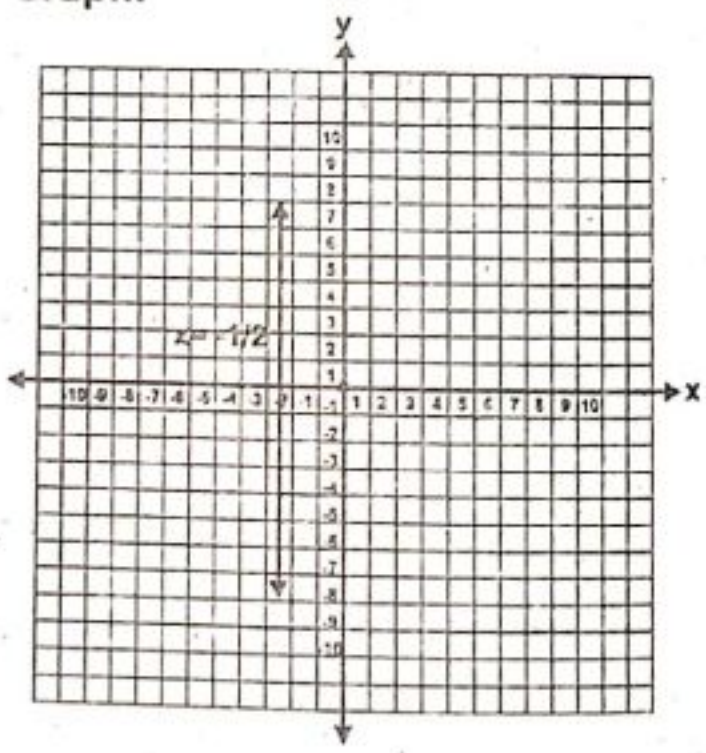
Graph:



h) $x = -1.5$

Sol. $x = -1.5$

Graph:

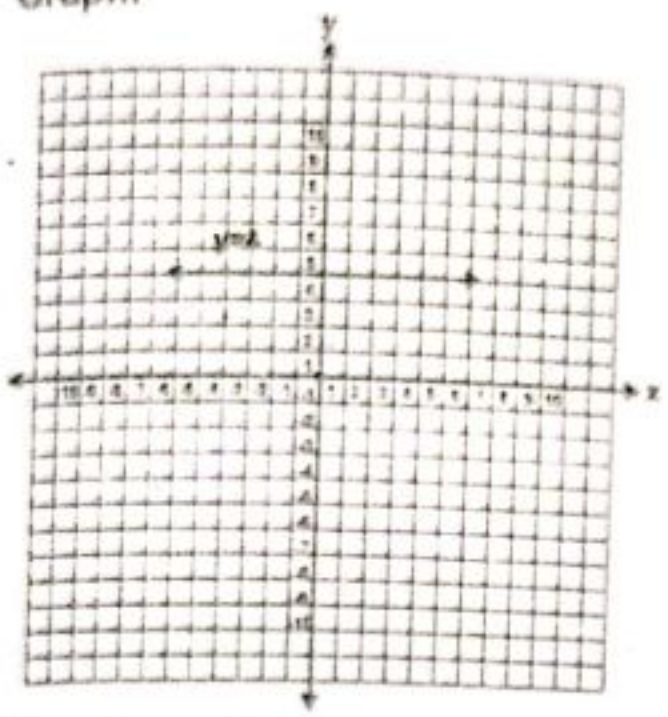


Q3. Draw the graphs of the following equations.

a) $y = 4$

Sol. $y = 4$

Graph:



b) $y = -9$

Sol. $y = -9$

Graph:

c) $y = 3.5$

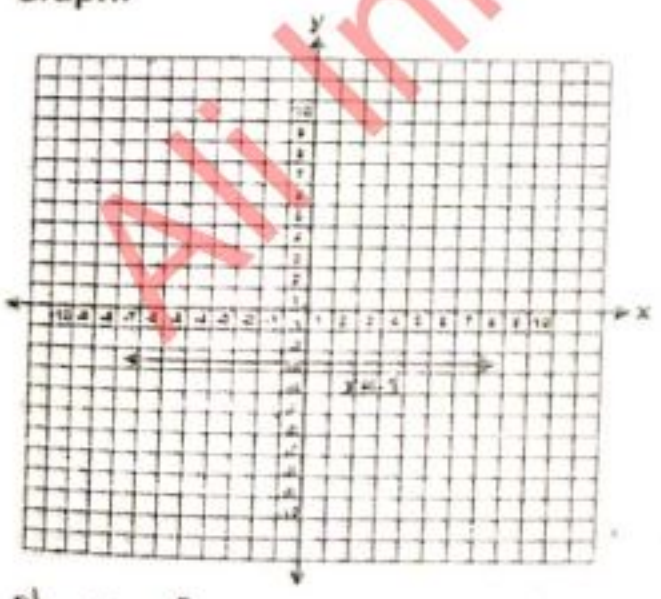
Sol. $y = 3.5$

Graph:

d) $y = -2.5$

Sol. $y = -2.5$

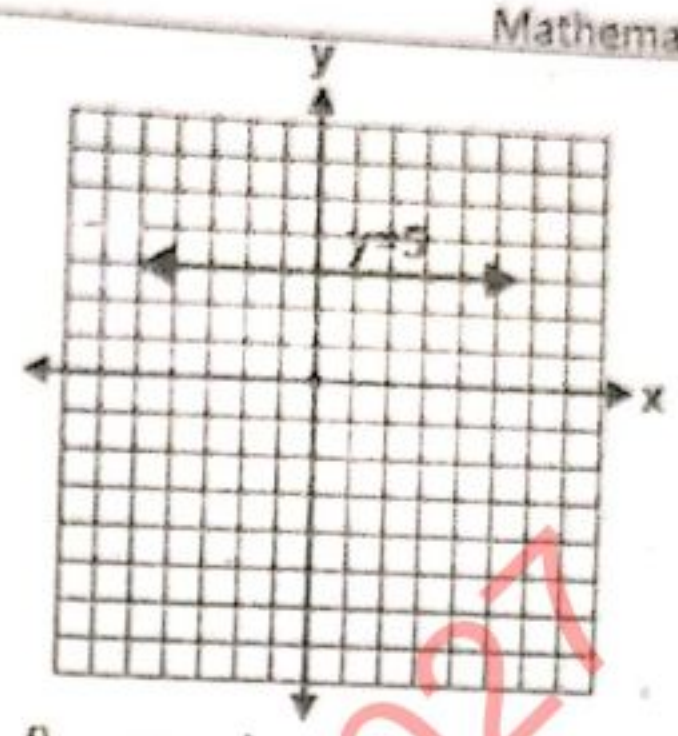
Graph:



e) $y = 5$

Sol. $y = 5$

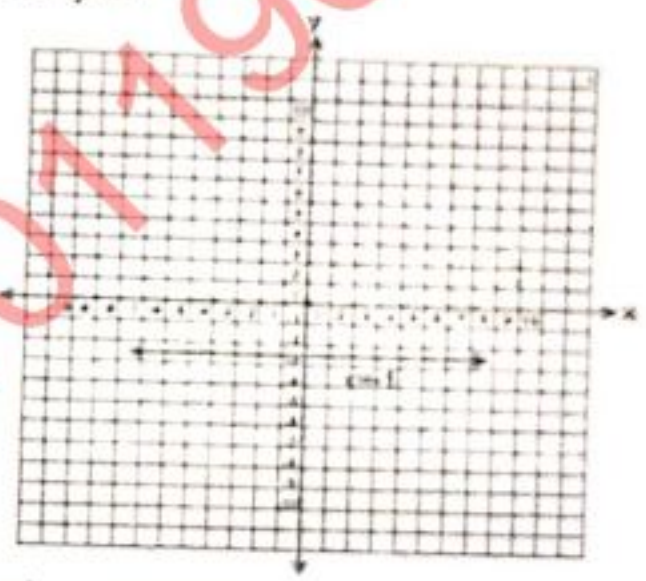
Graph:



f) $y = -1$

Sol. $y = -1$

Graph:



g) $y = -3$

Sol. $y = -3$

Graph:

h) $y = -5$

Sol. $y = -5$

Graph:

Exercise – 8.7

Q1. Plot the graphs for the following linear equations in two variables.

a) $3x - 5y = 20$

Sol. $3x - 5y = 20$

$\Rightarrow -5y = 20 - 3x$

$\Rightarrow 5y = 3x - 20$

Put x = 0

$\Rightarrow 5y = 3(0) - 20 = 0 - 20$

$\Rightarrow 5y = -20 \quad \Rightarrow y = -4$

Put x = 5

$\Rightarrow 5y = 3(5) - 20 = 15 - 20$

$\Rightarrow 5y = -5 \quad \Rightarrow y = -1$

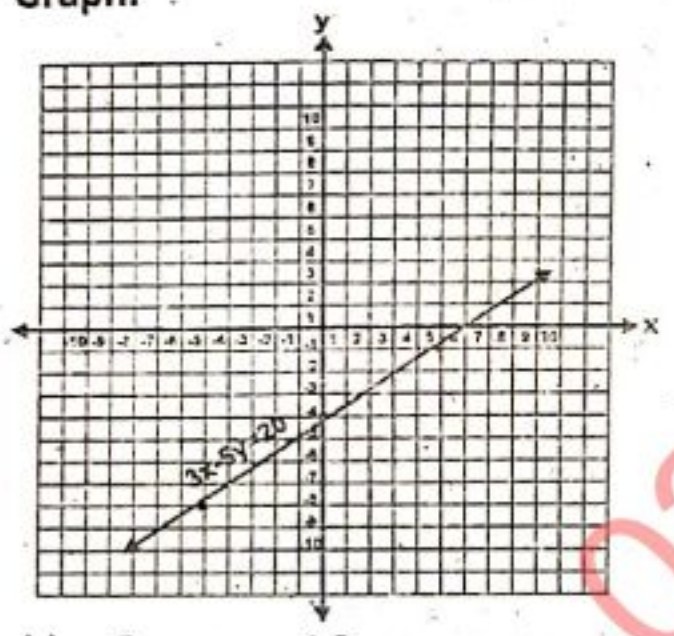
Put x = - 5

$\Rightarrow 5y = 3(-5) - 20 = -15 - 20$

$\Rightarrow 5y = -45 \quad \Rightarrow y = -9$

x	−5	0	5
y	−9	−4	−1

Graph:



b) $5x - y = 10$

Sol. $5x - y = 10$

$\Rightarrow -y = 10 - 5x$

$\Rightarrow y = 5x - 10$

Put x = 0

$\Rightarrow y = 5(0) - 10 = 0 - 10$

$\Rightarrow y = -10$

Put x = 1

$\Rightarrow y = 5(1) - 10 = 5 - 10$

$\Rightarrow y = -5$

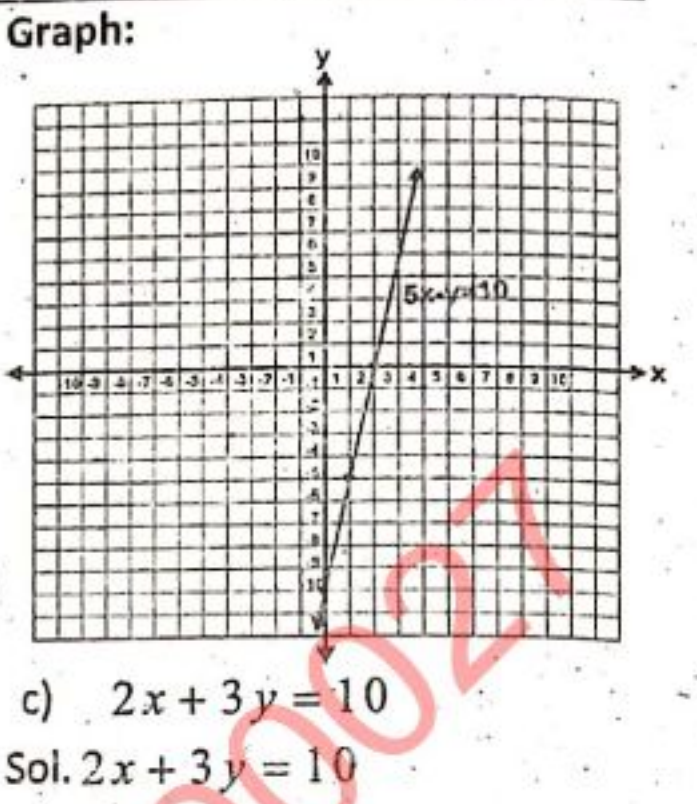
Put x = 2

$\Rightarrow y = 5(2) - 10 = 10 - 10$

$\Rightarrow y = 0$

x	0	1	2
y	−10	−5	0

Graph:



c) $2x + 3y = 10$

Sol. $2x + 3y = 10$

$\Rightarrow 3y = 10 - 2x$

Put x = − 1

$\Rightarrow 3y = 10 - 2(-1) = 10 + 2$

$\Rightarrow 3y = 12 \quad \Rightarrow y = 4$

Put x = 2

$\Rightarrow 3y = 10 - 2(2) = 10 - 4$

$\Rightarrow 3y = 6 \quad \Rightarrow y = 2$

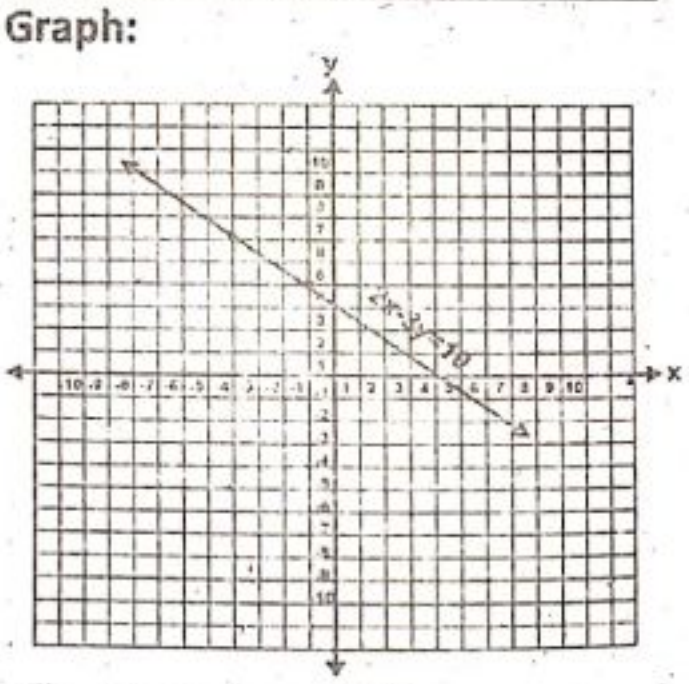
Put x = - 4

$\Rightarrow 3y = 10 - 2(-4) = 10 + 8$

$\Rightarrow 3y = 18 \quad \Rightarrow y = 6$

x	−4	−1	2
y	6	4	2

Graph:



d) $3x + 4y = 18$

Sol. $3x + 4y = 18$

$\Rightarrow 4y = 18 - 3x$

Put x = 6

$\Rightarrow 4y = 18 - 3(6) = 18 - 18$

$\Rightarrow 4y = 0 \qquad \Rightarrow y = 0$

Put x = 2

$\Rightarrow 4y = 18 - 3(2) = 18 - 6$

$\Rightarrow 4y = 12 \qquad \Rightarrow y = 3$

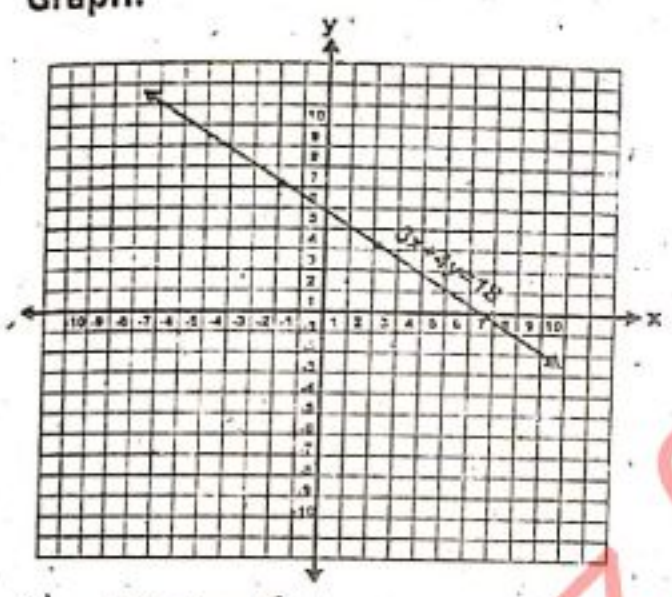
Put x = −2

$\Rightarrow 4y = 18 - 3(-2) = 18 + 6$

$\Rightarrow 4y = 24 \qquad \Rightarrow y = 6$

x	−2	2	6
y	6	3	0

Graph:



e) $x + y = 6$

Sol. $x + y = 6$

$\Rightarrow y = 6 - x$

Put x = 0

$\Rightarrow y = 6 - 0 \qquad \Rightarrow y = 6$

Put x = 1

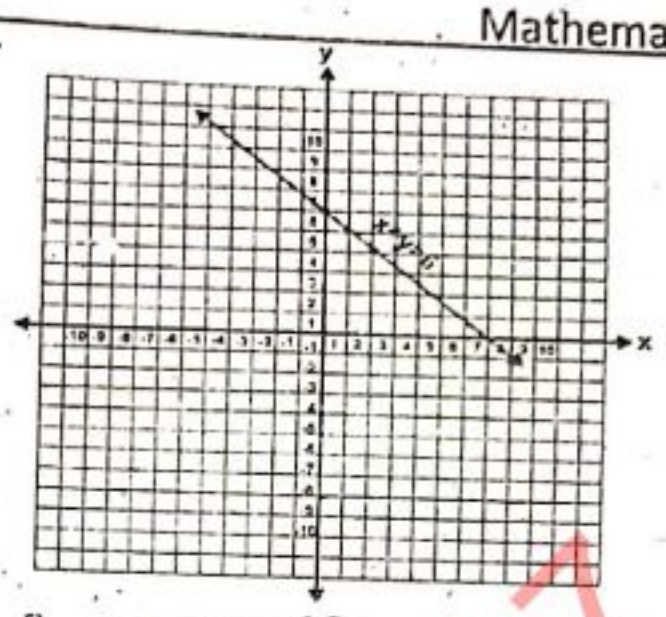
$\Rightarrow y = 6 - 1 \qquad \Rightarrow y = 5$

Put x = 2

$\Rightarrow y = 6 - 2 \qquad \Rightarrow y = 4$

x	0	1	2
y	6	5	4

Graph:



f) $-x + y = 18$

Sol. $-x + y = 18$

$\Rightarrow y = 18 + x$

Put x = 0

$\Rightarrow y = 18 + 0 \qquad \Rightarrow y = 18$

Put x = −4

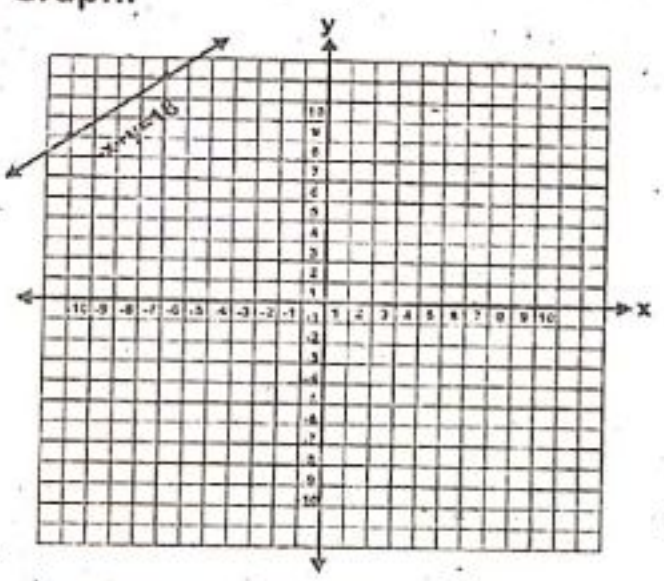
$\Rightarrow y = 18 - 4 \qquad \Rightarrow y = 14$

Put x = −6

$\Rightarrow y = 18 - 6 \qquad \Rightarrow y = 12$

x	−6	−4	0
y	12	14	18

Graph:



g) $3x - 2y = 21$

Sol. $3x - 2y = 21$

$\Rightarrow -2y = 21 - 3x$

$\Rightarrow 2y = 3x - 21$

Put x = 1

$\Rightarrow 2y = 3(1) - 21 = 3 - 21$

$\Rightarrow 2y = -18 \qquad \Rightarrow y = -9$

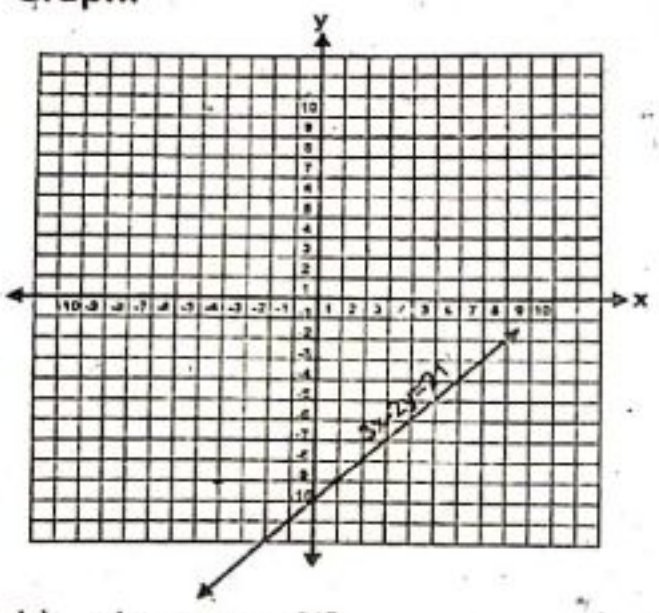
Put x = −1

$\Rightarrow 2y = 3(-1) - 21 = -3 - 21$

$\Rightarrow 2y = -24 \quad \Rightarrow y = -12$

x	−1	1
y	−12	−9

Graph:



h) $4x + y = 29$

Sol.

$\Rightarrow y = 29 - 4x$

Put x = 4

$\Rightarrow y = 29 - 4(4) = 29 - 16$

$\Rightarrow y = 13$

Put x = 5

$\Rightarrow y = 29 - 4(5) = 29 - 20$

$\Rightarrow y = 9$

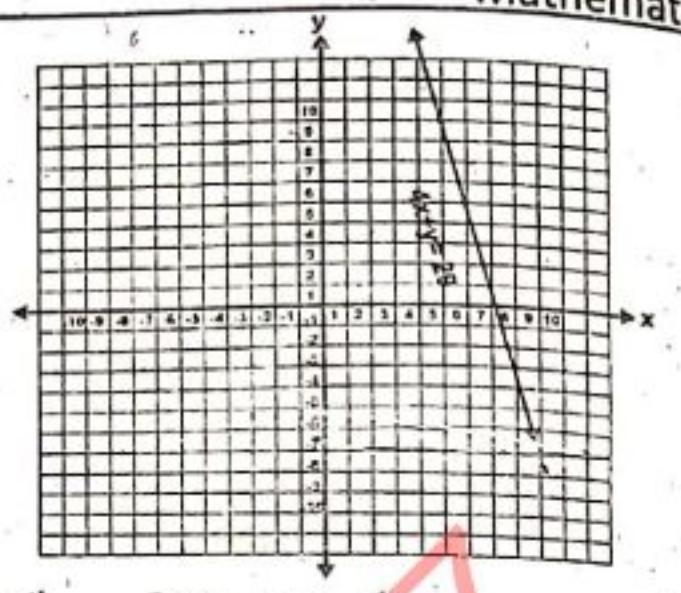
Put x = 6

$\Rightarrow y = 29 - 4(6) = 29 - 24$

$\Rightarrow y = 5$

x	4	5	6
y	13	9	5

Graph:



i) $-2x + y = -1$

Sol. $-2x + y = -1$

$\Rightarrow y = 2x - 1$

Put x = 0

$\Rightarrow y = 2(0) - 1 = 0 - 1$

$\Rightarrow y = -1$

Put x = 1

$\Rightarrow y = 2(1) - 1 = 2 - 1$

$\Rightarrow y = 1$

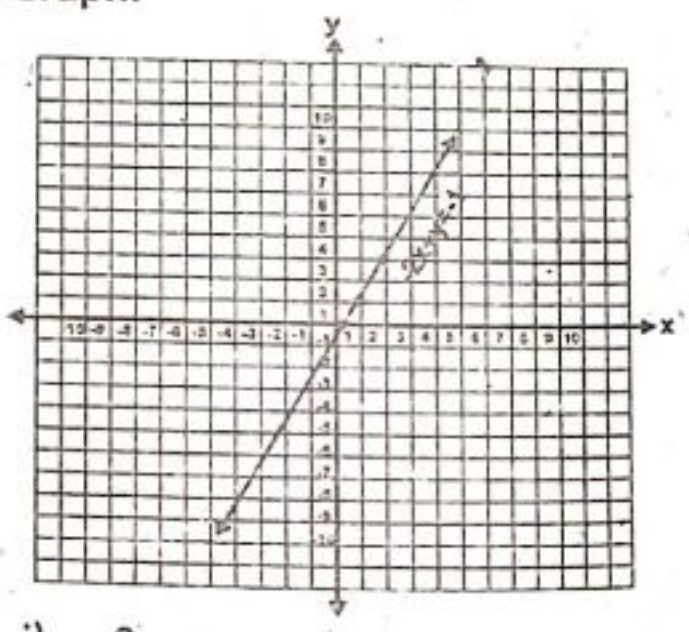
Put x = 2

$\Rightarrow y = 2(2) - 1 = 4 - 1$

$\Rightarrow y = 3$

x	0	1	2
y	−1	1	3

Graph:



j) $3x + y = 4$

Sol. $3x + y = 4$

$\Rightarrow y = 4 - 3x$

Put x = 0

$\Rightarrow y = 4 - 3(0) = 4 - 0$

$\Rightarrow y = 4$

Put x = 1

$\Rightarrow y = 4 - 3(1) = 4 - 3$

$\Rightarrow y = 1$

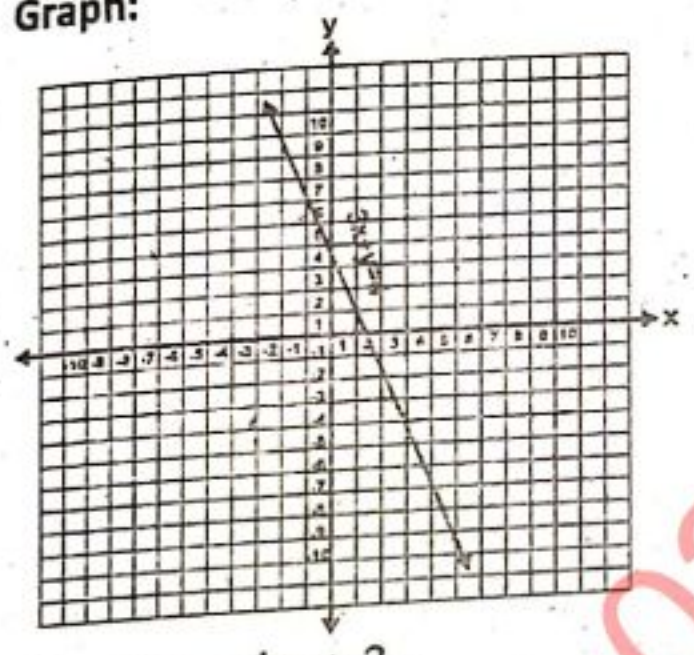
Put x = 2

$\Rightarrow y = 4 - 3(2) = 4 - 6$

$\Rightarrow y = -2$

x	0	1	2
y	4	1	−2

Graph:



k) $y = -4x + 3$

Sol. $y = -4x + 3$

Put x = 0

$\Rightarrow y = -4(0) + 3 = 0 + 3$

$\Rightarrow y = 3$

Put x = 1

$\Rightarrow y = -4(1) + 3 = -4 + 3$

$\Rightarrow y = -1$

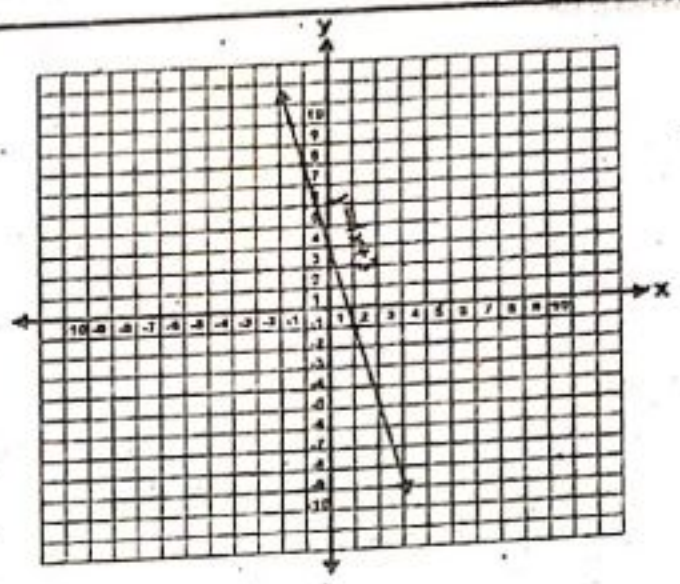
Put x = −1

$\Rightarrow y = -4(-1) + 3 = 4 + 3$

$\Rightarrow y = 7$

x	−1	0	1
y	7	3	−1

Graph:



l) $y - 2 = x$

Sol. $y - 2 = x$

$\Rightarrow y = x + 2$

Put x = 0

$\Rightarrow y = 0 + 2 \quad \Rightarrow y = 2$

Put x = 1

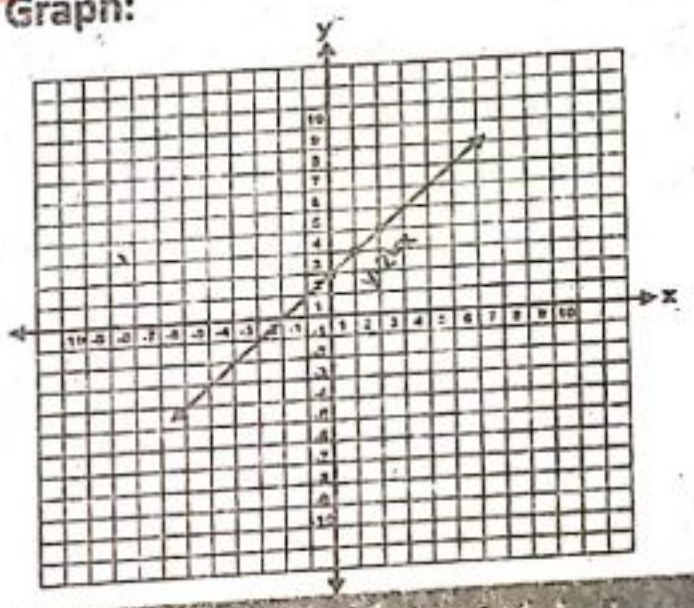
$\Rightarrow y = 1 + 2 \quad \Rightarrow y = 3$

Put x = 2

$\Rightarrow y = 2 + 2 \quad \Rightarrow y = 4$

x	0	1	2
y	2	3	4

Graph:



Review Exercise 6.1

Q1. Encircle the correct option.

a) If $\frac{4x}{6} = 2$, x= ____

i. 2
ii. 3
iii. 4
iv. 6

b) Which of these is not a linear equation?

i. $8x-5=60$

ii. $3x+5y^3=12$

iii. $\frac{3}{4}+x=0$

iv. $\frac{3}{2x}-\frac{1}{x}=\frac{3}{5}$

c) The solution of 8x + 5 = 3x + 4 is

i. $\frac{-1}{6}$

ii. $\frac{-1}{5}$

iii. -6

iv. -5

d) The solution of 0.4x + 0.1 = 0.2x + 0.3 is ____

i. 0

ii. 1

iii. 0.2

iv. 1.2

e) A linear equation in two variables x and y is an equation that can be written in the form of:

i. ax + b = 0

ii. $ax^2+by=0$

iii. ax + by = c

iv. $a+by=c$

f) Which of these is a linear equation in two variables?

i. $2x+3=0$

ii. 3x - y = 6

iii. $4x^2-7y=2$

iv. $x-3=8$

g) The solution of 2x + 3 = 0 is ____

i. 5

ii. −3

iii. $\frac{-3}{2}$

iv. $\frac{-2}{3}$

h) Which of these is a possible solution for 2x − y = − 1?

i. $x=-1, y=3$

ii. $x=-1, y=1$

iii. $x=2, y=3$

iv. x = -2, y = -3

i) The ordered pair (4, -2) lies in:

i. Quadrant I

ii. Quadrant II

iii. Quadrant III

iv. Quadrant IV

j) Which of these does not lie in 3rd quadrant?

i. $(-2,-1)$

ii. $(-3,-1)$

iii. (-1,-2)

iv. $(-3,-2)$

Q2. Write 3 linear equations in one variable.

Sol. 3 linear equations in one variable:

1. $8x-5=60$
2. $\frac{3}{4}+x=0$
3. $x-3=8$

Q3. Write the standard form of the equation of a:

a) Horizontal line

Sol. Standard form:

$y=c$

b) Vertical line

Sol. Standard form:

$x=c$

Q4. Solve the following linear equations. Also verify the solution.

a) $\frac{3(0.2x+3)}{4(5.2x-3)}=\frac{-7}{2}$

Sol. $\frac{3(0.2x+3)}{4(5.2x-3)}=\frac{-7}{2}$

$\Rightarrow \frac{(0.6x+9)}{(20.8x-12)}=\frac{-7}{2}$

By cross multiply

$\Rightarrow 2(0.6x+9)=-7(20.8x-12)$

$\Rightarrow 1.2x+18=-145.6x+84$

$\Rightarrow 1.2x+145.6x=84-18$

$\Rightarrow 146.8x=66$

Divide both sides by 146.8

$\Rightarrow \frac{146.8x}{146.8}=\frac{66}{146.8}$

$\Rightarrow x=0.45$

Verification: $\frac{3(0.2x+3)}{4(5.2x-3)}=\frac{-7}{2}$

Put $x=0.45$

$\Rightarrow \frac{3(0.2(0.45)+3)}{4(5.2(0.45)-3)}=\frac{-7}{2}$

$\Rightarrow \frac{3(0.09+3)}{4(2.34-3)}=\frac{-7}{2}$

$\Rightarrow \frac{3(3.09)}{4(-0.66)}=\frac{-7}{2}$

$\Rightarrow \frac{9.27}{-2.64}=\frac{-7}{2}$

$\Rightarrow -3.5=-3.5$ Verified.

Thus the solution is $x=0.45$

b) $\frac{(9x-3)}{3}=\frac{(4x-3)}{7}$

Sol. $\frac{(9x-3)}{3}=\frac{(4x-3)}{7}$

By cross multiplication

$\Rightarrow 7(9x-3)=3(4x-3)$

$\Rightarrow 63x-21=12x-9$

$\Rightarrow 63x-12x=-9+21$

$\Rightarrow 51x=12$

Divide both sides by 51

$\Rightarrow \frac{51x}{51}=\frac{12}{51}$

$\Rightarrow x=\frac{4}{17}$

Verification: $\frac{(9x-3)}{3}=\frac{(4x-3)}{7}$

Put $x=\frac{4}{17}$

$\Rightarrow \frac{\left(9\left(\frac{4}{17}\right)-3\right)}{3}=\frac{\left(4\left(\frac{4}{17}\right)-3\right)}{7}$

$\Rightarrow \frac{\left(\frac{36}{17}-\frac{3}{1}\right)}{3}=\frac{\left(\frac{16}{17}-\frac{3}{1}\right)}{7}$

$\Rightarrow \frac{\left(\frac{36-51}{17}\right)}{3}=\frac{\left(\frac{16-51}{17}\right)}{7}$

$\Rightarrow \frac{\left(\frac{-15}{17}\right)}{3}=\frac{\left(\frac{-35}{17}\right)}{7}$

$\Rightarrow \left(\frac{-15}{17}\right)\div 3=\left(\frac{-35}{17}\right)\div 7$

$\Rightarrow \frac{-15}{17}\times\frac{1}{3}=\frac{-35}{17}\times\frac{1}{7}$

$\Rightarrow \frac{\cancel{-15}^{5}}{17}\times\frac{1}{\cancel{3}}=\frac{\cancel{-35}^{5}}{17}\times\frac{1}{\cancel{7}}$

$\Rightarrow \frac{-5}{17}=\frac{-5}{17}$ Verified.

Thus the solution is $x = \frac{4}{17}$

c) $\frac{7(8x-1)}{12(x-2)} = \frac{8}{9}$

Sol. $\frac{7(8x-1)}{12(x-2)} = \frac{8}{9}$

$\Rightarrow \frac{56x-7}{12x-24} = \frac{8}{9}$

By cross multiply

$\Rightarrow 9(56x-7) = 8(12x-24)$

$\Rightarrow 504x-63 = 96x-192$

$\Rightarrow 504x-96x = -192+63$

$\Rightarrow 408x = -129$

Divide both sides by 408

$\Rightarrow \frac{408x}{408} = \frac{-129}{408}$

$\Rightarrow x = \frac{-43}{136}$

Verification:

$\frac{7(8x-1)}{12(x-2)} = \frac{8}{9}$ Put $x = \frac{-43}{136}$

$\Rightarrow \frac{7\left(8\left(\frac{-43}{136}\right)-1\right)}{12\left(\left(\frac{-43}{136}\right)-2\right)} = \frac{8}{9}$

$\Rightarrow \frac{7\left(\frac{-344}{136}-1\right)}{12\left(\frac{-43}{136}-2\right)} = \frac{8}{9}$

$\Rightarrow \frac{7\left(\frac{-344-136}{136}\right)}{12\left(\frac{-43-272}{136}\right)} = \frac{8}{9}$

$\Rightarrow \frac{7\left(\frac{-480}{136}\right)}{12\left(\frac{-315}{136}\right)} = \frac{8}{9}$

$\Rightarrow \frac{\left(\frac{-3360}{136}\right)}{\left(\frac{-3780}{136}\right)} = \frac{8}{9}$

$\Rightarrow \frac{-3360}{136} \times \frac{136}{-3780} = \frac{8}{9}$

$\Rightarrow \frac{3360}{3780} = \frac{8}{9}$

$\Rightarrow \frac{3360 \div 420}{3780 \div 420} = \frac{8}{9}$

$\Rightarrow \frac{8}{9} = \frac{8}{9}$ **Verified.**

Thus the solution is $x = \frac{-43}{136}$

Q5. The sum of 5 consecutive odd numbers is 625. Find the numbers.

Sol. Let the consecutive odd numbers be 'x , x+1, x+2, x+3 and x+4'

According to question

x+x+1+x+2+x+3+x+4 = 625

$\Rightarrow$5x + 10 = 625

$\Rightarrow$5x + 10 – 10 = 625 – 10

$\Rightarrow$ 5x = 615

Divide both sides by 5

$\Rightarrow \frac{5x}{5} = \frac{615}{5} \quad \Rightarrow x = 123$

The required 5 consecutive numbers are:

1st number x = 123

2nd number x+1 = 123 +1 = 124

3rd number x+2 = 123+2 = 125

4th number x+3 = 123 + 3 = 126

5th number x+4 = 123 + 4 = 127

Q6. The price of a printer is $\frac{1}{8}$ the price of a photocopy machine. If the price of 3 photocopy machines and 7 printers is Rs.77,025, find the price of a printer and a photocopy machine.

Sol. Let the price of photocopy machine = x

Then price of printer = $\frac{1}{8}x$

The price of 3 photocopy machines and 7 printers is Rs.77,025

$$\Rightarrow 3x+7\left(\frac{1}{8}x\right)=77,025$$

$$\Rightarrow 3x+\frac{7x}{8}=77,025$$

$$\Rightarrow \frac{24x+7x}{8}=77,025$$

$$\Rightarrow \frac{31x}{8}=77,025$$

Multiply both sides by $\frac{8}{31}$

$$\Rightarrow \frac{31x}{8}\times\frac{8}{31}=77,025\times\frac{8}{31}$$

$$\Rightarrow x=\frac{616200}{31}=19877$$

Thus price of photocopy machine is Rs.19,877

Price of printer = $\frac{1}{8}(19,877)$ Price of printer = Rs.2,484

Q7. The perimeter of a rectangular garden is 190 metre. Its length is 5 less than three times its width. Find the length and width of the garden.

Sol. Perimeter of rectangular garden = 190 m

Let width of rectangular garden be 'x'

Then length = 3x – 5

Using formula:

Perimeter = 2 (l + w)

190 = 2 (3x – 5 + x)

190 = 2 (4x – 5)

190 = 8x – 10

190 + 10 = 8x

200 = 8x

Divide both sides by 8

$$\Rightarrow \frac{8x}{8}=\frac{200}{8}$$

$$\Rightarrow x=25$$

Width = 25 m

Length = 3x – 5 = 3(25) – 5

Length = 75 – 5 = 70 m

Q8. In an isosceles triangle, the 2nd angle is 20 more than half of one of the base angles. Find the measure of its three angles.

Sol. Sum of angles of any triangle = 180

Let the base angle = x

Then 2nd angle = $\frac{x}{2}+20$

According to question:

$$x+x+\frac{x}{2}+20=180^0$$

$$\Rightarrow 2x+\frac{x}{2}+20=180$$

$$\Rightarrow \frac{2x}{1}+\frac{x}{2}=180-20$$

$$\Rightarrow \frac{4x+x}{2}=160$$

$$\Rightarrow \frac{5x}{2}\times 2=160\times 2$$

$$\Rightarrow 5x=320$$ Divide by 5

$$\Rightarrow \frac{5x}{5}=\frac{320}{5}$$

$$\Rightarrow x=64^0$$

$$2^{nd}\text{ angle} = \frac{x}{2}+20=\frac{64}{2}+20$$

2^{nd} angle = 32 + 20 = 52

Thus the required three angles of isosceles triangle are: 64^0, 64^0 52^0.

Q9. Construct a linear equation in two variables for the following.

a) 2 subtracted from 4 times a number is equal to 4 times another number.

Sol. Let the required numbers be 'x' and 'y'

4x – 2 = 4y Ans.

b) 8 added to twice a number equal thrice another number.

Sol. Let the required numbers be 'x' and 'y'

2x + 8 = 3y Ans.

c) A number decreased by 3 equal 4 times another number.

Sol. Let the required numbers be 'x' and 'y'

x – 3 = 4y Ans.

d) 2 decreased by a number equal another number.

Sol. Let the required numbers be 'x' and 'y'

x – 2 = y Ans.

Q10. The mass of 3 rice bags and 5 sugar bags is 65 kg. Construct a linear equation in two variable for this situation.

Sol. Let the price of a rice bag = x

Then the price of sugar = y

Equation:

3x + 5y = 65

Q11. The price of 10 cakes and 4 sandwiches is Rs.6800. Construct a linear equation in two variables for this situation.

Sol. Let the price of a cake = x

Then the price of a sandwich = y

Equation:

10x + 4y = 6800

Q12. Solve the following linear equation and find at least 5 solutions for each which satisfy the equation. Also plot the graphs for each of these.

a) $x - y = 4$

Sol. $x - y = 4$

$\Rightarrow x = y + 4$

Put y = 0

$\Rightarrow x = 0 + 4 \quad \Rightarrow x = 4$

Put y = 1

$\Rightarrow x = 1 + 4 \quad \Rightarrow x = 5$

Put y = 2

$\Rightarrow x = 2 + 4 \quad \Rightarrow x = 6$

Put y = 3

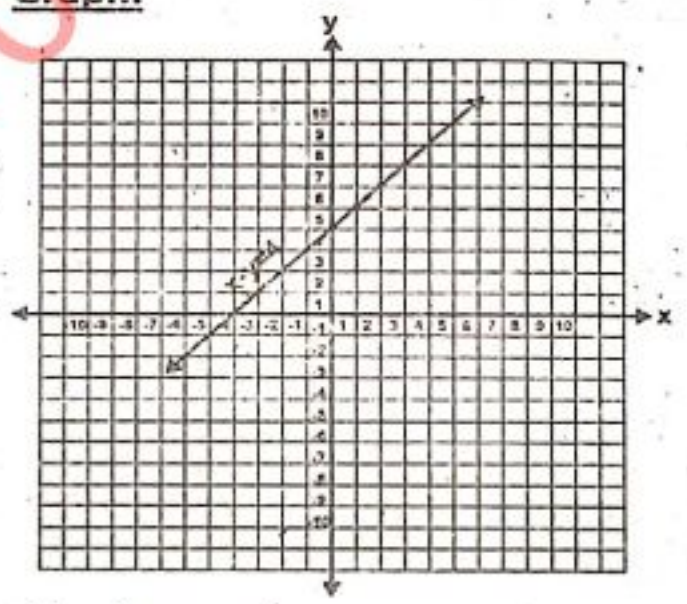
$\Rightarrow x = 3 + 4 \quad \Rightarrow x = 7$

Put y = 4

$\Rightarrow x = 4 + 4 \quad \Rightarrow x = 8$

x	0	1	2	3	4
y	4	5	6	7	8

Graph:



b) $2x - y = 1$

Sol. $2x - y = 1$

$\Rightarrow -y = 1 - 2x$

$\Rightarrow y = 2x - 1$

Put x = 0

$\Rightarrow y = 2(0) - 1 = 0 - 1$

$\Rightarrow y = -1$

Put x = 1

$\Rightarrow y=2(1)-1=2-1$

$\Rightarrow y=1$

Put x = 2

$\Rightarrow y=2(2)-1=4-1$

$\Rightarrow y=3$

Put x = 3

$\Rightarrow y=2(3)-1=6-1$

$\Rightarrow y=5$

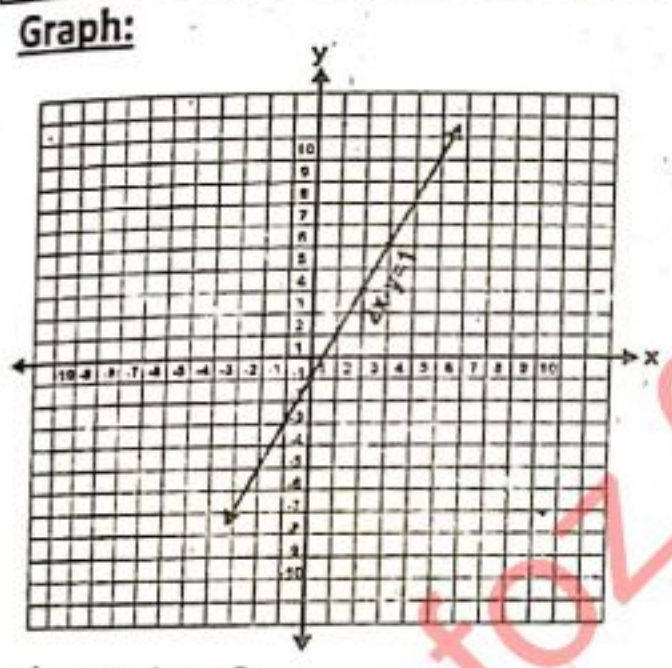
Put x = 4

$\Rightarrow y=2(4)-1=8-1$

$\Rightarrow y=7$

x	0	1	2	3	4
y	−1	1	3	5	7

Graph:



c) $x+2y=3$

Sol. $x+2y=3$

$\Rightarrow x=3-2y$

Put y = 0

$\Rightarrow x=3-2(0)=3-0$

$\Rightarrow x=3$

Put y = 1

$\Rightarrow x=3-2(1)=3-2$

$\Rightarrow x=1$

Put y = 2

$\Rightarrow x=3-2(2)=3-4$

$\Rightarrow x=-1$

Put y = 3

$\Rightarrow x=3-2(3)=3-6$

$\Rightarrow x=-3$

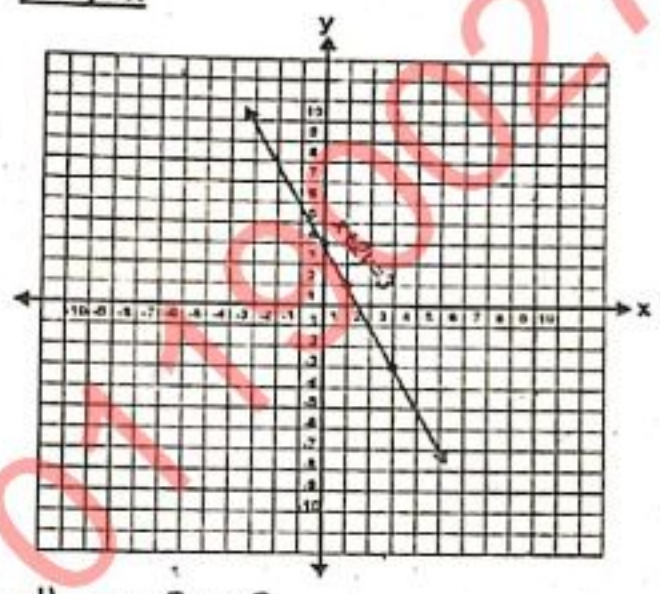
Put y = 4

$\Rightarrow x=3-2(4)=3-8$

$\Rightarrow x=-5$

x	0	1	2	3	4
y	3	1	−1	−3	−5

Graph:



d) $x-2y=2$

Sol. $x-2y=2$

$\Rightarrow x=2+2y$

Put y = 0

$\therefore x=2+2(0)=2+0$

$\Rightarrow x=2$

Put y = 1

$\Rightarrow x=2+2(1)=2+2$

$\Rightarrow x=4$

Put y = 2

$\Rightarrow x=2+2(2)=2+4$

$\Rightarrow x=6$

Put y = 3

$\Rightarrow x=2+2(3)=2+6$

$\Rightarrow x=8$

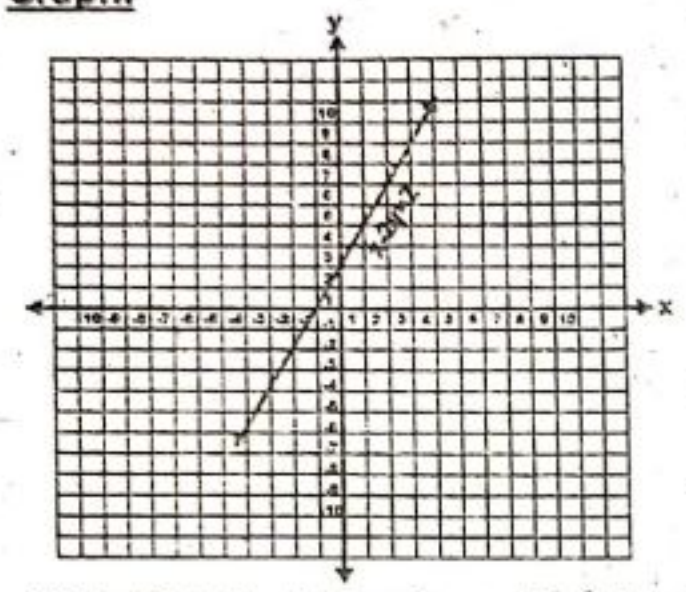
Put y = 4

$\Rightarrow x = 2+2(4) = 2+8$

$\Rightarrow x = 10$

x	0	1	2	3	4
y	2	4	6	8	10

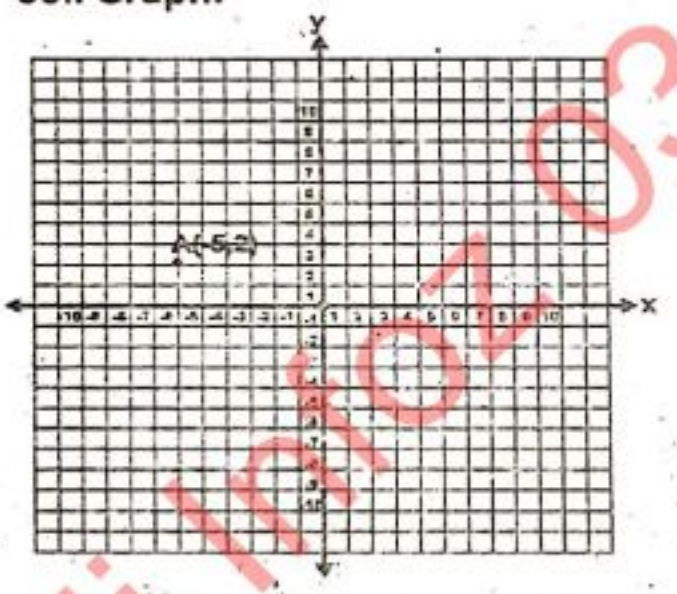
Graph:



Q13. Plot the following ordered pairs in the coordinate plane.

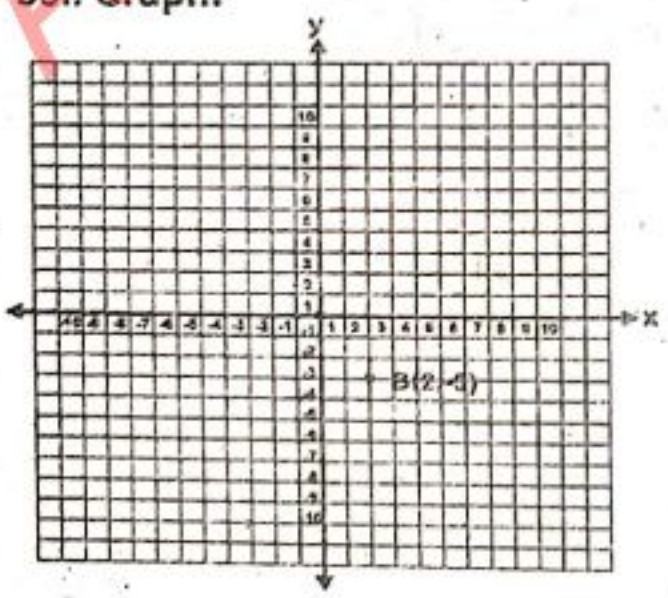
a) $A(-5,2)$

Sol. Graph:



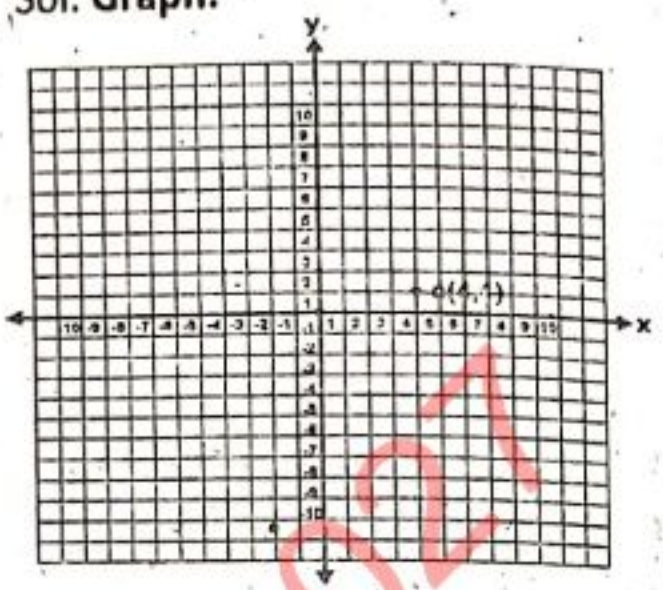
b) $B(2,-3)$

Sol. Graph:



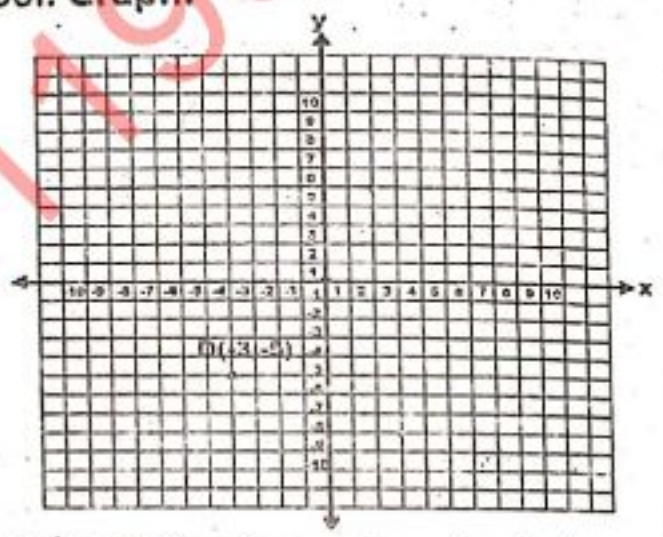
c) $C(4,1)$

Sol. Graph:

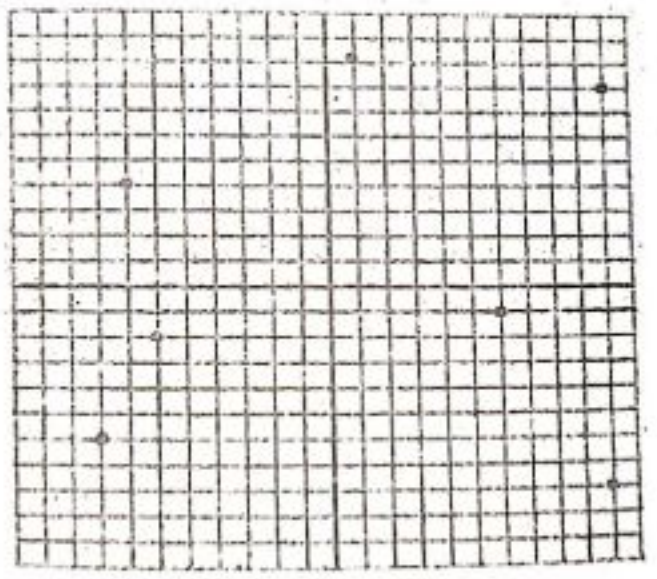


d) $D(-3,-5)$

Sol. Graph:



Q14. Write the ordered pair for each point.



Sol: 1st Quadrant: $A(10,8)$ and $B(1,9)$

2nd Quadrant: $C(-7,4)$

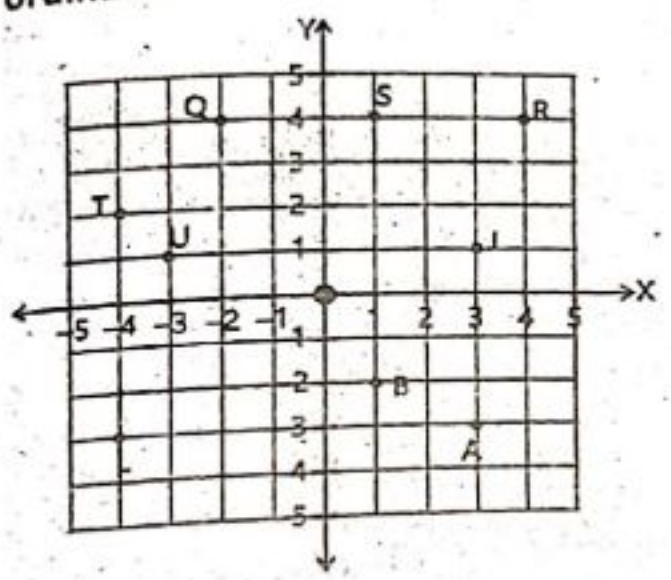
3rd Quadrant: $D(-6,-2)$ and

$E(-8,-6)$

4th Quadrant: $F(6,-1)$ and

$G(10,-8)$

Q15. Find the ordered pairs(s) with x-ordinate as 5.



Sol. 1st Quadrant: $S(1,4)$, $R(4,4)$ and $J(3,1)$

2nd Quadrant:

$Q(-2,4), T(-4,2)$ *and* $U(-3,1)$

3rd Quadrant: $L(-4,-3)$

4th Quadrant: $A(3,-3)$ and

$B(1,-2)$

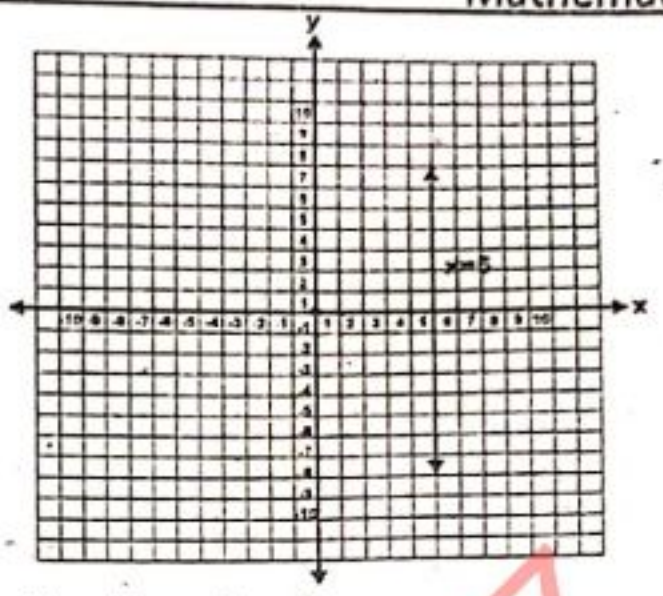
Q16. Plot the graphs for the following linear equations in one variable.

a) $x-5=0$

Sol. $x-5=0$

$\Rightarrow x=5$

Graph:

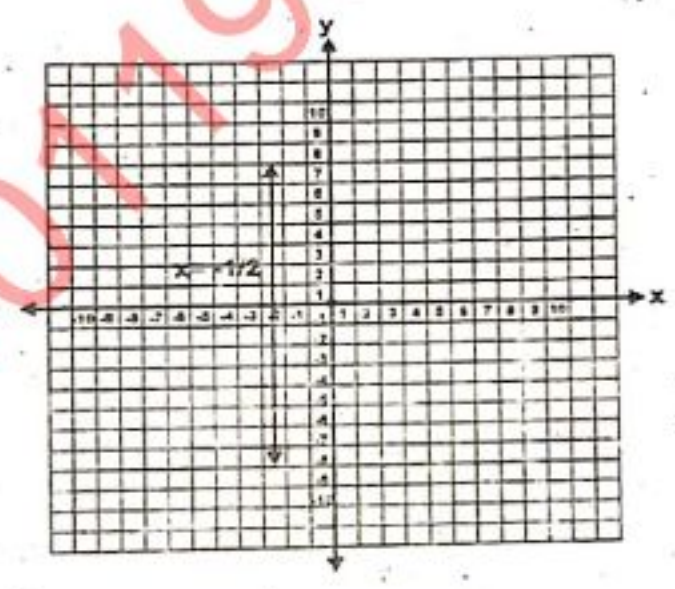


b) $2x+1=0$

Sol. $2x+1=0$

$\Rightarrow 2x=-1 \quad \Rightarrow x=\frac{-1}{2}$

Graph:

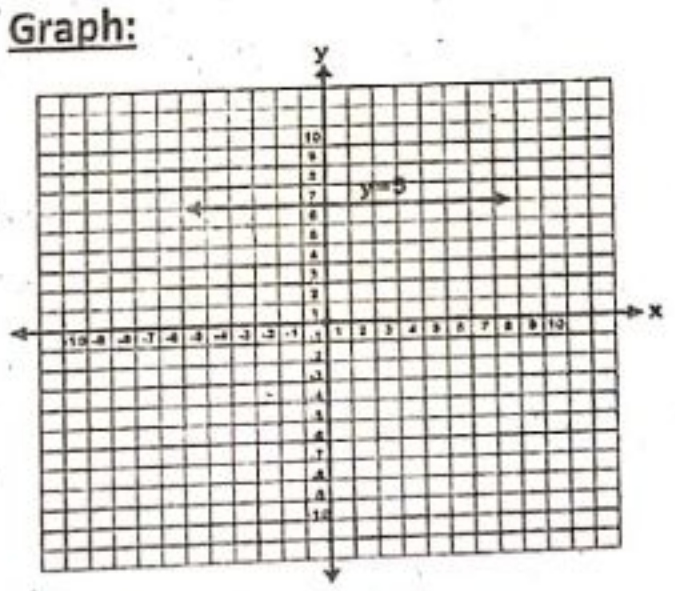


c) $y-5=0$

Sol. $y-5=0$

$\Rightarrow y=5$

Graph:

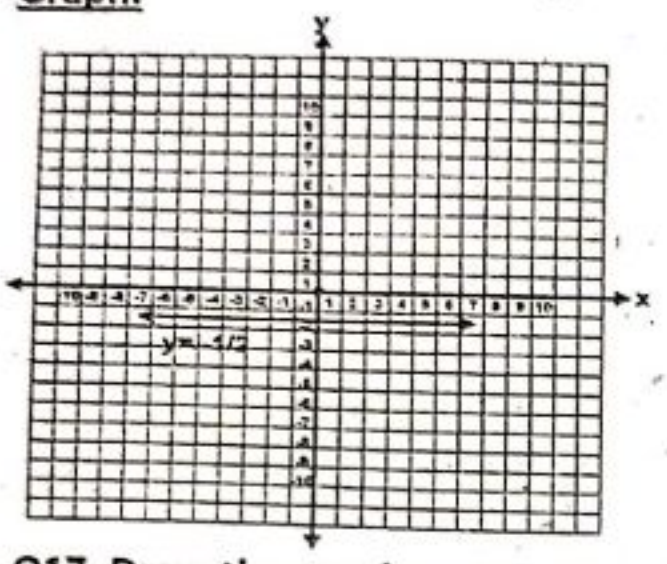


d) $2y+1=0$

Sol. $2y+1=0$

$\Rightarrow 2y = -1 \qquad \Rightarrow y = \frac{-1}{2}$

Graph:

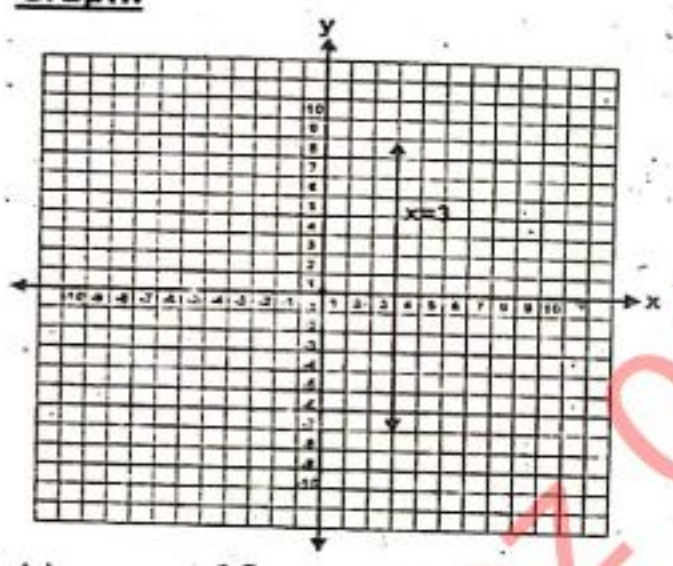


Q17. Draw the graphs of the following equations.

a) $x = 3$

Sol. $x = 3$

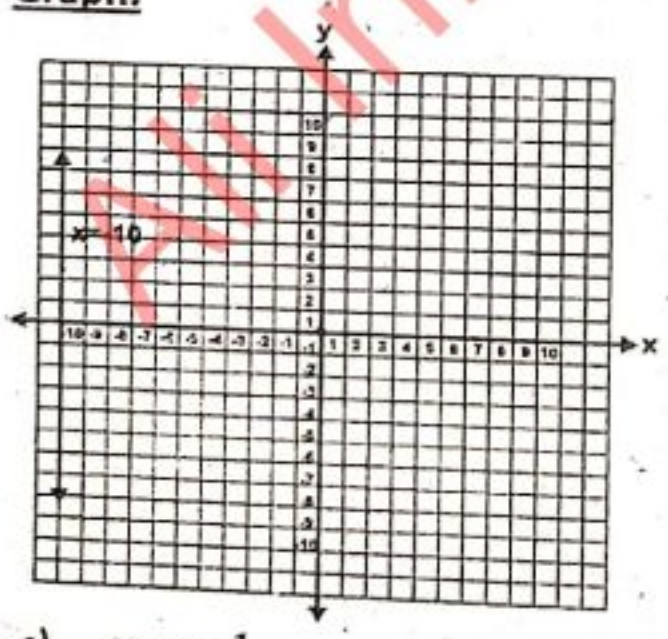
Graph:



b) $x = -10$

Sol. $x = -10$

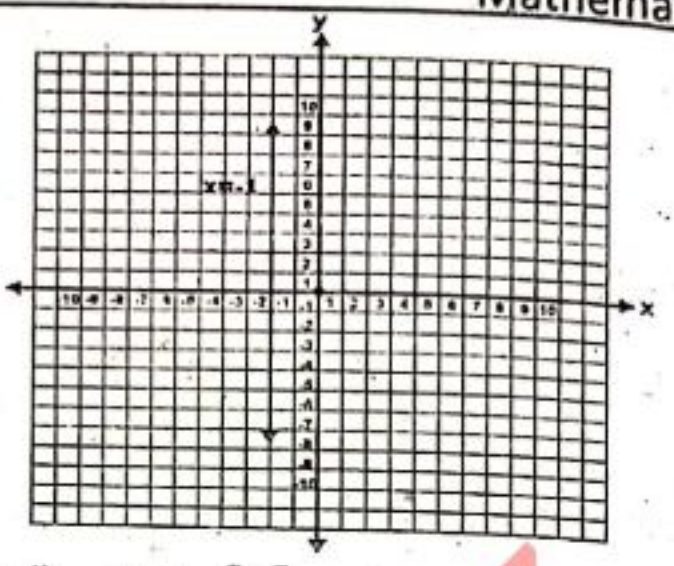
Graph:



c) $x = -1$

Sol. $x = -1$

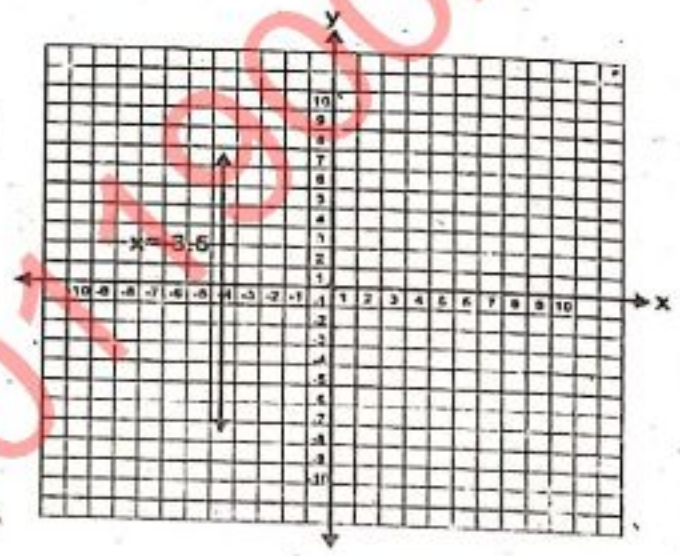
Graph:



d) $x = -3.5$

Sol. $x = -3.5$

Graph:

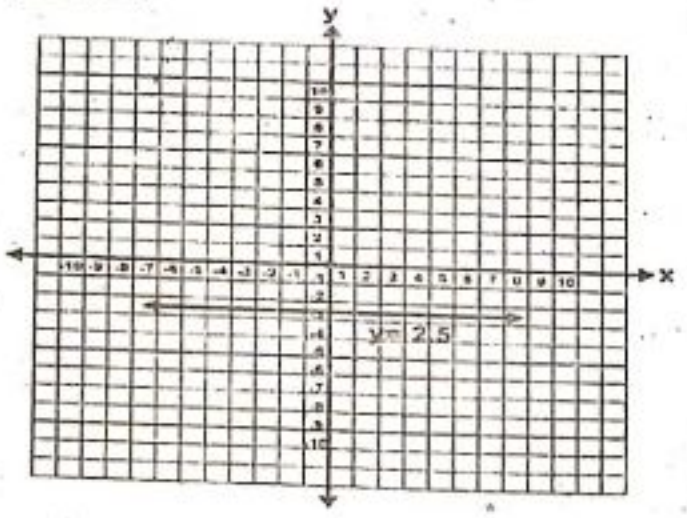


Q18. Draw the graphs of the following equations.

a) $y = -2.5$

Sol. $y = -2.5$

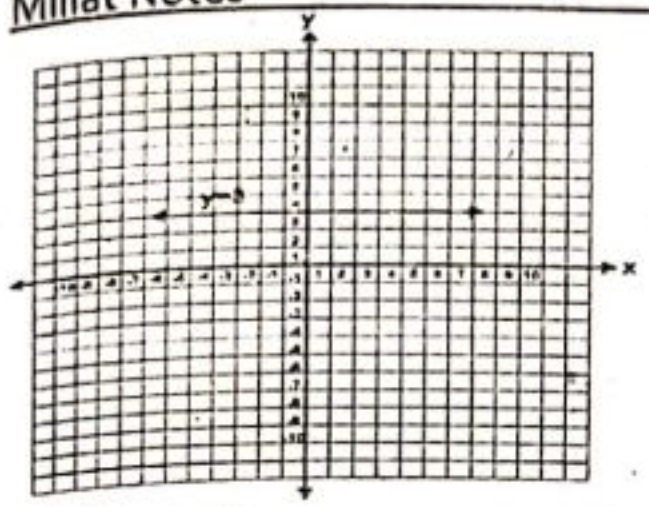
Graph:



b) $y = 3$

Sol. $y = 3$

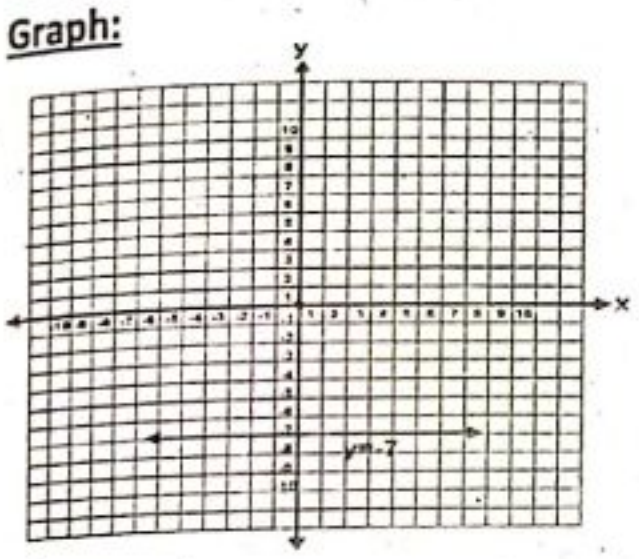
Graph:



c) $y = -7$

Sol. $y = -7$

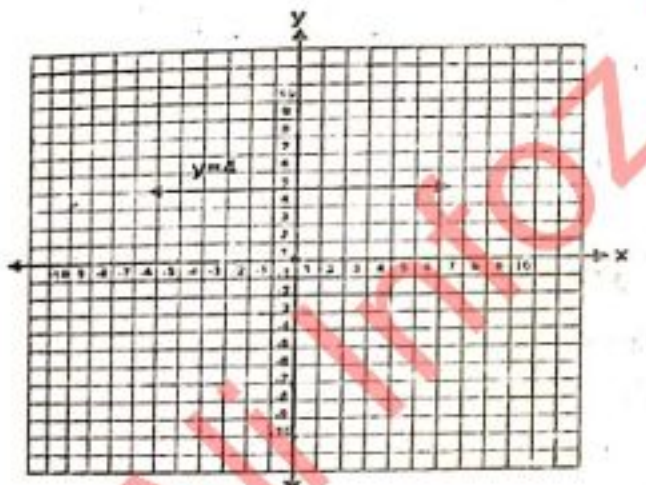
Graph:



d) $y = 4$

Sol. $y = 4$

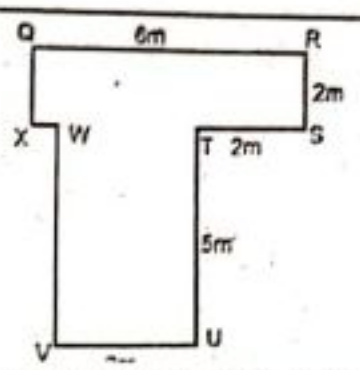
Graph:



Unit – 9
Surface Area and Volume
Exercise – 9.1

Q1. Find the perimeter and area of these composite shapes.

a)



Sol. Perimeter of the given figure:

Perimeter = QR + RS + ST + TU + UV + VW + WX + XQ

XQ = RS = 2 m

VW = TU = 5m

WX = QR – ST – UV

WX = 6m – 2m – 3m = 1 m

Perimeter = 6m + 2m + 2m + 5m + 3m + 5m + 1m + 2m

Perimeter = 26m Ans.

Area of the shape:

Area of rectangle QRSX:

Length = 6m

Width = 2 m

Area = length × width

Area = 6m × 2m = 12 m^2

Area of rectangle TUVW:

Length = 5m

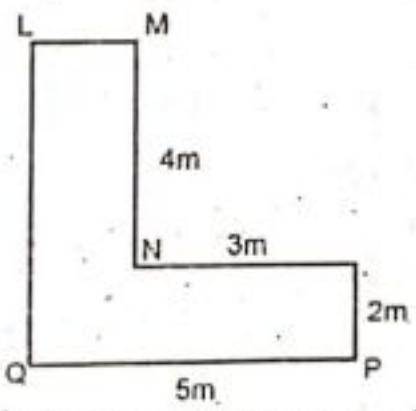
Width = 3m

Area = length × width

Area = 5m × 3m = 15 m^2

Area of the whole region = 12 m^2 + 15 m^2 = 27m^2 **Ans.**

b)



Sol. Perimeter of the given figure:

Perimeter = LM + MN + NO + OP + PQ + QL

LM = PQ – NO = 5m – 3m

LM = 2m

LQ = MN + OP = 4m + 2m

LQ = 6m

Perimeter = 2m + 4m + 3m + 2m + 5m + 6m

Perimeter = 22m **Ans.**

Area of the shape:

Area of rectangle A:

Length = 4 m

Width = 2 m

Area = length × width

Area = 4 m × 2 m = 8 m^2

Area of rectangle B:

Length = 5 m

Width = 2 m

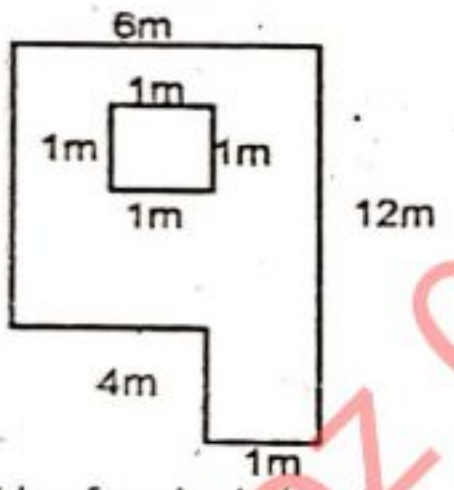
Area = length × width

Area = 5 m × 2 m = 10 m^2

Area of the whole region = 10 m^2 + 8 m^2 = 18m^2 **Ans.**

Q2. Find the perimeter and area of the shaded region.

a)



Sol. Side of unshaded region = 1 m

Area of unshaded region = 1 m^2

Shaded region is equal to rectangle A + rectangle B

Length of rectangle A = 8 m

Width of rectangle A = 6 m

Area of rectangle A = 48 m^2

Length of rectangle B = 4 m

Width of rectangle B = 1 m

Area of rectangle B = 4 m^2

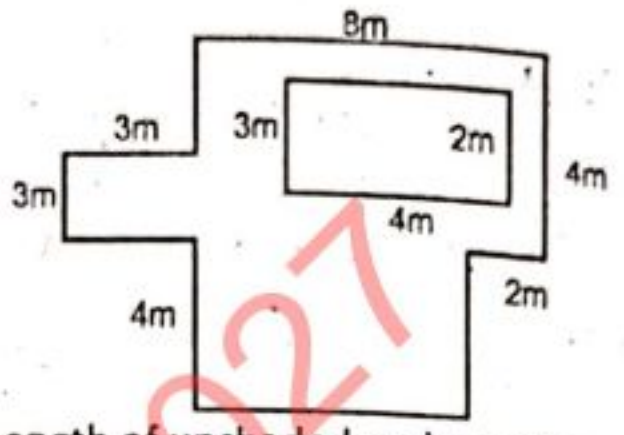
Area of the whole region = Area of rectangle A + rectangle B = 48 m^2 + 4 m^2 = 52 m^2

Now,

Area of shaded region = Area of the whole region – area of unshaded region

Area of shaded region = 52 m^2 – 1 m^2 = 51 m^2 **Ans.**

b)



Sol. Length of unshaded region = 4 m

Width of unshaded region = 2 m

Area of unshaded region = 4m×2m = 8m^2

Area of rectangle A:

Length = 3 m

Width = 3m

Area of rectangle A = length × width = 3m × 3m

Area of rectangle A = 9m^2

Area of rectangle B:

Length = 10 m

Width = 6 m

Area of rectangle B = length × width = 10 m × 6 m

area of rectangle B = 60 m^2

Area of rectangle C:

Length = 4 m

Width = 2 m

Area of rectangle C = length × width = 4 m × 2 m

Area of rectangle C = 8 m^2

Area of the whole figure = area of rectangle A + area of rectangle B + area of rectangle C

Area of the whole figure = 9m^2 + 60m^2 + 8m^2 = 77m^2

Now

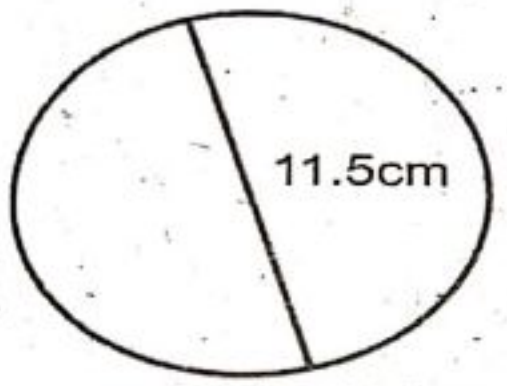
Area of the shaded region = area of the whole figure – area of unshaded region

Area of the shaded region = $77m^2 - 8m^2 = 69\ m^2$ Ans.

Exercise – 9.2

Q1. Find the circumference of each of the following circles is $\pi = 3.14$

a)



Sol. Diameter of circle = 11.5 cm
Circumference of the circle=?
Using formula:

$$C = \pi d$$

By putting values

$$C = 3.14(11.5\text{cm})$$

$$C = 36.11cm \text{ Ans.}$$

b)

Sol. Diameter of circle = 2 cm
Circumference of the circle=?
Using formula:

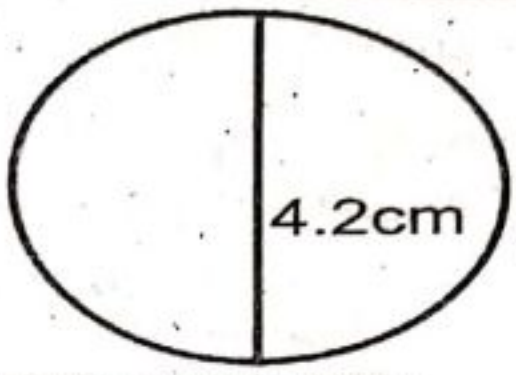
$$C = \pi d$$

By putting values

$$C = 3.14(2\text{cm})$$

$$C = 6.28cm \text{ Ans.}$$

c)



Sol. Diameter of circle=4.2cm
Circumference of the circle=?
Using formula:

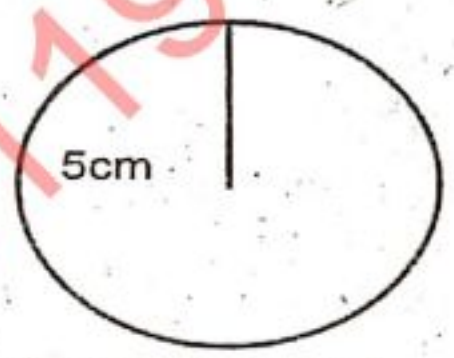
$$C = \pi d$$

By putting values

$$C = 3.14(4.2\text{cm})$$

$$C = 13.188cm \text{ Ans.}$$

d)



Sol. Radius of circle = 5 cm
Circumference of the circle=?
Using formula:

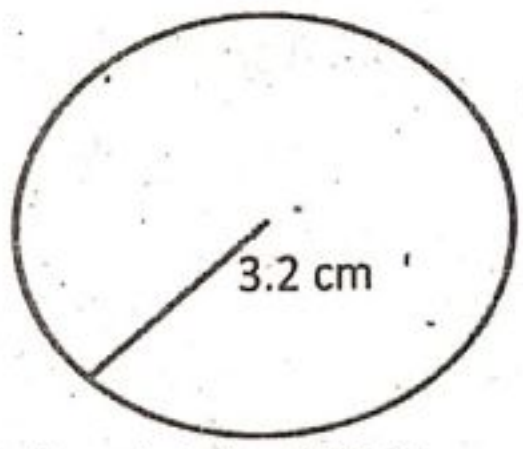
$$C = 2\pi r$$

By putting values

$$C = 2(3.14)5cm$$

$$C = 31.4cm \text{ Ans.}$$

e)



Sol. Radius of circle = 3.2 cm
Circumference of the circle=?
Using formula:

$$C = 2\pi r$$

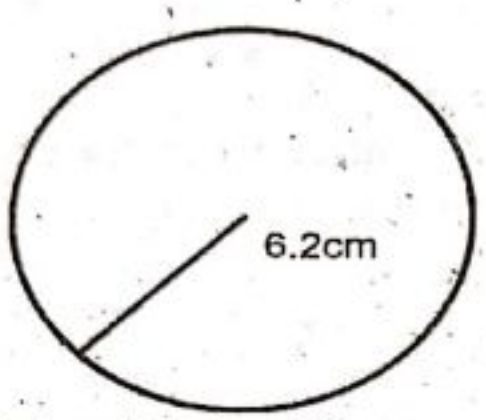
By putting values

$C = 2(3.14)(3.2cm)$

$C = 6.28(3.2cm)$

$C = 20.096cm$ **Ans.**

f)



Sol. Radius of circle = 6.2 mm
Circumference of the circle=?
Using formula:

$C = 2\pi r$

By putting values

$C = 2(3.14)(6.2mm)$

$C = 6.28(6.2mm)$

$C = 38.936\,mm$ **Ans.**

Q2. Find the circumference of the circles having these radii.

a) 0.5 cm

Sol. r = 0.5 cm
Circumference =?
Using formula:

$C = 2\pi r$

By putting values

$C = 2(3.14)(0.5cm)$

$C = 6.28(0.5cm)$

$C = 3.14\,cm$ **Ans.**

b) 4 cm

Sol. r = 4 cm
Circumference =?
Using formula:

$C = 2\pi r$

By putting values

$C = 2(3.14)(4cm)$

$C = 6.28(4cm)$

$C = 25.12\,cm$ **Ans.**

c) 7.2 m

Sol. r = 7.2 m
Circumference =?
Using formula:

$C = 2\pi r$

By putting values

$C = 2(3.14)(7.2m)$

$C = 6.28(7.2m)$

$C = 45.216\,m$ **Ans.**

d) 9.6 cm

Sol. r = 9.6 cm
Circumference =?
Using formula:

$C = 2\pi r$

By putting values

$C = 2(3.14)(9.6cm)$

$C = 6.28(9.6cm)$

$C = 60.288\,cm$ **Ans.**

e) 10.5 cm

Sol. r = 10.5 cm
Circumference =?
Using formula:

$C = 2\pi r$

By putting values

$C = 2(3.14)(10.5cm)$

$C = 6.28(10.5cm)$

$C = 65.94\,cm$ **Ans.**

f) 100.5 cm

Sol. r = 100.5 cm
Circumference =?
Using formula:

$C = 2\pi r$

By putting values

$$C = 2(3.14)(100.5cm)$$

$$C = 6.28(100.5cm)$$

$$C = 631.14\,cm \text{ Ans.}$$

Q3. Find the circumference of the circles having these diameters.

a) 6.8 cm

Sol. Diameter = 6.8 cm

Circumference =?

Using formula:

$$C = \pi d$$

By putting values

$$C = (3.14)(6.8cm)$$

$$C = 21.352\,cm \text{ Ans.}$$

b) 5.5 cm

Sol. Diameter = 5.5 cm

Circumference =?

Using formula:

$$C = \pi d$$

By putting values

$$C = (3.14)(5.5cm)$$

$$C = 17.27\,cm \text{ Ans.}$$

c) 8.3 cm

Sol. Diameter = 8.3 cm

Circumference =?

Using formula:

$$C = \pi d$$

By putting values

$$C = (3.14)(8.3cm)$$

$$C = 26.062\,cm \text{ Ans.}$$

d) 11.6 cm

Sol. Diameter = 11.6 cm

Circumference =?

Using formula:

$$C = \pi d$$

By putting values

$$C = (3.14)(11.6cm)$$

$$C = 36.424\,cm \text{ Ans.}$$

e) 4.4 cm

Sol. Diameter = 4.4 cm

Circumference =?

Using formula:

$$C = \pi d$$

By putting values

$$C = (3.14)(4.4cm)$$

$$C = 13.816\,cm \text{ Ans.}$$

f) 9.5 cm

Sol. Diameter = 9.5 cm

Circumference =?

Using formula:

$$C = \pi d$$

By putting values

$$C = (3.14)(9.5cm)$$

$$C = 29.83\,cm \text{ Ans.}$$

Q4. The diameter of a circle is 12.4 cm, find its circumference.

Sol. Diameter of circle=12.4cm

Circumference of circle =?

Using formula:

$$C = \pi d$$

By putting values

$$C = (3.14)(12.4cm)$$

$$C = 38.936cm \text{ Ans.}$$

Q5. Find the radius and diameter of a circle whose circumference is 48.984 cm.

Sol. Circumference of circle =48.984 cm

Diameter =?

Radius =?

Using formula:

$C = \pi d$ Putting values

$$48.984cm = (3.14)d$$

Divide both sides by 3.14

$$\Rightarrow \frac{48.984cm}{3.14} = \frac{(3.14)d}{3.14}$$

$$\Rightarrow d = 15.6\,cm$$

As radius = $\frac{d}{2}$

Radius = $\frac{15.6}{2} = 7.8\,cm$

Q6. The radius of a circle is 6.5 cm, find the length of its diameter.

Sol. radius of circle = 6.5 cm

Diameter =?

As diameter = 2r

Diameter = 2 × 6.5 cm

Diameter = 13 cm

Q7. The diameter of a circle is 23.3 cm, find its circumference.

Sol. Diameter = 23.3 cm

Circumference =?

Using formula:

$C = \pi d$ Putting values

$C = (3.14)(23.3\,cm)$

$C = 73.162\,cm$ **Ans.**

Q8. Find the circumference of a wheel whose diameter is 34 cm.

Sol. Diameter = 34 cm

Circumference =?

Using formula:

$C = \pi d$ Putting values

$C = (3.14)(34\,cm)$

$C = 106.76\,cm$ **Ans.**

Q9. Find the area of the circles whose radii are given below.

a) 2.3 cm

Sol. radius = 2.3 cm

Area of circle =?

Using formula:

$\text{Area of circle} = \pi r^2$

$\text{Area} = (3.14)(2.3\,\text{cm})^2$

$\text{Area} = (3.14)\times 5.29\,\text{cm}^2$

$\text{Area} = 16.6106\,\text{cm}^2$ **Ans.**

b) 6.5 cm

Sol. Radius = 6.5 cm

Area of circle =?

Using formula:

$\text{Area of circle} = \pi r^2$

$\text{Area} = (3.14)(6.5\,\text{cm})^2$

$\text{Area} = (3.14)\times 42.25\,\text{cm}^2$

$\text{Area} = 132.665\,\text{cm}^2$ **Ans.**

c) 11.2 cm

Sol. Radius = 11.2 cm

Area of circle =?

Using formula:

$\text{Area of circle} = \pi r^2$

$\text{Area} = (3.14)(11.2\,\text{cm})^2$

$\text{Area} = (3.14)\times 125.44\,\text{cm}^2$

$\text{Area} = 393.8816\,\text{cm}^2$ **Ans.**

d) 8.5 cm

Sol. Radius = 8.5 cm

Area of circle =?

Using formula:

$\text{Area of circle} = \pi r^2$

$\text{Area} = (3.14)(8.5\,\text{cm})^2$

$\text{Area} = (3.14)\times 72.25\,\text{cm}^2$

$\text{Area} = 226.865\,\text{cm}^2$ **Ans.**

e) 10.7 cm

Sol. Radius = 10.7 cm

Area of circle =?

Using formula:

$\text{Area of circle} = \pi r^2$

$\text{Area} = (3.14)(10.7\,\text{cm})^2$

$\text{Area} = (3.14)\times 114.49\,\text{cm}^2$

Area =359.4986 cm² Ans.

f) 14.8 cm

Sol. Radius = 14.8 cm

Area of circle =?

Using formula:

$$\text{Area of circle} = \pi r^2$$

$$\text{Area} = (3.14)(14.8\,\text{cm})^2$$

$$\text{Area} = (3.14)\times 219.04\,\text{cm}^2$$

Area =687.7856 cm² Ans.

g) 2.7 cm

Sol. Radius = 2.7 cm

Area of circle =?

Using formula:

$$\text{Area of circle} = \pi r^2$$

$$\text{Area} = (3.14)(2.7\,\text{cm})^2$$

$$\text{Area} = (3.14)\times 7.29\,\text{cm}^2$$

Area =22.8906 cm² Ans.

h) 9.25 cm

Sol. Radius = 9.25 cm

Area of circle =?

Using formula:

$$\text{Area of circle} = \pi r^2$$

$$\text{Area} = (3.14)(9.25\,\text{cm})^2$$

$$\text{Area} = (3.14)\times 85.5625\,\text{cm}^2$$

Area =268.66625 cm² Ans.

Q10. Find the area of a circle whose diameter is 6.2 cm.

Sol. Diameter = 6.2 cm

Area of circle =?

As radius = $\frac{d}{2}$

Radius = $\frac{6.2}{2} = 3.1\ cm$

Using formula:

$$\text{Area of circle} = \pi r^2$$

$$\text{Area} = (3.14)(3.1\,\text{cm})^2$$

$$\text{Area} = (3.14)\times 9.61\,\text{cm}^2$$

Area =30.1754 cm² Ans.

Q11. The diameter of a circle is 15.5 cm, find its area.

Sol. Diameter = 15.5 cm

Area of circle =?

As radius = $\frac{d}{2}$

Radius = $\frac{15.5}{2} = 7.75\ cm$

Using formula:

$$\text{Area of circle} = \pi r^2$$

$$\text{Area} = (3.14)(7.75\,\text{cm})^2$$

$$\text{Area} = (3.14)\times 60.0625\,\text{cm}^2$$

Area =188.59625 cm² Ans.

Q12. The circumference of a circle is 44.588 cm, find its area.

Sol.

Circumference = 44.588 cm

To find area of the circle, first we find its radius.

Using formula:

$C = 2\pi r$ Putting values

$$44.588\,cm = 2(3.14)r$$

$$44.588\,cm = 6.28\times r$$

Divide both sides by 6.28

$$\Rightarrow \frac{44.588\,cm}{6.28} = \frac{6.28\times r}{6.28}$$

$$\Rightarrow r = 14.2\,cm$$

Area of circle = πr^2

Area of circle=

$$(3.14)(14.2\,cm)^2$$

Area of circle =

$$(3.14)(201.64cm^2)$$

Area of circle = 633.1496 cm^2

Q13. Find the circumference of a circle whose area is 54.95 m^2.

Sol. Area of circle = 54.95 m^2

Circumference =?

First we find radius of circle:

Using formula:

Area of circle = πr^2

By putting values

54.95 m^2 = 3.14 × r^2

Divide both sides by 3.14

$$\frac{54.95\ m^2}{3.14} = \frac{3.14 \times r^2}{3.14}$$

$$\Rightarrow r^2 = 17.5m^2$$

Taking square root

$$\Rightarrow \sqrt{r^2} = \sqrt{17.5m^2}$$

r = 4.18 cm **Ans.**

Exercise – 9.3

Q1. The diameter of the car wheel is 54 cm. how far will the car have travelled after 423 revolutions of the wheel?

Sol. Diameter of wheel=54cm

First we find circumference of the wheel.

Using formula:

$C = \pi d$ Putting values

$C = 3.14 \times 54cm$

$C = 169.56cm$

Distance travelled in one revolution = 169.56 cm

Distance travelled in 423 revolutions = 423 × 169.56 cm

Total distance travelled = 71,723.88 cm**Ans.**

Q2. The diameter of a circular ground is 31 cm.

a) Calculate the cost of planting grass at the rate of 345/m^2.

b) Find the cost of fencing the ground at the rate of 143/m^2.

Sol. Diameter = 31 cm

As radius = $\frac{d}{2}$

Radius = $\frac{31cm}{2} = 15.5\,cm$

Area of circular ground = πr^2

Area = $3.14 \times (15.5\,cm)^2$

Area = 3.14 × 240.25 cm^2

Area = 754.385 cm^2

a. Rate of planting grass = 345/m^2

Total cost of planting grass

0.0754385m^2 =

754.385 × 345 = 260,262.825

Thus total cost is Rs.260,262.825

b. Cost of fencing the ground = 143/m^2

Total cost of fencing an area of 754.385 m^2 = 754.385 × 143

Total cost of fencing = Rs.107.877.055

Q3. The radius of the circular parking area is 112.2 m. calculate the cost of tiling it at the rate of Rs.580/m^2.

Sol. Radius of circular parking area = 112.2 m

Area of circular parking =?

Using formula:

Area = πr^2

Area = $3.14(112.2m)^2$

Area = 3.14 × 12588.84 m^2

Area = 39528.9576 m^2

Rate of tiling = 580/m^2

Cost of tiling the total area of parking = 39528.9576 × 580

Cost of tiling = Rs.22,926,795.408**Ans.**

Q4. The diameter of a circular playground is 5.7 m. find the cost of planting grass at the rate of Rs.342/m^2.

Sol. Diameter of circular playground = 5.7 m

As radius = $\frac{d}{2}$

Radius = $\frac{5.7cm}{2} = 2.85\,cm$

Area of circular playground = πr^2
Area = 3.14 × (2.85 cm)^2
Area = 3.14× 8.1225 cm^2
Area = 25.50465 cm^2
Rate of planting grass = 342/m^2
Cost of planting grass = 25.50465 × 342
Total cost = Rs.8,722.5903

Q5. The radius of the train wheel is 0.34m. How much distance will the train cover in 1234 revolutions of the wheel?

Sol. Radius of wheel of train =0.34 m
Circumference = $2\pi r$
$C = 2\times 3.14\times 0.34$
$C = 2.1352\,m$
Distance travelled in one revolution = 2.1352 m
Distance travelled in 1234 revolutions=1234 × 2.1352m
Total distance travelled = Rs.2634.8368 m Ans.

Q6. A circular playground has a diameter of 890 metres. Find the total amount required if half of the circular region is to be planted with grass at the rate of Rs.85/m^2 and the remaining area is to be cemented at the rate of Rs.404/m^2.

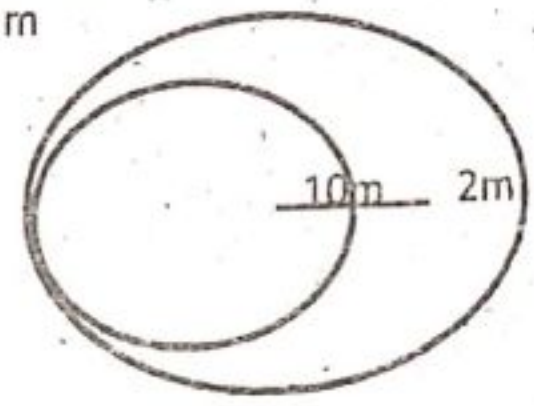
Sol. Diameter of circular playground = 890 m

Radius of circular playground = $\frac{d}{2}$ = $\frac{890m}{2}$
Radius = 445 m
Area of circular playground = πr^2
Area = 3.14 × (445m)^2
Area = 3.14 × 198,025 m^2
Area = 621,798.5 m^2
Half area of circular region = $\frac{total\ area}{2}$

Half area = $\frac{621,798.5m^2}{2}$
Half area = 310,899.25 m^2
Rate of planting grass = Rs.85/m^2
Cost of planting grass in half area of circular playground = 310,899.25 × 85
Total cost = Rs.13,990,466.25
Remaining area = 310,899.25 m^2
Cost of cementing = Rs.404/m^2
Total cost of cementing the remaining area = 310,899.25 × 404 = Rs.125,603,297
Grand total = cost of planting grass + cost of cementing
Grade total = 13,990,466.25 + 125,603,297 = Rs. 139,593,763.25 Ans.

Q7. A circular walking track of radius 10 m has a path 2m wide running around the inside of its boundary. Find the cost of construction of the path at the rate of Rs.450 per square meter.

Sol. Radius of circular walking track = 10 m



Width of path = 2m
Radius of the whole figure = 10 + 2 = 12 m
Area of the whole figure = πr^2

Area = $3.14\times(12m)^2$

Area =

Area = 452.16 m^2

Now, area of the region having radius of 10 m.

Area = $\pi r^2 = 3.14\times(10m)^2$

Area = $3.14\times 100m^2$

Area = 314 m^2

Area of the path = area of the whole figure – area of the inner region

Area of the path = 452.16m^2 – 314 m^2

Area of the path = 138.16m^2

Rate of construction = 450/m^2

Total cost of construction = 138.16 × 450 = Rs.62,172

Q8. Distance around a circular ground is 6561.3 m. What is the radius of the ground?

Sol. Distance around the circular ground = 6561.3 m

Circumference of the ground = 6561.3 m

To find radius:

Using formula:

$$C = 2\pi r$$

$r = \frac{C}{2\pi}$ Putting values

$$r = \frac{6561.3m}{2(3.14)}$$

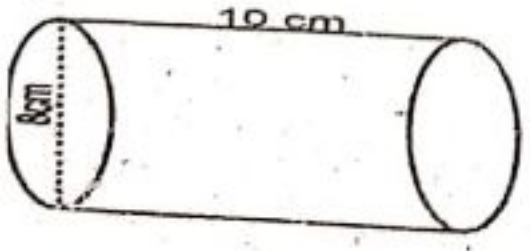
$$r = \frac{6561.3m}{6.28}$$

r = 1044.8 m Ans.

Exercise – 9.4

Q1. Find the total surface area of each of the following cylinders.

a)



Sol. From the figure:

h = 10 cm

d = 8 cm

$r = \frac{d}{2} = \frac{8cm}{2} = 4\,cm$

To find surface area of the cylinder use formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

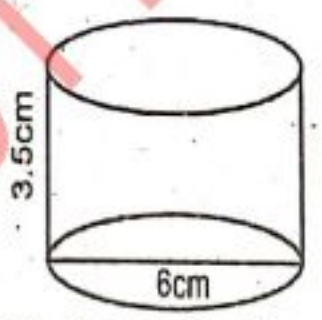
$$2(3.14)(4cm)(10cm+4cm)$$

Surface area = $6.28(4cm)(14cm)$

Surface area = $6.28\times 56cm^2$

Surface area = 351.68 cm^2

b)



Sol. From the figure:

h = 3.5 cm

d = 6 cm

$r = \frac{d}{2} = \frac{6cm}{2} = 3\,cm$

To find surface area of the cylinder use formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$$2(3.14)(3cm)(3.5cm+3cm)$$

Surface area = $6.28(3cm)(6.5cm)$

Surface area = $6.28\times 19.5cm^2$

Surface area = 121.875 cm^2

c)

Sol. From the figure:

h = 9 cm

d = 5 cm

$$r = \frac{d}{2} = \frac{5cm}{2} = 2.5cm$$

To find surface area of the cylinder use formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$$2(3.14)(2.5cm)(9cm+2.5cm)$$

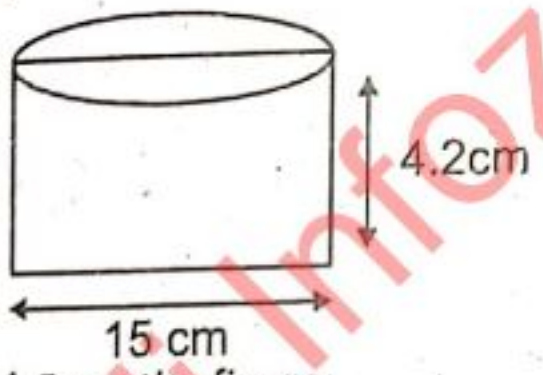
Surface area =

$$6.28(2.5cm)(11.5cm)$$

Surface area = $6.28\times 28.75cm^2$

Surface area = 180.55 cm^2

d)



Sol. From the figure:

h = 4.2 cm

d = 15 cm

$$r = \frac{d}{2} = \frac{15cm}{2} = 7.5cm$$

To find surface area of the cylinder use formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$$2(3.14)(7.5cm)(4.2cm+7.5cm)$$

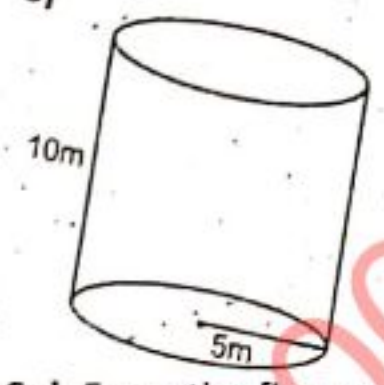
Surface area =

$$6.28(7.5cm)(11.7cm)$$

Surface area = $6.28\times 87.75cm^2$

Surface area = 551.07 cm^2

e)



Sol. From the figure:

h = 10 m

r = 5 m

To find surface area of the cylinder use formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

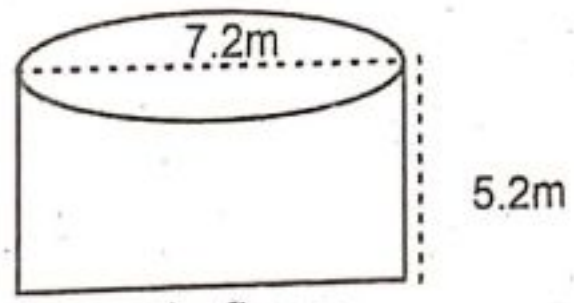
$$2(3.14)(5m)(10m+5m)$$

Surface area = $6.28(5m)(15m)$

Surface area = $6.28\times 75m^2$

Surface area = 471 cm^2

f)



Sol. From the figure:

h = 5.2 m

d = 7.2 m

$$r = \frac{d}{2} = \frac{7.2m}{2} = 3.6\,m$$

To find surface area of the cylinder use formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$$2(3.14)(3.6m)(5.2m+3.6m)$$

Surface area = $6.28(3.6m)(8.8m)$

Surface area = $6.28\times 31.68m^2$

Surface area = 198.95 cm^2

Q2. A rod is 6 cm long and its radius is 4.1 cm. calculate the surface area of the curved surface.

Sol. length of rod = h = 6 cm

Radius of rod = r = 4.1 cm

Surface area of rod =?

Using formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$$2(3.14)(4.1cm)(6cm+4.1cm)$$

Surface area = $6.28(4.1cm)(10.1cm)$

Surface area = $6.28\times 41.41cm^2$

Surface area = 260.05 cm^2

Q3. The diameter of a cylinder is 19.2 cm and length is 5.3 cm. Find the surface area of the curved surface.

Sol. Diameter of the cylinder = d = 19.2 cm

$$r=\frac{d}{2}=\frac{19.2cm}{2}=9.6cm$$

Length = h = 5.3 cm

Surface area of the cylinder =?

Using formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$$2(3.14)(9.6cm)(5.3cm+9.6cm)$$

Surface area = $6.28(9.6cm)(14.9cm)$

Surface area = $6.28\times 143.04cm^2$

Surface area = 898.29 cm^2

Q4. The radius of a cylinder is 2.3 cm and length is 6.3 cm. Calculate the surface area of the cylinder.

Sol. Radius of the cylinder = r = 2.3 cm

Length of the cylinder = h = 6.3 cm.

Surface area of the cylinder =?

Using formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$$2(3.14)(2.3cm)(6.3cm+2.3cm)$$

Surface area = $6.28(2.3cm)(8.6cm)$

Surface area = $6.28\times 19.78cm^2$

Surface area = 124.22 cm^2

Q5. Find the total surface area of a 4.3 cm long tin whose radius is 3.5 cm.

Sol. Length of tin = h =4.3cm

Radius of tin = r = 3.5 cm

Surface area of tin =?

Using formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$$2(3.14)(3.5cm)(4.3cm+3.5cm)$$

Surface area = $6.28(3.5cm)(7.8cm)$

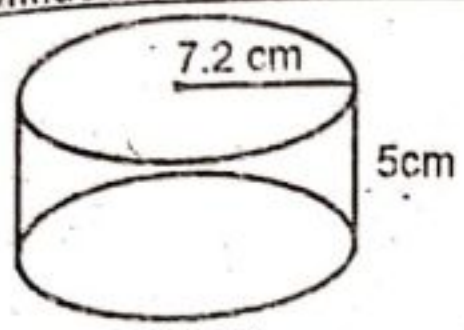
Surface area = $6.28\times 27.3cm^2$

Surface area = 171.444 cm^2

Exercise ~ 9.5

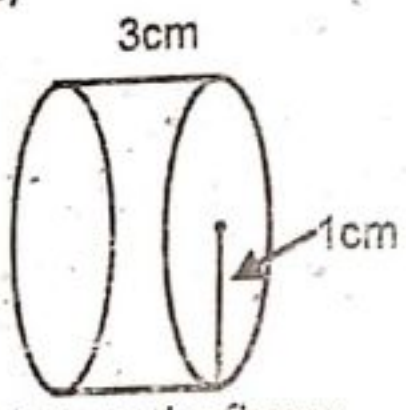
Q1. Find the volume of each of the following cylinders.

a)



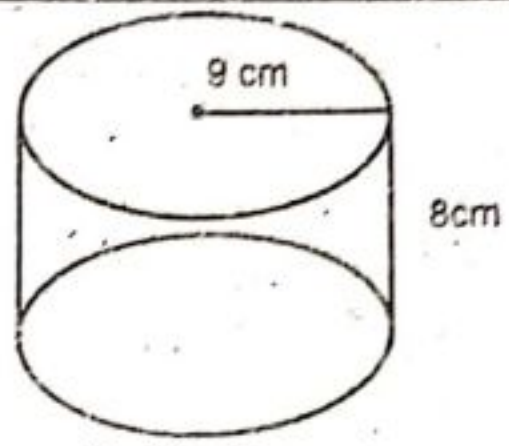
Sol. From the figure:
Radius of cylinder = 7.2 cm
Height of cylinder = 5 cm
Volume of cylinder =?
Using formula:
Volume = $\pi r^2 h$
Putting values
Volume = $(3.14)(7.2cm)^2(5cm)$
Volume = $3.14 \times 51.84cm^2 \times 5cm$
Volume = $3.14 \times 259.2cm^3$
Volume = 813.888 cm^3

b)



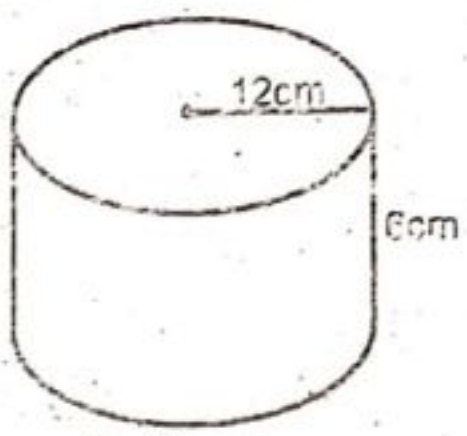
Sol. From the figure:
Radius of cylinder = 1 cm
Height of cylinder = 3 cm
Volume of cylinder =?
Using formula:
Volume = $\pi r^2 h$
Putting values
Volume = $(3.14)(1cm)^2(3cm)$
Volume = $3.14 \times 1cm^2 \times 3cm$
Volume = $3.14 \times 3cm^3$
Volume = 9.42 cm^3

c)



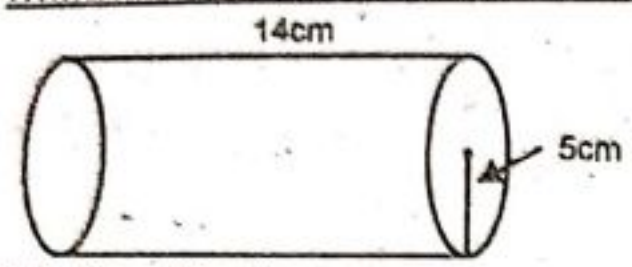
Sol. From the figure:
Radius of cylinder = 9 cm
Height of cylinder = 8 cm
Volume of cylinder =?
Using formula:
Volume = $\pi r^2 h$
Putting values
Volume = $(3.14)(9cm)^2(8cm)$
Volume = $3.14 \times 81cm^2 \times 8cm$
Volume = $3.14 \times 648cm^3$
Volume = 2034.72 cm^3

d)



Sol. From the figure:
Radius of cylinder = 12 cm
Height of cylinder = 6 cm
Volume of cylinder =?
Using formula:
Volume = $\pi r^2 h$
Putting values
Volume = $(3.14)(12cm)^2(6cm)$
Volume = $3.14 \times 144cm^2 \times 6cm$
Volume = $3.14 \times 864cm^3$
Volume = 2712.96 cm^3

e)



Sol. From the figure:
Diameter of cylinder = 5 cm

Radius = $\frac{d}{2} = \frac{5}{2} = 2.5cm$

Height of cylinder = 14 cm
Volume of cylinder =?
Using formula:
Volume = $\pi r^2 h$
Putting values

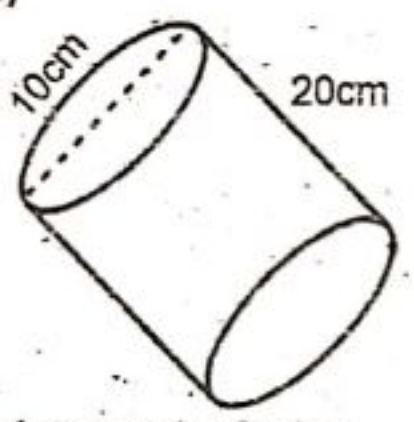
Volume = $(3.14)(2.5cm)^2(14cm)$

Volume = $3.14 \times 6.25cm^2 \times 14cm$

Volume = $3.14 \times 87.5cm^3$

Volume = 274.75 cm^3

f)



Sol. From the figure:
Diameter of cylinder = 10 cm

Radius = $\frac{d}{2} = \frac{10}{2} = 5cm$ Height of cylinder = 20 cm
Volume of cylinder =?
Using formula:
Volume = $\pi r^2 h$
Putting values

Volume = $(3.14)(5cm)^2(20cm)$

Volume = $3.14 \times 25cm^2 \times 20cm$

Volume = $3.14 \times 500cm^3$

Volume = 1570 cm^3

Q2. Find the volume of each cylinder having the following height and radius.

a) Height = 24 m
Radius = 10 m

Sol. Radius of cylinder=10 cm
Height of cylinder = 24 cm
Volume of cylinder =?
Using formula:
Volume = $\pi r^2 h$
Putting values

Volume = $(3.14)(10cm)^2(24cm)$

Volume = $3.14 \times 100cm^2 \times 24cm$

Volume = $3.14 \times 2400cm^3$

Volume = 7,536 cm^3

b) Height = 5.5 m
Radius = 2.7 m

Sol. Radius of cylinder=2.7cm
Height of cylinder = 5.5 cm
Volume of cylinder =?
Using formula:
Volume = $\pi r^2 h$
Putting values

Volume = $(3.14)(2.7cm)^2(5.5cm)$

Volume = $3.14 \times 7.29cm^2 \times 5.5cm$

Volume = $3.14 \times 40.095cm^3$

Volume = 125.8983 cm^3

c) Height = 6.2 cm
Radius = 6.9 cm

Sol. Radius of cylinder=6.9cm
Height of cylinder = 6.2 cm
Volume of cylinder =?
Using formula:
Volume = $\pi r^2 h$
Putting values

Volume = $(3.14)(6.9cm)^2(6.2cm)$

Volume = $3.14 \times 47.61cm^2 \times 6.2cm$

Volume = $3.14 \times 295.182cm^3$

Volume = 926.87 cm^3

d) Height = 33.4 m

Radius = 11.5 m

Sol. Radius of cylinder = 11.5 cm

Height of cylinder = 33.4 cm

Volume of cylinder =?

Using formula:

Volume = $\pi r^2 h$

Putting values

Volume = $(3.14)(11.5cm)^2(33.4cm)$

Volume = $3.14 \times 132.25cm^2 \times 33.4cm$

Volume = $3.14 \times 4417.15cm^3$

Volume = 13869.851 cm^3

e) Height = 12.4 m

Radius = 5.7 m

Sol. Radius of cylinder=5.7cm

Height of cylinder = 12.4 cm

Volume of cylinder =?

Using formula:

Volume = $\pi r^2 h$

Putting values

Volume =

$(3.14)(5.7cm)^2(12.4cm)$

Volume =

$3.14 \times 32.49cm^2 \times 12.4cm$

Volume = $3.14 \times 402.876cm^3$

Volume = 1265.031 cm^3

f) Height = 9 cm

Radius = 6 cm

Sol. Radius of cylinder = 6 cm

Height of cylinder = 8 cm

Volume of cylinder =?

Using formula:

Volume = $\pi r^2 h$.

Putting values

Volume = $(3.14)(6cm)^2(8cm)$

Volume = $3.14 \times 36cm^2 \times 8cm$

Volume = $3.14 \times 288cm^3$

Volume = 904.32 cm^3

g) Height = 4 m

Radius = 3 m

Sol. Radius of cylinder = 3 cm

Height of cylinder = 4 cm

Volume of cylinder =?

Using formula:

Volume = $\pi r^2 h$

Putting values

Volume = $(3.14)(3cm)^2(4cm)$

Volume = $3.14 \times 9cm^2 \times 4cm$

Volume = $3.14 \times 36cm^3$

Volume = 113.04 cm^3

h) Height = 77 cm

Radius = 40 cm

Sol. Radius of cylinder =40cm

Height of cylinder = 77 cm

Volume of cylinder =?

Using formula:

Volume = $\pi r^2 h$

Putting values

Volume = $(3.14)(40cm)^2(77cm)$

Volume = $3.14 \times 1600cm^2 \times 77cm$

Volume = $3.14 \times 123200cm^3$

Volume = 386,848 cm^3

Q3. Find the volume of a cylinder whose height is 8.8 cm and radius is 2.7 cm.

Sol. Height of cylinder = h = 8.8 cm

Radius of cylinder = r =2.7 cm

Volume of cylinder =?

Using formula:

Volume = $\pi r^2 h$

Putting values

Volume = $(3.14)(2.7cm)^2(8.8cm)$

Volume = $3.14 \times 7.29cm^2 \times 8.8cm$

Volume = $3.14 \times 64.152cm^3$

Volume = 201.437 cm^3

Q4. The volume of a cylinder is 233.34 cm^3 and height is 8 cm. Find the radius of the circular region of the cylinder.

Sol. Volume of cylinder = V = 233.34 cm^3

Height of cylinder = h = 8cm

Radius of cylinder = r =?

Using formula:

Volume = $\pi r^2 h$

Putting values

233.34 cm^3 = $(3.14)r^2(8cm)$

233.34 cm^3 = $25.12cm \times r^2$

Divide both sides by 25.12cm

$$\frac{233.34cm^3}{25.12cm} = \frac{25.12cm \times r^2}{25.12cm}$$

$r^2 = 9.289cm^2$

Taking square root

$$\sqrt{r^2} = \sqrt{9.289cm^2}$$

r = 3.04 cm **Ans.**

Q5. The radius of a beaker is 6 cm and its volume is 3242 cm^3. Find the height of the beaker.

Sol. Radius of beaker= r=6cm

Volume of beaker = V = 3242cm^3

Height of beaker = h =?

Using formula:

Volume = $\pi r^2 h$

Putting values

3242cm^3 = $(3.14)(6cm)^2 h$

3242cm^3 = $3.14 \times 36cm^2 \times h$

3242cm^3 = $113.04cm^2 \times h$

Divide both sides by 113.04cm^2

$$\frac{3242cm^3}{113.04cm^2} = \frac{113.04cm^2 \times h}{113.04cm^2}$$

h = 28.68 cm **Ans.**

Q6. Find the radius of a cylinder if it has a height of 7.2 cm and its volume is 4321 cm^3.

Sol. Height of cylinder=7.2cm

Volume of cylinder= 4321cm^3

Radius of cylinder =?

Using formula:

Volume = $\pi r^2 h$

Putting values

4321 cm^3 = $(3.14)r^2(7.2cm)$

4321 cm^3 = $22.608cm \times r^2$

Divide both sides by 22.60cm

$$\frac{4321cm^3}{22.608cm} = \frac{22.608cm \times r^2}{22.608cm}$$

$r^2 = 191.127cm^2$

Taking square root

$$\sqrt{r^2} = \sqrt{191.127cm^2}$$

r = 13.824 cm **Ans.**

Q7. A hollow iron pipe has an internal radius of 7.5 cm and an external radius of 10.2 cm. If the length of pipe is 0.35 meters, find the volume of iron used in making the pipe.

Sol. Length of iron pipe = 0.35m =0.35 × 100cm = 35cm

Internal radius r_1= 7.5 cm

External radius r_2 = 10.2 cm

Volume $V_1 = \pi r_1^2 h$

By putting values

$$V_1 = (3.14)(7.5cm)^2(35cm)$$

$$V_1 = (3.14)56.25cm^2(35cm)$$

$$V_1 = (3.14)1968.75cm^3$$

$$V_1 = 6,181.875cm^3$$

Now we find V_2

$$V_2 = \pi r_2^2 h$$

By putting values

$$V_2 = (3.14)(10.2cm)^2(35cm)$$

$$V_2 = (3.14)104.04cm^2(35cm)$$

$$V_2 = (3.14) \times 3,641.4cm^3$$

$$V_2 = 11,433.996cm^3$$

Volume of iron used in making the pipe

$= V_2 - V_1$

Volume of iron =

$11,433.996cm^3 - 6,181.875cm^3$

Volume of iron = $5,252.121cm^3$ Ans.

Q9. A cylindrical pool has a diameter of 11 meters. If the height of the pool is 3 meters, what is the capacity of the pool?

Sol. Diameter of pool 'd' = 11m

d = 11 m $r = \frac{d}{2}$

$r = \frac{11m}{2} = 5.5m$

Height of pool 'h' = 3m

Capacity of pool =?

Using formula:

Capacity = $\pi r^2 h$

By putting values

Capacity = $(3.14)(5.5m)^2(3m)$

Capacity = $(3.14)\times 30.25m^2\times(3m)$

Capacity = $(3.14)\times 90.75m^3$

Capacity = $284.955m^3$ Ans.

Q10. The height of a cylinder shaped oil tank is 24 m and its radius is 12.6 m. if the empty space in it has a height of 9.5 meters, find the volume of oil inside it.

Sol. Radius = r = 12.6 m

Height = h_1 = 24 m

Height = h_2 = 9.5 m

Difference in height = $h_1 - h_2$

h = 24 m – 9.5 m = 14.5 m

Using formula:

Volume = $\pi r^2 h$

Putting values

Volume =

$(3.14)(12.6cm)^2(14.5cm)$

Volume =

$3.14\times 158.76cm^2\times 14.5cm$

Volume = $3.14\times 2302.02cm^3$

Volume = 7,228.3428 cm^3 Ans.

Q11. A drum has a radius of 7.1 m and volume of 1111m^3. Find the height of the drum.

Sol. Radius of drum = r=7.1m

Volume = V = 1111 m^3

Height = h =?

Using formula:

Volume = $\pi r^2 h$

Putting values

$1111cm^3 = (3.14)(7.1cm)^2 h$

$1111cm^3 = 3.14\times 50.41cm^2\times h$

$1111cm^3 = 158.2874cm^2\times h$

Divide both sides by 158.2874cm^2

$\frac{1111cm^3}{158.2874cm^2} = \frac{158.2874cm^2\times h}{158.2874cm^2}$

h = 7.02 cm Ans.

Q12. A cylindrical shaped tower has a radius of 23 m and height of 65 m. Calculate the price of painting its curved walls at the rate of Rs.432/m^2.

Sol. Radius = r = 23 m

Height = h = 65 m

Surface area = A =?

Using formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$2(3.14)(23m)(65m+23m)$

Surface area = $6.28\times(23m)(88m)$

Surface area = $12,710.72m^2$

Rate of painting = Rs.432/m^2

Cost of painting = 12,710.72× 432

Cost of painting = Rs.5,491,031.04Ans.

Q13. The outer walls of four cylindrical shaped warehouses are painted. If the diameter of each warehouse is 17.3 m and height is 25 m, find the cost of painting the walls at the rate of Rs.450/m².

Sol. Height of each cylinder = h = 25 m

Diameter of each cylinder = d = 17.3 m

$$r = \frac{d}{2} = \frac{17.3m}{2} = 8.65m$$

Surface area of each cylinder =?

Using formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$$2(3.14)(8.65m)(25m+8.65m)$$

Surface area =

$$6.28\times(8.65m)(33.65m)$$

Surface area = $1{,}827.9353m^2$

Rate of painting = 450/m²

Cost of painting = 1,827.9353 × 450

Rate of painting = Rs.822,570.885

Surface area of four such cylinders =

$$4\times 1{,}827.9353m^2$$

Surface area of four such cylinders = 7,311.7412 m²

Rate of painting = 450/m²

Cost of painting = 7,311.7412 × 450

Total cost = Rs.3,290,283.54

Q14. Find the volume and surface area of a cylinder whose radius is 6 cm and height is 29 cm.

Sol. Radius = r = 6 cm

Height = h = 29 cm

Surface area = A =?

Using formula:

Surface area = $2\pi r(h+r)$

By putting values

Surface area =

$$2(3.14)(6m)(29m+6m)$$

Surface area = $6.28\times(6m)(35m)$

Surface area = $1{,}318.8m^2$

Volume = V =?

Using formula:

Volume = $\pi r^2 h$

Putting values

Volume = $(3.14)(6cm)^2(29cm)$

Volume = $3.14\times 36cm^2\times 29cm$

Volume = $3.14\times 1{,}044cm^3$

Volume = 3,278.16 cm³

Q15. Each of the 8 cylindrical pillar of Masjid have a circumference of 15 m and height of 18 m. find the cost of refilling it with cement at the rate of Rs.745/m³.

Sol. Height = h = 18 m

Circumference = C = 15 m

First we find radius:

Using formula:

$C = 2\pi r$ Putting values

$$15m = 2(3.14)r$$

$$15m = 6.28\times r$$

Divide both sides by 6.28

$$\frac{15m}{6.28} = \frac{6.28\times r}{6.28}$$

r = 2.389 m

Volume of cylinder = V =?

Using formula:

$V = \pi r^2 h$ Putting values

$$V = (3.14)(2.389m)^2(18m)$$

$$V = (3.14)\times 5.707m^2\times(18m)$$

$$V = (3.14)\times 102.73m^3$$

$$V = 322.578m^3$$

Rate of refilling = Rs.745/m^3
Cost of refilling = 322.578 × 745
Total cost of refilling =
Rs.240,320.448Ans.

Exercise – 9.6

Q1. Find the surface area of the following prism.

a)

Sol. From the figure

$\ell = 13m, w = 9m, h = 3m$

Surface area of prism =?

Using formula:

Surface area of cuboid =

$$2\left[(\ell \times w)+(w \times h)+(h \times \ell)\right]$$

By putting values

Surface area of cuboid =

$$2\left[(13\times 9)+(9\times 3)+(3\times 13)\right]$$

Surface area of cuboid =

$$2[117+27+39]$$

Surface area of cuboid = 2[183] = 366 m^2

b)

Sol. From the figure

$\ell = 20cm, w = 6cm, h = 4cm$

Surface area of prism =?

Using formula:

Surface area of cuboid =

$$2\left[(\ell \times w)+(w \times h)+(h \times \ell)\right]$$

By putting values

Surface area of cuboid =

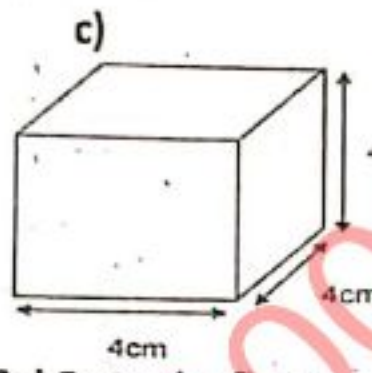
$$2\left[(20\times 6)+(6\times 4)+(4\times 20)\right]$$

Surface area of cuboid =

$$2[120+24+80]$$

Surface area of cuboid = 2[224] = 448 m^2

c)



Sol. From the figure

$\ell = w = h = 4cm$

Surface area of cube =?

Using formula:

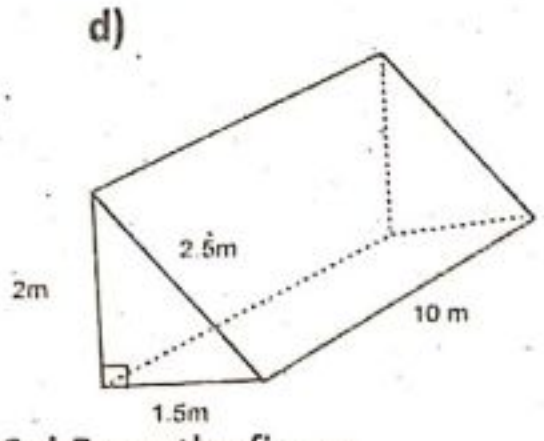
Surface area of cube = $6\ell^2$

Surface area = $6(4cm)^2$

Surface area = $6\times 16cm^2$

Surface area of cube = 96cm^2

d)



Sol. From the figure

L = 10 m

S1 = 1.5 m

S2 = 2 m

S3 = 2.5 m

Surface area =?

Surface area of right prism = bh + Sum of areas of three triangles

Surface area = bh + (S1 + S2 + S3) × L

Putting values

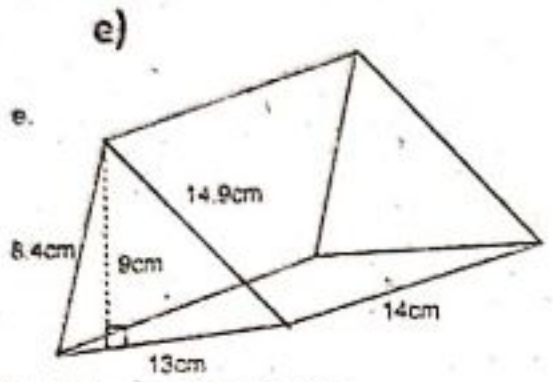
Surface area = (2m × 1.5m) + (2m + 1.5m + 2.5m) × 10m

Surface area=$3m^2$+(6m)×10m

Surface area = $3m^2 + 60m^2$

Surface area = 63 m^2 Ans.

e)



Sol. From the figure

L = 14 cm

S1 = 8.4 cm

S2 = 14.9 cm

S3 = 13 cm

h = 9 cm

surface area of triangular prism =?

Using formula:

Surface area = bh + (S1 + S2 + S3) × L

Putting values

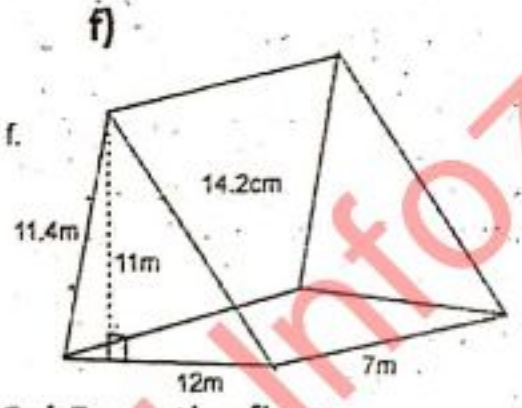
Surface area = (13cm × 9cm) + (14.9cm + 8.4cm + 13cm) × 14cm

Surface area = $117cm^2 + (36.3cm) \times 14cm$

Surface area = $117cm^2 + 508.2cm^2$

Surface area = 625.2 cm^2 Ans.

f)



Sol. From the figure

L = 7 m

S1 = 12 m

S2 = 11.4 m

S3 = 14.2 m

h = 11 m

surface area of triangular prism =?

Using formula:

Surface area = bh + (S1 + S2 + S3) × L

Putting values

Surface area = (12m × 11m) + (12m + 11.4m + 14.2m) × 7m

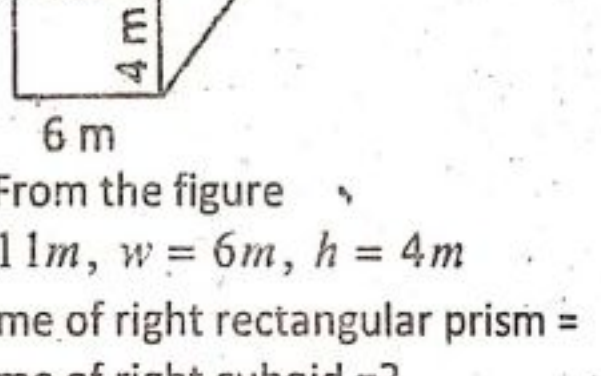
Surface area = $132m^2 + (37.6m) \times 7m$

Surface area = $132m^2 + 263.2m^2$

Surface area = 395.2 m^2 Ans,

Q2. Find the volume of the following prism.

a)



Sol. From the figure

$\ell = 13m,\ w = 9m,\ h = 3m$

Volume of right rectangular prism =

Volume of right cuboid =?

Using formula:

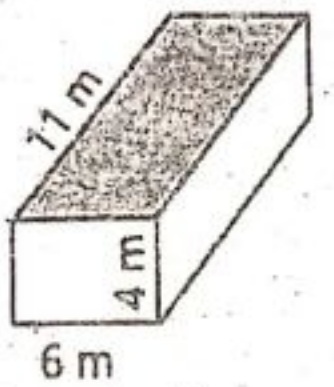
Volume = $\ell \times w \times h$

Putting values

Volume = $13m \times 9m \times 3m$

Volume = 351 m^3 Ans.

b)



Sol. From the figure

$\ell = 11m,\ w = 6m,\ h = 4m$

Volume of right rectangular prism =

Volume of right cuboid =?

Using formula:

Volume = $\ell \times w \times h$

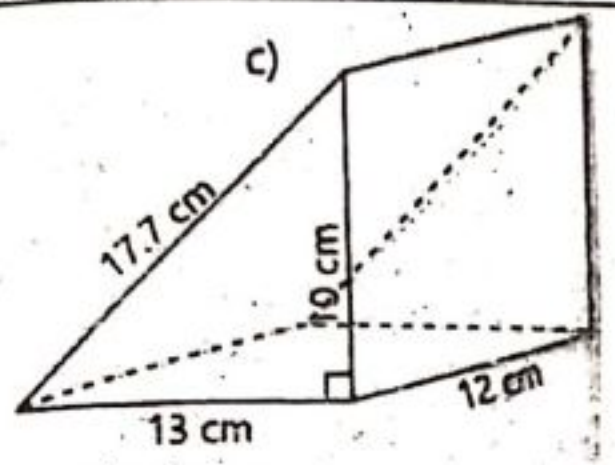
Putting values

Volume = $11m \times 6m \times 4m$

Volume = 264 cm^3 Ans.

c)

c)



Sol. From the figure

$b = 13\,cm$

$h = 10\,cm$

$\ell = 12\,cm$

Volume of triangular prism =?

Using formula:

$$\text{Volume} = \frac{1}{2}bh \times \ell$$

Putting values

Volume =

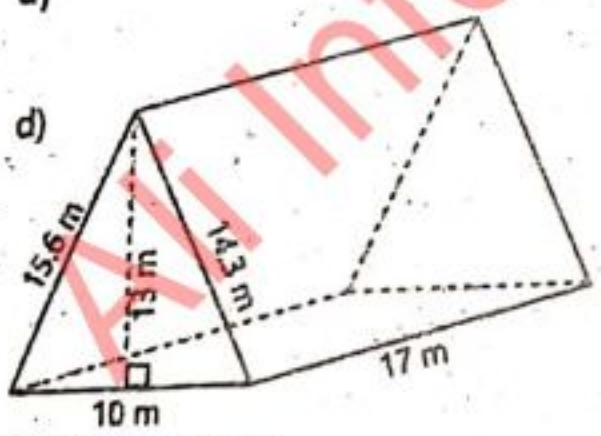
$$\frac{1}{2}(13cm)(10cm)\times(12cm)$$

$$\text{Volume} = \frac{1}{2}130cm^2 \times (12cm)$$

$$\text{Volume} = 65cm^2 \times (12cm)$$

$$\text{Volume} = 780cm^3 \text{ Ans.}$$

d)



Sol. From the figure

$b = 10m$

$h = 13m$

$\ell = 17\,m$

Volume of triangular prism =?

Using formula:

$$\text{Volume} = \frac{1}{2}bh \times \ell$$

Putting values

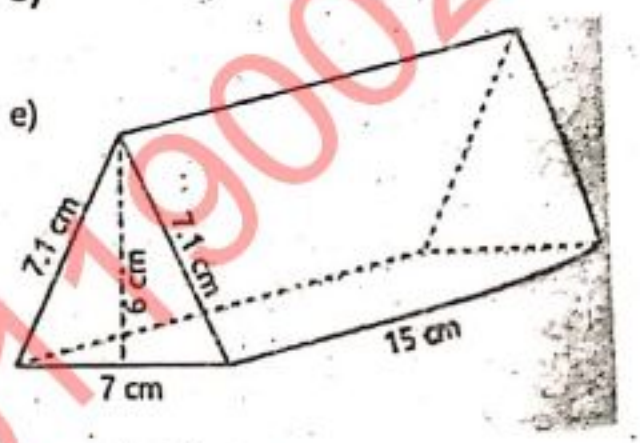
$$\text{Volume} = \frac{1}{2}(10m)(13m)\times(17m)$$

$$\text{Volume} = \frac{1}{2}130m^2 \times (17m)$$

$$\text{Volume} = 65m^2 \times (17m)$$

$$\text{Volume} = 1{,}105cm^3 \text{ Ans.}$$

e)



Sol. From the figure

$b = 7\,cm$

$h = 6\,cm$

$\ell = 15\,cm$

Volume of triangular prism =?

Using formula:

$$\text{Volume} = \frac{1}{2}bh \times \ell$$

Putting values

$$\text{Volume} = \frac{1}{2}(7cm)(6cm)\times(15cm)$$

$$\text{Volume} = \frac{1}{2}42cm^2 \times (15cm)$$

$$\text{Volume} = 21cm^2 \times (15cm)$$

$$\text{Volume} = 315cm^3 \text{ Ans.}$$

Exercise – 9.7

Q1. Find the total surface area of a box whose length is 8cm, breadth 6cm and height 5cm.

Sol. Length = 8 cm
Breadth = 6 cm
Height = 5 cm
Surface area =?
Using formula:
Surface area =

$$2\left[(l\times w)+(w\times h)+(h\times l)\right]$$

Putting values
Surface area =

$$2\left[(8\times 6)+(6\times 5)+(5\times 8)\right]$$

Surface area = $2\left[48+30+40\right]$

Surface area = $2\left[118cm^2\right]$

Surface area = 236 cm^2 **Ans.**

Q2. How much tin sheet is required to make a tin box whose dimensions are 40cm × 15cm × 35 cm. Find the cost of the sheet at the rate of Rs.1.25 per cm^2.

Sol. Dimension of tin box = 40cm × 15cm × 35 cm
Required tin sheet = surface area of tin box
Using formula:
Surface area =

$$2\left[(l\times w)+(w\times h)+(h\times l)\right]$$

Putting values
Surface area =

$$2\left[(40\times 15)+(15\times 35)+(35\times 40)\right]$$

Surface area = $2\left[600+525+1400\right]$

Surface area = $2\left[2,525cm^2\right]$

Surface area = 5,050 cm^2
The required tin sheet = 5,050 cm^2 **Ans.**

Q3. A pool is 35m long, 15m wide and 1.5m deep. What will be the total cost of cementing its walls at the rate of Rs.45 per m^2.

Sol. Length = 35 m
Width = 15 m
Depth = 1.5 m
Surface area =?
Using formula:
Surface area =

$$2\left[(l\times w)+(w\times h)+(h\times l)\right]$$

Putting values
Surface area =

$$2\left[(35\times 15)+(15\times 1.5)+(1.5\times 35)\right]$$

Surface area = $2\left[525+22.5+52.5\right]$

Surface area = $2\left[600m^2\right]$

Surface area = 1200 m^2
Rate of cementing= Rs.45/m^2
Cost of cementing the total surface area = 1200 × 45
Cost of cementing=Rs.54,000

Q4. A triangular camping tent made of cloth 4.5 m long. The area of its triangular face is 20m^2. What is the volume of the camping tent.

Sol. Length of cloth = 4.5 m
Area of triangular face=20 m^2
Volume of tent =?
Using formula:
Volume = triangular area × length
Volume = 20 m^2 × 4.5 m
Volume = 90 m^3 **Ans.**

Q5. A candy jar is of triangle prism shaped having length 7cm. If the lengths of the sides of the triangular base are 4 cm, 5 cm and 3 cm respectively and its base length is 5 cm then find the total surface area of triangular prism shaped jar.

Sol. Length of candy jar =7cm
Dimension of triangular face = 4cm, 5cm and 3 cm
Base = 5 cm
Surface area =?
Using formula:

Using formula:

Surface area = bh + (S1 + S2 + S3) × L

Putting values

Surface area = (5cm × 4cm) + (5cm + 4cm + 3cm) × 7cm

Surface area=$20cm^2$+(12cm)×7cm

Surface area = $20cm^2 + 84cm^2$

Surface area = 104 cm^2 Ans.

Review Exercise – 9

Q1. Choose the correct option.

a) The total length of the boundary of the circle is called ____ of the circle.

i. **Circumference**
ii. Volume
iii. Base
iv. diameter

b) The symbol of pi is ___.

i. $\subseteq$
ii. π
iii. $\sqrt{}$
iv. $\cong$

c) The value of π is ____.

i. 2.12
ii. 3.12
iii. 3.11
iv. **3.14**

d) Circumference of a circle = _____

i. $2\pi \times d$
ii. $d \div \pi$
iii. $2\pi r$
iv. πr^2

e) The area of circular region = _____

i. $\pi \times d$
ii. $d \div \pi$
iii. $2\pi r$
iv. πr^2

f) Total surface area of a cylinder = _____

i. $2\pi r(h+r)$
ii. $2\pi rh$
iii. $2\pi r^2 h$
iv. $r^2 h$

g) Volume of a cylinder =_____

i. πh
ii. $\pi r^2 h$
iii. $r^2 h$
iv. $\pi r^3 r$

Q2. Find the area and circumference of the circle, if the radius is:

a) 3.3 cm

Sol. r = 3.3 cm

Area of circle =?

Circumference of circle =?

To find area use formula:

Area = πr^2

Putting values

Area = $(3.14)(3.3cm)^2$

Area = $(3.14)10.89cm^2$

Area = 34.1946 cm^2

To find circumference use formula:

$C = 2\pi r$

Putting values

$C = 2(3.14)(3.3cm)$

$C = 6.28(3.3cm)$

Circumference = 20.724 cm

b) 4.3 cm

Sol. r = 4.3 cm

Sol. r = 4.3 cm

Area of circle =?

Circumference of circle =?

To find area use formula:

Area = πr^2

Putting values

Area = $(3.14)(4.3cm)^2$

Area = $(3.14)18.49cm^2$

Area = 58.0586 cm^2

To find circumference use formula:

$C = 2\pi r$

Putting values

$C = 2(3.14)(4.3cm)$

$C = 6.28(4.3cm)$

Circumference = 27.004 cm

c) 9.3 cm

Sol. r = 9.3 cm

Sol. r = 9.3 cm

Area of circle =?

Circumference of circle =?

To find area use formula:

Area = πr^2

Putting values

Area = $(3.14)(9.3cm)^2$

Area = $(3.14)86.49cm^2$

Area = 271.5786 cm^2

To find circumference use formula:

$C = 2\pi r$

Putting values

$C = 2(3.14)(9.3cm)$

$C = 6.28(9.3cm)$

Circumference = 58.404 cm

d) 5.8 cm

Sol. r = 5.8 cm

Sol. r = 5.8 cm

Area of circle =?

Circumference of circle =?

To find area use formula:

Area = πr^2

Putting values

Area = $(3.14)(5.8cm)^2$

Area = $(3.14)33.64cm^2$

Area = 105.6296 cm^2

To find circumference use formula:

$C = 2\pi r$

Putting values

$C = 2(3.14)(5.8cm)$

$C = 6.28(5.8cm)$

Circumference = 36.424 cm

e) 11.9 cm

Sol. r = 11.9 cm

Sol. r = 11.9 cm

Area of circle =?

Circumference of circle =?

To find area use formula:

Area = πr^2

Putting values

Area = $(3.14)(11.9cm)^2$

Area = $(3.14)141.61cm^2$

Area = 444.6554 cm^2

To find circumference use formula:

$C = 2\pi r$

Putting values

$C = 2(3.14)(11.9cm)$

$C = 6.28(11.9cm)$

Circumference = 74.732 cm

f) 23.3 cm

Sol. r = 23.3 cm

Sol. r = 23.3 cm

Area of circle =?

Circumference of circle =?

To find area use formula:

Area = πr^2

Putting values

Area = $(3.14)(23.3cm)^2$

Area = $(3.14)542.89cm^2$

Area = 1,704.6746 cm^2

To find circumference use formula:

$C = 2\pi r$

Putting values

$C = 2(3.14)(23.3cm)$

$C = 6.28(23.3cm)$

Circumference = 146.324 cm

Q3. Find the surface area and volume of cylinder for the following measurements of radius and height.

a) r = 3.3 cm, h = 13 cm

Sol. r = 3.3 cm, h = 13 cm

Surface area =?

Volume =?

To find surface area use formula:

Surface area = $2\pi r(h+r)$

Putting values

Surface area =

$2\times 3.14\times 3.3cm(13cm+3.3cm)$

Surface area =

$6.28\times 3.3cm(16.3cm)$

Surface area = $6.28\times 53.79cm^2$

Surface area = 337.8012 cm^2

To find volume use formula:

Volume = $\pi r^2 h$

Putting values

Volume = $3.14(3.3cm)^2(13cm)$

Volume = $3.14\times 10.89cm^2(13cm)$

Volume = $3.14\times 141.57cm^3$

Volume = 444.5298 cm^3

b) r = 9.3 cm, h = 20 cm

Sol. r = 9.3 cm, h = 20 cm

Surface area =?

Volume =?

To find surface area use formula:

Surface area = $2\pi r(h+r)$

Putting values

Surface area =

$2\times 3.14\times 9.3cm(20cm+9.3cm)$

Surface area =

$6.28\times 9.3cm(29.3cm)$

Surface area = $6.28\times 272.49cm^2$

Surface area = 1,711.2372 cm^2

To find volume use formula:

Volume = $\pi r^2 h$

Putting values

Volume = $3.14(9.3cm)^2(20cm)$

Volume = $3.14\times 86.49cm^2(20cm)$

Volume = $3.14\times 1729.8cm^3$

Volume = 5,431.572 cm^3

c) r = 4.2 cm, h = 12 cm

Sol. r = 4.2 cm, h = 12 cm

Surface area =?

Volume =?

To find surface area use formula:

Surface area = $2\pi r(h+r)$

Putting values

Surface area =

$2\times 3.14\times 4.2cm(12cm+4.2cm)$

Surface area =

$6.28\times 4.2cm(16.2cm)$

Surface area = $6.28\times 68.04cm^2$

Surface area = 427.2912 cm^2

To find volume use formula:

Volume = $\pi r^2 h$

Putting values

Volume = $3.14(4.2cm)^2(12cm)$

Volume = $3.14\times 17.64cm^2(12cm)$

Volume = $3.14\times 211.68cm^3$

Volume = 664.6752 cm^3

d) r = 5.3 cm, h = 9 cm

Sol. r = 5.3 cm, h = 9 cm

Surface area =?

Volume =?

To find surface area use formula:

Surface area = $2\pi r(h+r)$

Putting values

Surface area =

$2\times 3.14\times 5.3cm(9cm+5.3cm)$

Surface area =

$6.28\times 5.3cm(14.3cm)$

Surface area = $6.28\times 75.79cm^2$

Surface area = 475.9612 cm^2

To find volume use formula:

Volume = $\pi r^2 h$

Putting values

Volume = $3.14(5.3cm)^2(9cm)$

Volume = $3.14\times 28.09cm^2(9cm)$

Volume = $3.14\times 252.81cm^3$

Volume = 793.8234 cm^3

Q4. Radius of the circular ground is 78.3 cm. find the cost of fencing the ground at the rate of Rs.112/m^2.

Sol. Radius of the circular ground = r = 78.3 cm

Area of the ground =?

Using formula:

Area = πr^2 Putting values

Area = $3.14(78.3\,\text{cm})^2$

Area = $3.14\times 6,130.89cm^2$

Area = $19,250.9946cm^2$

Rate of fencing the ground = Rs.112/m^2

Cost of fencing the ground = 19,250.9946 × 112

Total cost =Rs.2, 156,111.4

Q5. Find the surface area of the cylinder whose radius is 5cm and height is 34 cm.

Sol. Radius = r =5 cm

Height = h = 34 cm

Surface area of cylinder =?

Using formula:

Surface area = $2\pi r(h+r)$

Putting values

Surface area =

$2\times 3.14\times 5cm(34cm+5cm)$

Surface area = $6.28\times 5cm(39cm)$

Surface area = 1,224.6 cm^2

Q6. A cylindrical decoration piece is to be made with fine steel. Find the area of steel required if the length of the decoration piece is to be 34cm and its diameter is 19cm.

Sol. Diameter = d = 19 cm

$r=\frac{d}{2}=\frac{19cm}{2}=9.5cm$

Length = height = h = 34 cm

Area of steel required =?

Using formula:

Surface area = $2\pi r(h+r)$

Putting values

Surface area =

$2\times 3.14\times 9.5cm(34cm+9.5cm)$

Surface area =

$6.28\times 9.5cm(43.5cm)$

Surface area = 2,595.21 cm^2

Q7. A room is 4.5m long, 3.5m wide and 3m high. Find the cost of cementing its walls and floor at the rate of Rs.28 per m^2.

Sol. Length = 4.5 m

Width = 3.5 m

Depth = 3 m

Surface area =?

Using formula:

Surface area =

$2[(l\times w)+(w\times h)+(h\times l)]$

Putting values

Surface area =

$2[(4.5\times 3.5)+(3.5\times 3)+(3\times 4.5)]$

Surface area =

$$2[15.75+10.5+13.5]$$

Surface area = $2[39.75m^2]$

Surface area = 79.5 m^2

Rate of cementing= Rs.28/m^2

Cost of cementing the total surface area = 79.5 × 28

Cost of cementing=Rs.2,226

Unit – 10
Distance, Time and Speed
Exercise – 10.1

Q1. Convert the following.

a) 3 m = ___ cm

Sol. 3 m into cm

As 1 m = 100 cm

So 3 m = 3 × 100 cm

3 m = 300 cm **Ans.**

b) 893 cm = ___ m ___ cm

Sol. 893 cm into m and cm

893 cm = 800 cm + 93 cm

893 cm = 8 m and 93 cm Ans.

c) 56m 8cm = ___ cm

Sol. 56 m 8 cm into cm

As 1 m = 100 cm

56 m = 56 × 100 cm =5600cm

So 56 m 8 cm = 5600cm+8cm

56 m 8 cm = 5608 cm Ans.

d) 10 km = ___ m

Sol. 10 km into m

As 1 km = 1000 m

So 10 km = 10,000 m Ans.

e) 101 cm = ___ m ____cm

Sol. 101 cm into m and cm

101 cm = 100 cm + 1 cm

As 100 cm = 1 m

101 cm = 1 m 1 cm

f) 18km 550 m = ___ m

Sol. 18 km 550 m into m

As 1 km = 1000 m

18 km = 18000 m

18 km 550 m = 18000 m+ 550 m

18 km 550 m = 18550 m Ans.

g) 50 cm = ___ mm

Sol. 50 cm into mm

As 1 cm = 10 mm

50 cm = 50 × 10 mm

50 cm = 500 mm **Ans.**

Exercise – 10.2

Q1. Express these times in the 24-hour clock format.

a) 7:45 a.m. 7:45p.m.

Sol. 7:45 a.m. 7:45p.m.

7:45 a.m. in 24-hours clock format = 07:45

7:45 p.m. in 24-hours clock format = 19:45

b) 12:00 a.m. 12:00 p.m.

Sol. 12:00 a.m. 12:00 p.m.

12:00 a.m. in 24-hours clock format = 00:00

12:00 p.m. in 24-hours clock format = 24:00

c) 4:15 a.m. 4:15 p.m.

Sol. 4:15 a.m. 4:15 p.m.

4:15 a.m. in 24-hours clock format = 04:15

4:15 p.m. in 24-hours clock format = 16:15

d) 5:22 a.m. 5:22 p.m.

Sol. 5:22 a.m. 5:22 p.m.

5:22 a.m. in 24-hours clock format = 05:22

5:22 p.m. in 24-hours clock format = 17:22

Q2. Tell the time in the 12-hour clock format,

a) 03:50

Sol. 03:50 in 12-hours clock format = 3:50 a.m.

b) 00:41

Sol. 00:41 in 12-hours clock format = 12:41 a.m.

c) 16:56

Sol. 16:56 in 12-hours clock format = 4:56 p.m.

d) 22:18

Sol. 22:18 in 12-hours clock format = 10:18 p.m.

Q3. Convert the following 24-hour clock times to 12-hour clock times.

a) 01:30 hours

Sol. 01:30 in 12-hours clock format = 1:30 p.m.

b) 15:32 hours

Sol. 15:32 in 12-hours clock format = 3:32 p.m.

c) 09:45 hours

Sol. 09:45 in 12-hours clock format = 9:45 a.m.

d) 00:10 hours

Sol. 00:10 in 12-hours clock format = 12:10 a.m.

Q4. Convert the following 12-hours clock times to 24-hour clock times.

a) 06:50 a.m.

Sol. 06:50 a.m. in 24-hours clock format = 0650 hours

b) 05:32 a.m.

Sol. 05:32 a.m. in 24-hours clock format = 0532 hours

c) 01:45 p.m.

Sol. 1:45 p.m. in 24-hours clock format = 1345 hours

d) 12:59 a.m.

Sol. 12:59 a.m. in 24-hours clock format = 1259 hours

Q5. Convert the following.

a) 2 hours 25 minutes to minutes

Sol. 2 hours 25 min to min

As 1 hour = 60 min

So 2 hours = 2 × 60 min

2 hours = 120 min

2 hours 25 min = 120 min + 25 min

2 hours 25 min = 145 min

b) 365 minutes to hours and minutes

Sol. 365 min to hours and minutes

1 hour = 60 min

1 min = $1 \div 60$ hour

365 min = (360 + 5) min

365 min = 360 min + 5 min

360 min = $360 \div 60$ = 6 hours

365 min = 6 hours 5 min

c) 19 minutes 25 seconds to seconds

Sol. 19 min 25 seconds to seconds

1 min = 60 sec

19 min = 19 × 60 sec

19 min = 1140 sec

19 min 25 sec = 1140 sec + 25 sec

19 min 25 sec = 1165 sec

d) 2 hours 20 minutes to minutes

Sol. 2 hours 20 min to min

1 hour = 60 min

2 hours = 120 min

2 hours 20 min = 120 min + 20 min

2 hours 20 min = 140 min

e) 465 seconds to minutes and seconds

Sol. 465 sec to min and sec

465 sec = 420 sec + 35 sec

420 sec = $420 \div 60$ = 7 min

465 sec = 7 min 35 sec

f) 3000 seconds to minutes and seconds.

Sol. 3000 sec to min and sec

60 sec = 1 min

3000 sec = $3000 \div 60$ = 50 min **Ans.**

Q6. Convert the speed into metres per second.

a) 65 km/hr

Sol. 65 km/hour into m/sec

As 1 km = 1000 m

1 hour = 3600 sec

$$65 \text{ km/hour} = 65 \times \frac{1000}{3600} \text{ m/sec}$$

$$65 \text{ km/hour} = 65 \times \frac{10}{36} \text{ m/sec}$$

65 km/hour= $\frac{650}{36}$ m/sec

65 km/hour = 18.05 m/sec

b) 123 km/hr

Sol. 123 km/hour into m/sec

As 1 km = 1000 m

1 hour = 3600 sec

123 km/hr= $123\times\frac{1000}{3600}$ m/sec

123 km/hour= $123\times\frac{10}{36}$ m/sec

123 km/hour= $\frac{1230}{36}$ m/sec

123 km/hour = 34.17 m/sec

c) 72 km/hr

Sol. 72 km/hour into m/sec

As 1 km = 1000 m

1 hour = 3600 sec

72 km/hour= $72\times\frac{1000}{3600}$ m/sec

72 km/hour= $72\times\frac{10}{36}$ m/sec

72 km/hour= $\frac{720}{36}$ m/sec

72 km/hour = 20 m/sec

d) 128 km/hr

Sol. 128 km/hour into m/sec

As 1 km = 1000 m

1 hour = 3600 sec

128 km/hr= $128\times\frac{1000}{3600}$ m/sec

128 km/hour= $128\times\frac{10}{36}$ m/sec

128 km/hour= $\frac{1280}{36}$ m/sec

128 km/hour = 35.56 m/sec

e) 323 km/hr

Sol. 323 km/hour into m/sec

As 1 km = 1000 m

1 hour = 3600 sec

323 km/hr= $323\times\frac{1000}{3600}$ m/sec

323 km/hour= $323\times\frac{10}{36}$ m/sec

323 km/hour= $\frac{3230}{36}$ m/sec

323 km/hour = 89.73 m/sec

f) 1221 km/hr

Sol. 1221 km/hour into m/sec

As 1 km = 1000 m

1 hour = 3600 sec

1221 km/hour= $1221\times\frac{1000}{3600}$ m/sec

1221 km/hour= $1221\times\frac{10}{36}$ m/sec

1221 km/hour= $\frac{12210}{36}$ m/sec

1221 km/hour = 339.167 m/sec Ans.

Q7. Convert the speed into kilometre per hour.

a) 23 m/sec

Sol. 23 m/sec into km/hour

As 1 m = $\frac{1}{1000}km$

1 sec = $\frac{1}{3600}hour$

To convert m/sec into km/hour multiply with $\frac{3600}{1000}$

23 m/sec = $23\times\frac{3600}{1000}$ km/hr

23 m/sec = $23\times\frac{36}{10}$ km/hour

23 m/sec = 23×3.6 km/hour

23 m/sec = 82.8 km/hour

b) 12 m/sec

Sol.12 m/sec into km/hour

As 1 m = $\frac{1}{1000}km$

1 sec = $\frac{1}{3600} hour$

To convert m/sec into km/hour

multiply with $\frac{3600}{1000}$

12 m/sec = $12 \times \frac{3600}{1000}$ km/hr

12 m/sec = $12 \times \frac{36}{10}$ km/hour

12 m/sec = 12×3.6 km/hour

12 m/sec = 43.2 km/hour

c) 7 m/sec

Sol. 7 m/sec into km/hour

As 1 m = $\frac{1}{1000} km$

1 sec = $\frac{1}{3600} hour$

To convert m/sec into km/hour

multiply with $\frac{3600}{1000}$

7 m/sec = $7 \times \frac{3600}{1000}$ km/hr

7 m/sec = $7 \times \frac{36}{10}$ km/hour

7 m/sec = 7×3.6 km/hour

7 m/sec = 25.2 km/hour

d) 17 m/sec

Sol.17 m/sec into km/hour

As 1 m = $\frac{1}{1000} km$

1 sec = $\frac{1}{3600} hour$

To convert m/sec into km/hour

multiply with $\frac{3600}{1000}$

17 m/sec = $17 \times \frac{3600}{1000}$ km/hr

17 m/sec = $17 \times \frac{36}{10}$ km/hour

17 m/sec = 17×3.6 km/hour

17 m/sec = 61.2 km/hour

e) 35 m/sec

Sol.35 m/sec into km/hour

As 1 m = $\frac{1}{1000} km$

1 sec = $\frac{1}{3600} hour$

To convert m/sec into km/hour

multiply with $\frac{3600}{1000}$

35 m/sec = $35 \times \frac{3600}{1000}$ km/hr

35 m/sec = $35 \times \frac{36}{10}$ km/hour

35 m/sec = 35×3.6 km/hour

35 m/sec = 126 km/hour

f) 3 m/sec

Sol.3 m/sec into km/hour

As 1 m = $\frac{1}{1000} km$

1 sec = $\frac{1}{3600} hour$

To convert m/sec into km/hour

multiply with $\frac{3600}{1000}$

3 m/sec = $3 \times \frac{3600}{1000}$ km/hr

3 m/sec = $3 \times \frac{36}{10}$ km/hour

3 m/sec = 3×3.6 km/hour

3 m/sec = 10.8 km/hour

Q8. Convert the speed into centimetre per second.

a) 670 m/hr

Sol. 670 m/hour into centimetre per sec

As 1 m = 100 cm

1 hour = 3600 seconds

To convert m/hour into cm/sec

multiply with $\frac{100}{3600}$

670 m/hour = $670 \times \frac{100}{3600}$ cm/sec

670 m/hour = $670 \times \frac{1}{36}$ cm/sec

670 m/hour = $\frac{670}{36}$ cm/sec

670 m/hour = 18.62 cm/sec

b) 590 m/hr

Sol. 590 m/hour into centimetre per second

As 1 m = 100 cm

1 hour = 3600 seconds

To convert m/hour into cm/sec

multiply with $\frac{100}{3600}$

590 m/hour = $590 \times \frac{100}{3600}$ cm/sec

590 m/hour = $590 \times \frac{1}{36}$ cm/sec

590 m/hour = $\frac{590}{36}$ cm/sec

590 m/hour = 16.389 cm/sec

c) 499 m/hr

Sol. 499 m/hour into centimetre per second

As 1 m = 100 cm

1 hour = 3600 seconds

To convert m/hour into cm/sec

multiply with $\frac{100}{3600}$

499 m/hour = $499 \times \frac{100}{3600}$ cm/sec

499 m/hour = $499 \times \frac{1}{36}$ cm/sec

499 m/hour = $\frac{499}{36}$ cm/sec

499 m/hour = 13.86 cm/sec

d) 184 m/hr

Sol. 184 m/hour into centimetre per second

As 1 m = 100 cm

1 hour = 3600 seconds

To convert m/hour into cm/sec

multiply with $\frac{100}{3600}$

184 m/hour = $184 \times \frac{100}{3600}$ cm/sec

184 m/hour = $184 \times \frac{1}{36}$ cm/sec

184 m/hour = $\frac{184}{36}$ cm/sec

184 m/hour = 5.12 cm/sec

Q9. Convert the speed into metre per hours.

a) 199 cm/sec

Sol. 199 cm/sec into m/hour

As 1 cm = $\frac{1}{100} m$

1 sec = $\frac{1}{3600} hour$

To convert cm/sec into m/hour

multiply with $\frac{3600}{100}$

199 cm/sec = $199 \times \frac{3600}{100}$ m/hour

199 cm/sec = 199×36 m/hour

199 cm/sec = 7,164 m/hour

b) 345 cm/sec

Sol. 345 cm/sec into m/hour

As 1 cm = $\frac{1}{100} m$

1 sec = $\frac{1}{3600} hour$

To convert cm/sec into m/hour

multiply with $\frac{3600}{100}$

345 cm/sec = $345 \times \frac{3600}{100}$ m/hour

345 cm/sec = 345×36 m/hour

345 cm/sec = 12,420 m/hour

c) 21 cm/sec

Sol. 21 cm/sec into m/hour

As 1 cm = $\frac{1}{100} m$

1 sec = $\frac{1}{3600} hour$

To convert cm/sec into m/hour

multiply with $\frac{3600}{100}$

21 cm/sec = $21 \times \frac{3600}{100}$ m/hour

21 cm/sec = 21×36 m/hour

21 cm/sec = 756 m/hour

d) 99 cm/sec

Sol. 99 cm/sec into m/hour

As 1 cm = $\frac{1}{100} m$

1 sec = $\frac{1}{3600} hour$

To convert cm/sec into m/hour

multiply with $\frac{3600}{100}$

99 cm/sec = $99 \times \frac{3600}{100}$ m/hour

99 cm/sec = 99×36 m/hour

99 cm/sec = 3,564 m/hour

Exercise – 10.3

Q1. A bus started its journey from Lahore at 10:25 and reached Islamabad at 14:40. How long did it take to reach Islamabad?

Sol. Departure time = 10:25

Arrival time = 14:40

Journey time = Arrival time – Departure time

Journey time = 14:40 – 10:25

Journey time = 04:15

4 hours and 15 min **Ans.**

Q2. Taalba went to the Allama Iqbal Museum, Lahore with her classmates. She reached the museum at 10:45 and spent 3 hours 40 minutes there. What time did she leave the museum?

Sol. Arrival time = 10:45

Time spent = 3 hour 40 min

Departure time = Arrival time + Time spent

Departure time= 10:45+ 3:40

Departure time = 14:25

14:25 or 2:25 p.m. **Ans.**

Q3. Complete the table.

Departure time	Arrival time	Time of journey
1:01 a.m.		5 hrs 15 min
	7:20 p.m.	11 hrs 2 min
8:55 p.m.	6:20 a.m.	
10:40 a.m.		5 hrs 50 min

Sol.

a. Departure time = 1:01 a.m.

Time of journey = 5 hours 15 min

Arrival time = Departure time + time of journey

Arrival time = 1 hour 1 min + 5 hours 15 min

Arrival time = 6 hours 16 min

Arrival time = 6:06 a.m.

b. Arrival time = 7:20 p.m.

Time of journey = 11 hours 2 min

Departure time = Arrival time – time of journey

Departure time = 7:20 p.m. – 11 hours 2 min

Departure time = 19:20 – 11:02

Departure time = 8:18 a.m.

c. Arrival time = 6:20 a.m.

Departure time = 8:55 p.m.
Time of journey = Arrival time – Departure time
Time of journey = 6:20 – 8:55
Time of journey = 18:20 – 8:55
Time of journey = 9:25
Time of journey = 9 hours 25 minutes

d. Departure time = 10:40 a.m.
Time of journey = 5 hours 50 minutes
Arrival time = Departure time + time of journey
Arrival time = 10:40 + 5:50
Arrival time = 16:30
Arrival time = 4:30 p.m.

Departure time	Arrival time	Time of journey
1:01 a.m.	6:06 a.m.	5 hrs 15 min
8:18 a.m.	7:20 p.m.	11 hrs 2 min
8:55 p.m.	6:20 a.m.	9 hrs 25 min.
10:40 a.m.	4:30 p.m.	5 hrs 50 min

Q4. The journey time from Multan to Karachi is 10 hours 45 minutes. If Asad departure started at 6:45 a.m. At what time he reached to Karachi.

Sol. Time of journey = 10 hours 45 minutes
Departure time = 6:45 a.m.
Arrival time = Departure time + time of journey
Arrival time = 6:45 + 10:45
Arrival time = 17:30 hours
Arrival time = 5:30 p.m.

Q5. Rabia started its journey at 4:25 a.m. On Monday and reach at 7:20 p.m. on Tuesday from city A to city B by train. How much time she spent in journey?

Sol. Departure time = 4:25 a.m. On Monday
Arrival time = 7:20 p.m. On Tuesday
Time of journey =?
On Tuesday at 4:25 a.m. it completes 24 hours
Now we calculate the time between 4:25 a.m. and 7:20 p.m.
Time of journey = Departure time – Arrival time
Time of journey = 7: 20 p.m. – 4:25 a.m.
Time of journey = 19:20 – 4:25
Time of journey = 14:55
Time of journey = 14 hours 55 min
Now adding 24 hours
24 hours + 14 hours 55 min
38 hours 55 minutes **Ans.**

Q6. Ahmad goes from Lahore to Islamabad and then goes from Islamabad to Murree at 7:28 a.m. If he spends 6 hours and 49 minutes in journey. Find the time of departure of Ahmad from Lahore?

Sol. Arrival time to Islamabad = 7:28 a.m.
Time of journey = 6 hours 49 minutes
Departure time from Lahore = Arrival time to Islamabad + Time of journey
Departure time = 7:28 + 6 hours 49 min
Departure time from Lahore = 14:17
Departure time form Lahore = 2:17 p.m. **Ans.**

Exercise – 10.4

Q1. Rizwan covered distance of 125 km in 2 hours on bike. Find the average speed.

Sol. Distance covered = 125 km
Time taken = 2 hours
Average speed = $125 \div 2$
Average speed = 62.5 km/hour **Ans.**

Q2. Hadia covered a distance of 640 km by car in 8 hours. Find the average speed.

Sol. Distance covered = 640 km
Time taken = 8 hours

Average speed = $640 \div 8$

Average speed = 80 km/hour

Q3. If the total distance covered in 7 hours is 12 km. what is the average speed?

Sol. Distance covered = 12 km

Time taken = 7 hours

Average speed = $12 \div 7$

Average speed = 1.7 km/hour

Q4. A train covered a distance of 200 kilometer per hours for first 3 hours and then its speed changed and it covered a distance of 150 km per hour for the next 5 hours. Find the average speed of the train.

Sol. 1st Distance = 200 km

Time taken = 3 hours

Distance travelled = 200 × 3

Distance travelled = 600 km

2nd Distance = 150 km

Time taken = 5 hours

Distance travelled = 150 × 5

Distance travelled = 750 km

Total distance travelled = 600 + 750 = 1350 km

Total time taken = 3 + 5 = 8 hours

Average speed = $1350 \div 8$

Average speed = 168.75 km/hour **Ans.**

Q5. A car covered a distance at a speed of 109 km/hour for 5 hours and then at a speed of 100 km/hour for 2 hours. Calculate the average speed of the car.

Sol. 1st Distance = 109 km

Time taken = 5 hours

Distance travelled = 109 × 5

Distance travelled = 545 km

2nd Distance = 100 km

Time taken = 2 hours

Distance travelled = 100 × 2

Distance travelled = 200 km

Total distance travelled = 545 + 200 = 745 km

Total time taken = 5 + 2 = 7 hours

Average speed = $745 \div 7$

Average speed = 106.43 km/hour **Ans.**

Exercise – 10.5

Q1. A plane covers 535760 meters in 8500 seconds. What is the speed of the plane? Also convert the speed to km/hr.

Sol. Distance = 535760 m

Time taken = 8500 sec

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{Speed} = \frac{535760}{8500} \text{ m/sec}$$

Speed = 63.03 m/sec

Now to convert m/sec into km/hour multiply with $\frac{3600}{1000}$

$$\text{Speed in km/hour} = 63.03 \times \frac{3600}{1000}$$

km/hour

$$\text{Speed in km/hour} = 63.03 \times \frac{36}{10}$$

km/hour

Speed in km/hour = 63.03×3.6 km/hour

Speed in km/hour = 226.91 km/hour **Ans.**

Q2. Afnan is going to school on his cycle. If the covers the distance of 6 km in 35 minutes, find his speed.

Sol. Total distance = 6 km

Time taken = 35 minutes

As 1 min = $\frac{1}{60} hour$

Time taken = $35 \times \frac{1}{60} hour$

Time taken = 0.5834 hour

Speed =?

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

Speed = $\frac{6}{0.5834} km / hour$

Speed = 10.2845 km/hour

Q3. How long does a bus take to cover a distance of 1520 km at a speed of 100 km/hr?

Sol. Distance = 1520 km

Speed = 100 km/hour

Time taken =?

Time taken = $\frac{\text{distance}}{\text{speed}}$

Time taken = $\frac{1520km}{100km / hour}$

Time taken =15.2 hours

Time taken = 15 hours 0.2 hours

Time taken = 15 hours 0.2 × 60 min

Time taken = 15 hours 12 min **Ans.**

Q4. A car moves at aspeed of 8250 m/sec. how far will it travel in 2 hours?

Sol. Speed = 8250 m/sec

Time taken = 2 hours = 2 × 60 sec = 120 seconds

Distance covered =?

Distance covered = speed × time taken

Distance covered = 8250 × 120

Distance covered = 990,000 meter

Or 990 km **Ans.**

Q5. A train leaves one station at 1:00 p.m. and reached the other station at 6:00 p.m. If the distance between two stations is 432 km, find the speed of the train.

Sol. Departure time = 1:00 p.m.

Arrival time = 6:00 p.m.

Time of journey =6:00 – 1: 00

Time of journey = 5 hours

Distance = 432 km

Speed = $\frac{\text{distance}}{\text{time}}$

Speed = $\frac{432}{5} km / hour$

Speed = 86.4 km/hour **Ans.**

Q6. Amir covered 5 km by walking for 3 hours. Find the distance he can travel in 30 minutes.

Sol. Distance = 5 km

Time = 3 hours

Speed = $\frac{\text{distance}}{\text{time}}$

Speed = $\frac{5}{3} km / hour$

Speed = 1.67 km/hour

Now to find distance travelled in 30 minutes, convert 30 minutes into hours

1 min = $\frac{1}{60} hour$

30 min = $30 \times \frac{1}{60} hour$

30 min = 0.5 hour

Distance covered in 0.5 hour:

Distance covered = 0.5 × 1.67

Distance covered = 0.834 km

Q7. A tourist climbed a 45 metre high hill in 15 minutes. How long will he take to climb a 90 meter high hill?

Sol. Distance = 45 m

Time taken = 15 min

Speed = $\frac{\text{distance}}{\text{time}}$

Speed = $\frac{45}{15} m / \min$

Speed = 3 meter per min

Now time required for 90 meter distance

Time required = $\frac{90meter}{3meter / \min}$

Time required = 30 min **Ans.**

Q8. A bus covers 312 km in 4 hours. How much distance will it cover in 8 hours?

Sol. Distance = 312 km
Time taken = 4 hours

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{Speed} = \frac{312}{4} km/hour$$

Speed = 78 km/hour
Now distance covered in 8 hours:
Distance covered = speed × time
Distance covered = 78 × 8
Distance covered = 624 km/hour **Ans.**

Q9. A truck covers a distance in 12 hours with a speed of 102 km/hr. in how much time will it cover the same distance if its speed is decreased to 96 km/hr?

Sol. Time = 12 hours
Speed = 102 km/hour
Distance = Speed × Time
Distance = 102 × 12
Distance = 1224 km
Time required to cover the same distance:
New speed = 96 km/hour
Distance = 1224 km

$$\text{Time required} = \frac{\text{distance}}{speed}$$

$$\text{Time required} = \frac{1224}{96} \text{ km/hr}$$

Time required = 12.75 km/hour **Ans.**

Review Exercise – 10

Q1. Choose the correct option.

a) The number of minutes in 5 hours is ___
   i. 360
   ii. 180
   iii. 240
   iv. **300**

b) There are ____ metres in 500 cm.
   i. **5**
   ii. 50
   iii. 500
   iv. 5000

c) To convert speed from km/hour to metre per hours multiply it by:
   i. 100
   ii. 10
   iii. **1000**
   iv. 1

d) The same distance covered in same time is called ____
   i. Distance
   ii. **Uniform speed**
   iii. Average speed
   iv. Time

e) The duration in which all things happen is called:
   i. **Time**
   ii. Speed
   iii. Distance
   iv. Proportion

f) Speed = ____
   i. $\frac{\text{distance}}{\text{time}}$
   ii. $\frac{\text{time}}{\text{distance}}$
   iii. Distance × time
   iv. Time × time

Q2. Convert the following unit of distance.

a) 8 m into cm

Sol. 8 m into cm
As 1 m = 100 cm
8 m = 8 × 100 cm
8 m = 800 cm **Ans.**

b) 5 km 70m into m

Sol. 5 km 70m into m
As 1 km = 1000 m
5 km = 5000 m
5 km 70 m = 5000 m + 70 m
5 km 70 m = 5070 m **Ans.**

c) 110 cm into mm

Sol. 110 cm into mm
As 1 cm = 10 mm

So 110 cm = 110 × 10 mm
110 cm = 1100 mm ans.

d) 50m 6cm into cm

Sol. 50m 6cm into cm
As 1 m = 100 cm
So 50 m = 500 cm
50 m 6 cm = 500 cm + 6 cm
50 m 6 cm = 506 cm **Ans.**

e) 44km into m

Sol. 44km into m
As 1 km = 1000 m
44 km = 44000 m **Ans.**

f) 3m 15cm into cm

Sol. 3m 15cm into cm
As 1 m = 100 cm
3 m = 300 cm
3 m 15 cm = 300 cm + 15 cm
3 m 15 cm = 315 cm **Ans.**

g) 56000m into km

Sol. 56000m into km

$$\text{As 1 m} = \frac{1}{1000} km$$

$$56000 \text{ m} = \frac{56000}{1000} km$$

56000 m = 56 km **Ans.**

h) 96314m into km and m

Sol. 96314m into km and m

$$\text{As 1 m} = \frac{1}{1000} km$$

$$96314 \text{ m} = \frac{96314}{1000} km$$

96314 m = 96 km 314 m

i) 99mm into cm and mm

Sol. 99mm into cm and mm

$$1 \text{ mm} = \frac{1}{10} cm$$

$$99 \text{ mm} = \frac{99}{10} cm$$

99 mm = 9 cm 9 mm **Ans.**

Q3. Convert the following unit of time.

a) 2 hours 25 minutes into minutes.

Sol. 2 hours 25 minutes into minutes.
As 1 hour = 60 min
2 hours = 120 min
2 hours 25 min = 120 min + 25 min
2 hours 25 min = 145 min

b) 255 minutes into hours and minutes.

Sol. 255 minutes into hours and minutes.

$$\text{As 1 min} = \frac{1}{60} hour$$

$$255 \text{ min} = \frac{255}{60} hour$$

255 min = 4 hours 15 min

c) 880 seconds to minutes and seconds

Sol. 880 seconds to minutes and seconds

$$\text{As 1 sec} = \frac{1}{60} \text{min}$$

$$880 \text{ sec} = \frac{880}{60} \text{min}$$

880 sec = 14 min 40 min

d) 360 minutes to hoursand minutes

Sol. 360 minutes to hours and minutes

$$\text{As 1 min} = \frac{1}{60} hour$$

$$360 \text{ min} = \frac{360}{60} hour$$

360 min = 6 hours. **Ans.**

Q4. Convert the speed.

a) 849m/hr to km/hr

Sol. 849m/hr to km/hr
To change m/hour to km/hour multiply by $\frac{1}{1000}$

$$849 \text{ m/hour} = 849 \times \frac{1}{1000}$$

849 m/hour = 0.849 km/hour

b) 450m/hr to cm/sec

Sol. 450m/hr to cm/sec

To change m/hour to cm/sec multiply 450 with $\frac{100}{3600}$

$$450 \text{ m/hour} = 450 \times \frac{100}{3600}$$

450 m/hour = 12.5 cm/sec

c) 124cm/sec to m/hr

Sol. 124cm/sec to m/hr

To convert cm/sec into m/hour multiply 124 with $\frac{3600}{100}$

$$124 \text{ cm/sec} = 124 \times \frac{3600}{100}$$

124 cm/sec = 124 × 36 m/hour

124 cm/sec = 4,464 m/hour

Q5. Amir departure time is 11:57 a.m. from city A and he reached to city B at 1:22 p.m. Find the total time of his journey?

Sol. Departure time = 11:57 a.m.

Arrival time = 1:22 p.m.

Time of journey = arrival time – Departure time

Time of journey = 1:22 – 11:57

In 24-hours clock format

Time of journey = 13:22 – 11:57

Time of journey = 01:25

Time of journey = 1 hour 25 minutes **Ans.**

Q6. Find the average speed of bus if the total distance it covered in 10 hours is 560 km.

Sol. Distance = 560

Time = 10 hours

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{Speed} = \frac{560}{10} km/hour$$

Speed = 56 km/hour **Ans.**

Unit – 11

Quadrilateral, Polygon and Circles

Exercise – 11.1

Q1. Draw and describe the properties of the following quadrilaterals based on parallel sides, equal sides, equal angles, right angles, lines of symmetry etc.

a) Square

Sol. A square has 4 sides and 4 angles. ABCD is a square.

Sides: AB, BC, CD and DA are the 4 sides of the square. All the four sides of square are equal in length.

$$AB = BC = CD = DA$$

Angles: $\angle ABC, \angle BCD, \angle CDA$ and $\angle DAB$ are the four angles of this square. All the 4 angles of a square are right angles.

$$\angle ABC = \angle BCD = \angle CDA = \angle DAB = 90^0$$

Sum of all angles of square is equal to 360^0.

Parallel line: In square, opposite sides are parallel. $AB \parallel CD$ and $BC \parallel DA$.

Perpendicular lines: All sides are perpendicular to each other.

$$AB \perp BC,\ BC \perp CD$$

$$CD \perp DA,\ DA \perp AB$$

Line of symmetry: there are six line of symmetry in a square.

b) Rectangle

Sol. A rectangle has 4 sides and 4 angles. ABCD is a rectangle.

Sides: AB, BC, CD and DA are the 4 sides of the rectangle. Opposite sides of rectangle are equal in length.

$AB = CD,\ BC = DA$

Angles: $\angle ABC, \angle BCD, \angle CDA$ and $\angle DAB$ are the four angles of this rectangle. Opposite angles of a rectangle are equal to right angles.

$\angle ABC = \angle CDA = 90^0$

$\angle BCD = \angle DAB = 90^0$

Sum of all angles of rectangle is equal to 360^0.

Parallel line: In rectangle, opposite sides are parallel. $AB \| CD$ and $BC \| DA$.

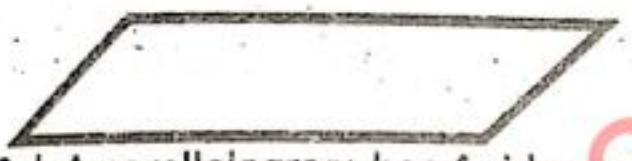
Perpendicular lines: All sides are perpendicular to each other.

$AB \perp BC,\ BC \perp CD$

$CD \perp DA,\ DA \perp AB$

Line of symmetry: there are two line of symmetry in a rectangle.

c) Parallelogram



Sol. A parallelogram has 4 sides and 4 angles. ABCD is a parallelogram.

Sides: AB, BC, CD and DA are the 4 sides of the parallelogram. Opposite sides of parallelogram are equal in length.

$AB = CD,\ BC = DA$

Angles: $\angle ABC, \angle BCD, \angle CDA$ and $\angle DAB$ are the four angles of this parallelogram. Opposite angles of a parallelogram are equal. None of them is right angle.

$\angle ABC = \angle CDA$

$\angle BCD = \angle DAB$

Sum of opposite angle is 180^0

$\angle ABC + \angle CDA = 180^0$

$\angle BCD + \angle DAB = 180^0$

Sum of all angles of parallelogram is equal to 360^0.

Parallel line: In parallelogram, opposite sides are parallel. $AB \| CD$ and $BC \| DA$.

Perpendicular lines: None of the side is perpendicular to each other.

$AB \not\perp BC,\ BC \not\perp CD$

$CD \not\perp DA,\ DA \not\perp AB$

Line of symmetry: There is no line of symmetry in a parallelogram.

d) Rhombus

Sol. A rhombus has 4 sides and 4 angles. ABCD is a rhombus.

Sides: AB, BC, CD and DA are the 4 sides of the rhombus. All sides of rhombus are equal in length.

$AB = BC = CD = DA$

Note: A rhombus is a parallelogram with all four sides equal.

Angles: $\angle ABC, \angle BCD, \angle CDA$ and $\angle DAB$ are the four angles of this rhombus. Opposite angles of a rhombus are equal. None of them is right angle.

$\angle ABC = \angle CDA$

$\angle BCD = \angle DAB$

Sum of opposite angle is 180^0

$\angle ABC + \angle CDA = 180^0$

$\angle BCD + \angle DAB = 180^0$

Sum of all angles of rhombus is equal to 360^0.

Parallel line: In rhombus, opposite sides are parallel. $AB \| CD$ and $BC \| DA$.

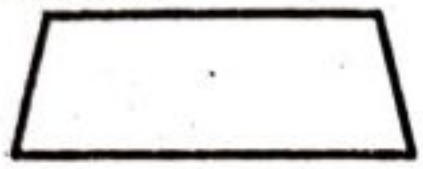
Perpendicular lines: None of the side is perpendicular to each other.

$AB \not\perp BC,\ BC \not\perp CD$

$CD \not\perp DA,\ DA \not\perp AB$

Line of symmetry: There aretwo lines of symmetry in a rhombus.

e) Trapezium



Sol. A trapezium has 4 sides and 4 angles. ABCD is a trapezium.

Sides: AB, BC, CD and DA are the 4 sides of the trapezium. All sides of rhombus are unequal in length.

$AB \neq BC \neq CD \neq DA$

Angles: $\angle ABC, \angle BCD, \angle CDA$ and $\angle DAB$ are the four angles of this trapezium. Sum of each pair of angles between two parallel lines is equal to 180^0.

Sum of all angles of trapezium is equal to 360^0.

$\angle BAC + \angle ADC = 180^0$.

$\angle ABC + \angle DCB = 180^0$

Parallel line: Trapezium has one pair of parallel sides opposite to each other.

$AB \parallel CD$.

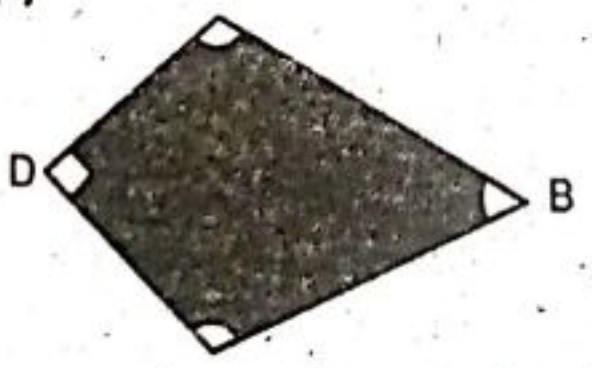
Perpendicular lines: None of the side is perpendicular to each other.

$AB \not\perp BC,\ BC \not\perp CD$

$CD \not\perp DA,\ DA \not\perp AB$

Line of symmetry: There is no line of symmetry in a trapezium except isosceles trapezium, which has one line of symmetry.

f)



Sol. A kite has 4 sides and 4 angles. ABCD is a kite.

Sides: AB, BC, CD and DA are the 4 sides of the kite. Both pairs of distinct adjacent sides are equal in length.

$CD = DA \text{ and } AB = BC$

Angles: $\angle ABC, \angle BCD, \angle CDA$ and $\angle DAB$ are the four angles of this kite. Only one pair of opposite angles are equal to each other. Sum of all angles of kite is equal to 360^0.

Parallel line: kite has no pair of parallel sides..

Perpendicular lines: None of the side is perpendicular to each other.

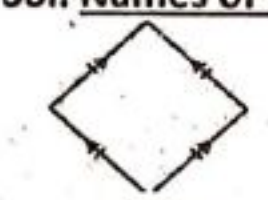
$AB \not\perp BC,\ BC \not\perp CD$

$CD \not\perp DA,\ DA \not\perp AB$

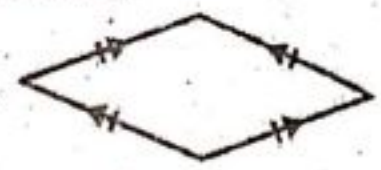
Line of symmetry: There is only one line of symmetry in a kite.

Q2. Name the following figures.

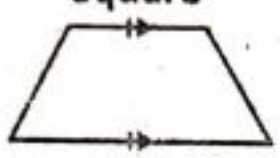
Sol. Names of the figures:



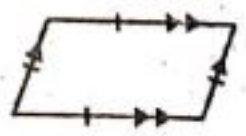
Square



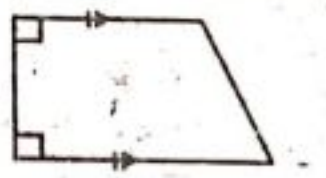
Rhombus



Trapezium



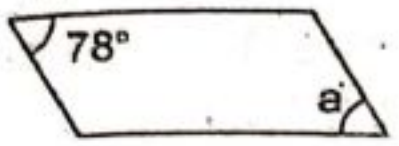
Parallelogram



Isosceles Trapezium

Q3. Find the unknown marked angles in the following parallelograms.

a)

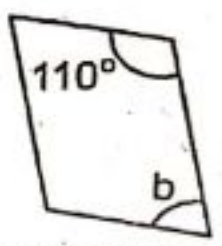


Sol. From the figure

Given angle = 78^0 is opposite to $\angle a$. So these angles will be equal. Because in parallelogram opposite angle are equal.

Thus $\angle a = 78^0$

b)



Sol. From the figure

The given angle = 110^0 and the adjacent angle is $\angle b$

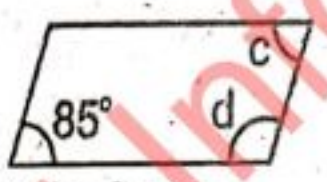
In parallelogram, adjacent angles are supplementary.

$$\angle b + 110^0 = 180^0$$

$$\angle b = 180^0 - 110^0$$

$$\angle b = 70^0$$

c)



Sol. From the figure

The given angle = 85^0 and the adjacent angle is $\angle d$ while the opposite angle is $\angle c$

In parallelogram, opposite angle are equal in measure.

So $\angle c = 85^0$

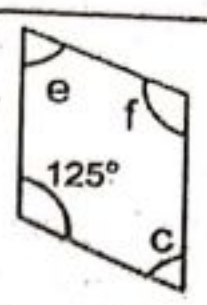
In parallelogram, adjacent angles are supplementary.

$$\angle d + 85^0 = 180^0$$

$$\angle d = 180^0 - 85^0$$

$$\angle d = 95^0$$

d)



Sol. From the figure

The given angle = 125^0 and the adjacent angle is $\angle g$ while the opposite angle is $\angle f$

In parallelogram, adjacent angles are supplementary.

$$\angle g + 125^0 = 180^0$$

$$\angle g = 180^0 - 125^0$$

$$\angle g = 55^0$$

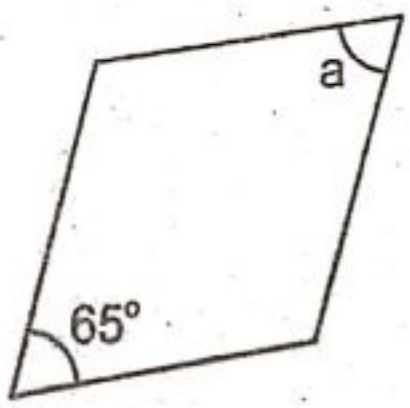
In parallelogram, opposite angle are equal in measure.

So $\angle f = 125^0$

And $\angle g = \angle e = 55^0$

Q4. Find the unknown marked angles in each of these rhombuses.

a)



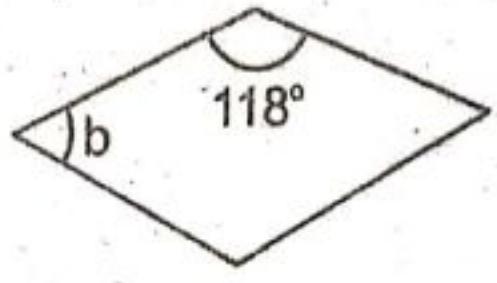
Sol. From the figure

The given angle = 65^0 and the opposite angle is $\angle a$

As we know that opposite angles of rhombus are equal in measure.

So $\angle a = 65^0$

b)



Sol. From the figure

The given angle = 118^0 and the adjacent angle is $\angle b$

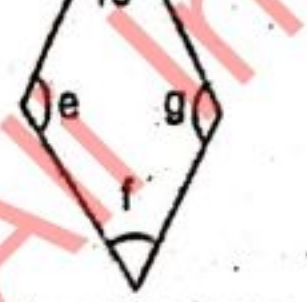
As we know that adjacent angles of rhombus are equal to 180^0.

$$\angle b+118^0=180^0$$

So $$\angle b=180^0-118^0$$

$$\angle b=62^0$$

c)



Sol. From the figure

The given angle = 60^0 and the adjacent angle is $\angle c$ while opposite angle $\angle d$

As we know that adjacent angles of rhombus are equal to 180^0.

$$\angle c+60^0=180^0$$

So $$\angle c=180^0-60^0$$

$$\angle c=120^0$$

Also opposite angles are equal.

$$\angle d=60^0$$

d)

Sol. From the figure

The given angle = 15^0 and the adjacent angle is $\angle e$ while opposite angle $\angle f$

As we know that adjacent angles of rhombus are equal to 180^0.

$$\angle e+15^0=180^0$$

So $$\angle e=180^0-15^0$$

$$\angle e=165^0$$

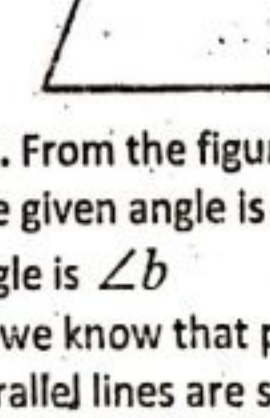
Also opposite angles are equal.

$$\angle e=\angle g=165^0$$

$$\angle f=15^0$$

Q5. Find the unknown marked angles in each of these trapeziums.

a)



Sol. From the figure

The given angle is 90^0 and the adjacent angle is $\angle a$

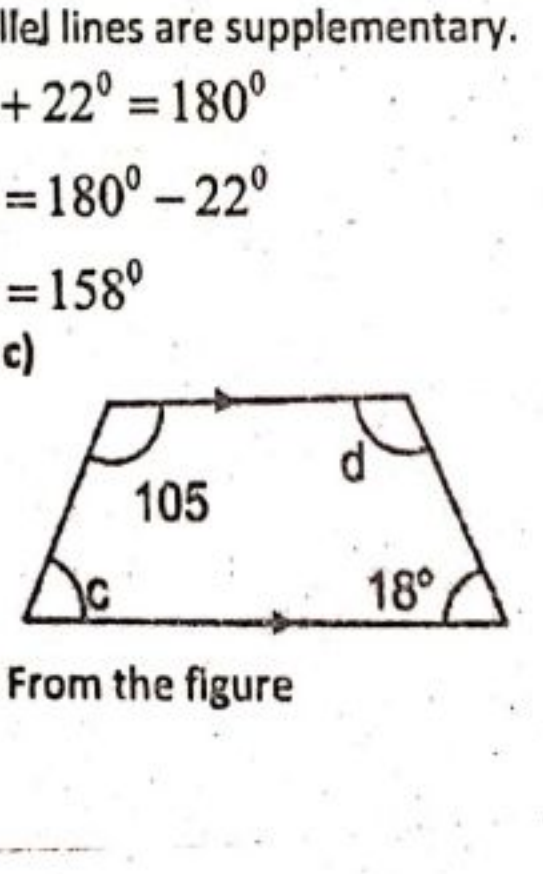
As we know that pair of angles between parallel lines are supplementary.

$$\angle a+90^0=180^0$$

$$\angle a=180^0-90^0$$

$$\angle a=90^0$$

b)



Sol. From the figure

The given angle is 22^0 and the adjacent angle is $\angle b$

As we know that pair of angles between parallel lines are supplementary.

$$\angle b+22^0=180^0$$

$$\angle b=180^0-22^0$$

$$\angle b=158^0$$

c)

Sol. From the figure

The given angle is 105^0 and 18^0 the adjacent angles are $\angle c$ *and* $\angle d$ respectively.

As we know that pair of angles between parallel lines are supplementary.

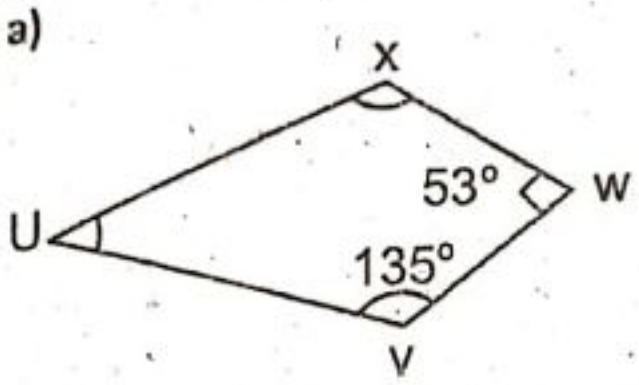
$\angle c+105^0=180^0$ $\angle d+18^0=180^0$

$\angle c=180^0-105^0$ $\angle d=180^0-18^0$

$\angle c=75^0$ $\angle d=162^0$

Q6. Find the unknown angles in these kites.

a)



Sol. From the figure

$\angle W=53^0, \angle V=135^0$

$\angle$U is opposite to $\angle W$

$\angle X$ is opposite to $\angle V$

In the given Kite:

Pair of angles which are equal are:

$\angle X=\angle V$

As $\angle V=135^0$ *so* $\angle X=135^0$

Now we find $\angle U$

Sum of all angles of Kite = 360^0

$\angle U+\angle V+\angle W+\angle X=360^0$

Putting values

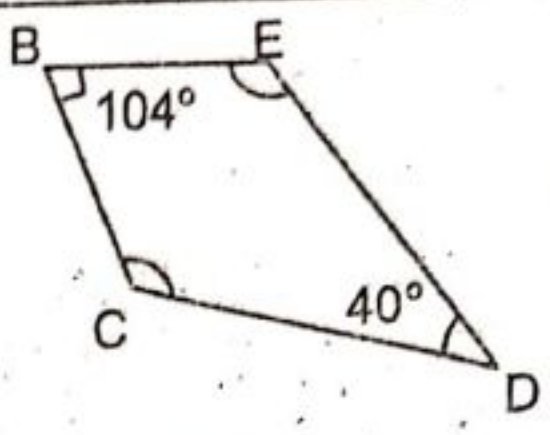
$\angle U+135^0+53^0+135^0=360^0$

$\angle U+323^0=360^0$

$\angle U=360^0-323^0$

$\angle U=37^0$

b)



Sol. From the figure

$\angle B=104^0, \angle D=40^0$

$\angle B$ is opposite to $\angle D$

$\angle E$ is opposite to $\angle C$

In the given Kite:

Pair of angles which are equal are:

$\angle E=\angle C$

Sum of all angles of Kite = 360^0

$\angle B+\angle C+\angle D+\angle E=360^0$

Putting values

$104^0+\angle C+40^0+\angle C=360^0$

Because $\angle E=\angle C$

$2(\angle C)+144^0=360^0$

$2\angle C=360^0-144^0$

$2\angle C=216^0$

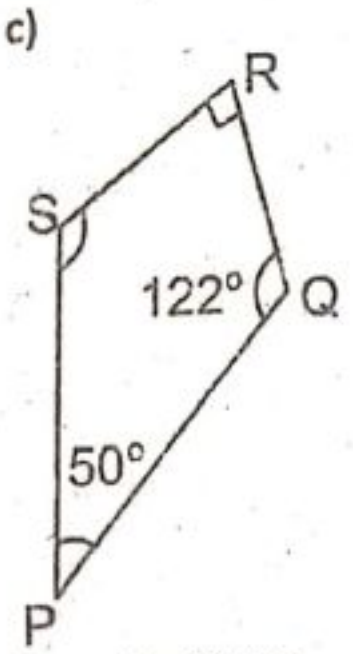
Divid both sides by 2

$\frac{2\angle C}{2}=\frac{216^0}{2}$

$\angle C=108^0$ As $\angle E=\angle C$

So $\angle E=108^0$

c)



Sol. From the figure

$\angle P=50^0, \angle Q=122^0$

$\angle Q$ is opposite to $\angle S$

$\angle P$ is opposite to $\angle R$

In the given Kite:

Pair of angles which are equal are:

$\angle Q = \angle S$

As $\angle Q = 122^0$ so $\angle S = 122^0$

Sum of all angles of Kite = 360^0

$\angle P + \angle Q + \angle R + \angle S = 360^0$

Putting values

$50^0 + 122^0 + \angle R + 122^0 = 360^0$

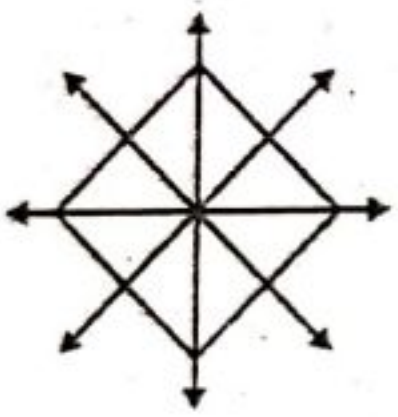
$\angle R + 294^0 = 360^0$

$\angle R = 360^0 - 294^0$

$\angle R = 66^0$

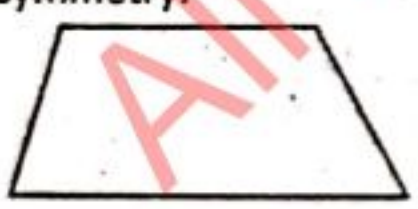
Q7. Draw the lines of symmetry for each of the following (if any).

Sol.

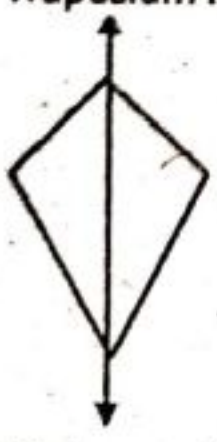


The Rhombus has four lines of symmetry.

Isosceles Trapezium has no line of symmetry.



Trapezium has no line of symmetry.

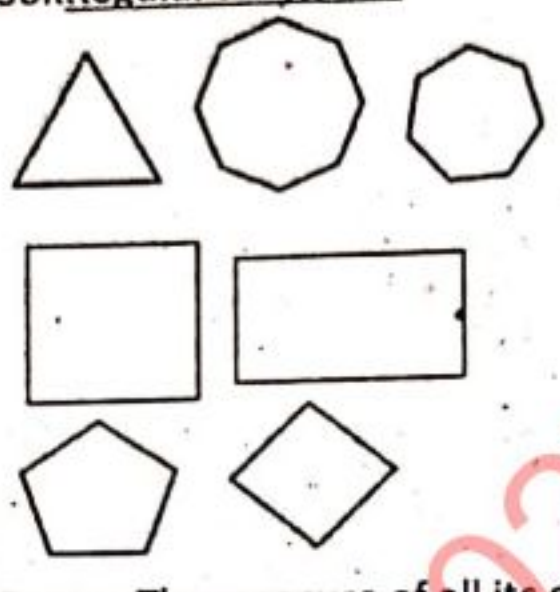


Kite has only one line of symmetry.

Exercise – 11.2

Q1. Identify regular and irregular polygons among the following. Justify your answer.

Sol. Regular Polygons:



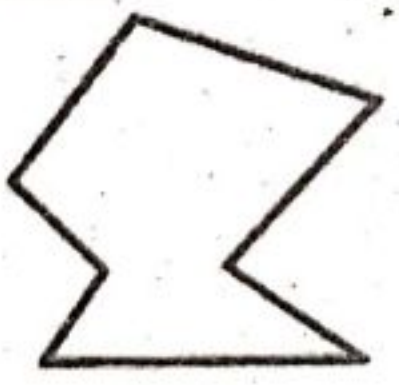
Reson: The measure of all its sides and interior angles are equal.

Irregular Polygons:

Reason: The measure of all its sides and interior angles are not equal.

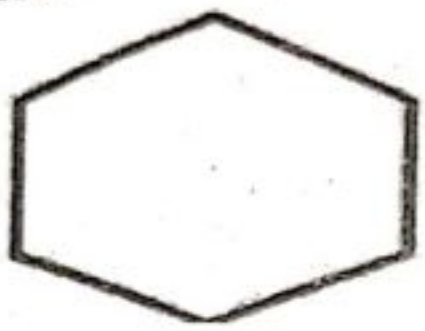
Q2. Draw an irregular polygon that has odd number of sides.

Sol. Irregular polygon with odd number of sides:



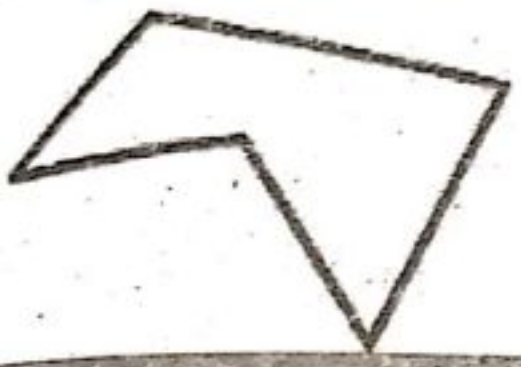
Q3. Draw a regular polygon that has even number of sides.

Sol. Regular polygon with even number of sides:



Q4. Draw a concave polygon with 5-sides.

Sol. Concave polygon with 5-sides:



Exercise – 11.3

Q1. Calculate the sum of interior angles of polygons by counting the triangle.

a. Number of sides = 7

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 7

Sum of interior angles of polygon =

$$180^0 \times (7-2)$$

$$\Rightarrow 180^0 \times 5 = 900^0$$

b. Number of sides = 8

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 8

Sum of interior angles of polygon =

$$180^0 \times (8-2)$$

$$\Rightarrow 180^0 \times 6 = 1080^0$$

c. Number of sides = 9

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 9

Sum of interior angles of polygon =

$$180^0 \times (9-2)$$

$$\Rightarrow 180^0 \times 7 = 1260^0$$

d. Number of sides = 10

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 10

Sum of interior angles of polygon =

$$180^0 \times (10-2)$$

$$\Rightarrow 180^0 \times 8 = 1440^0$$

Q2. Calculate the sum of interior angles of polygons using the formula and complete the table.

Number of sides of polygon	Sum of interior angles
6	
9	
11	
15	
20	
18	

a. Number of sides = 6

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 6

Sum of interior angles of polygon =

$$180^0 \times (6-2)$$

$$\Rightarrow 180^0 \times 4 = 720^0$$

b. Number of sides = 9

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 9

Sum of interior angles of polygon =

$$180^0 \times (9-2)$$

$$\Rightarrow 180^0 \times 7 = 1260^0$$

c. Number of sides = 11

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 11

Sum of interior angles of polygon =

$$180^0 \times (11-2)$$

$\Rightarrow 180^0 \times 9 = 1620^0$

d. Number of sides = 15

Sum of interior angles of polygon =

$180^0 \times (n-2)$

Put n = 15

Sum of interior angles of polygon =

$180^0 \times (15-2)$

$\Rightarrow 180^0 \times 13 = 2340^0$

e. Number of sides = 20

Sum of interior angles of polygon =

$180^0 \times (n-2)$

Put n = 20

Sum of interior angles of polygon =

$180^0 \times (20-2)$

$\Rightarrow 180^0 \times 18 = 3240^0$

f. Number of sides = 18

Sum of interior angles of polygon =

$180^0 \times (n-2)$

Put n = 18

Sum of interior angles of polygon =

$180^0 \times (18-2)$

$\Rightarrow 180^0 \times 16 = 2880^0$

Number of sides of polygon	Sum of interior angles
6	720^0
9	1260^0
11	1620^0
15	2340^0
20	3240^0
18	2880^0

Q3. Calculate the interior angles of a regular polygon having:

a) 5 sides

Sol. n = 5

Interior angles of regular polygon =

$$\frac{180^0 \times (n-2)}{n}$$

Where n = number of sides

Interior angles of regular polygon =

$$\frac{180^0 \times (5-2)}{5}$$

$$\Rightarrow \frac{180^0 \times 3}{5} = \frac{540^0}{5} = 108^0$$

b) 6 sides

Sol. n = 6

Interior angles of regular polygon =

$$\frac{180^0 \times (n-2)}{n}$$

Where n = number of sides

Interior angles of regular polygon =

$$\frac{180^0 \times (6-2)}{6}$$

$$\Rightarrow \frac{180^0 \times 4}{6} = \frac{720^0}{6} = 120^0$$

c) 8 sides

Sol. n = 8

Interior angles of regular polygon =

$$\frac{180^0 \times (n-2)}{n}$$

Where n = number of sides

Interior angles of regular polygon =

$$\frac{180^0 \times (8-2)}{8}$$

$$\Rightarrow \frac{180^0 \times 6}{8} = \frac{1080^0}{8} = 135^0$$

d) 10 sides

Sol. n = 10

Interior angles of regular polygon =

$$\frac{180^0 \times (n-2)}{n}$$

Where n = number of sides

Interior angles of regular polygon =

$$\frac{180^0 \times (10-2)}{10}$$

$$\Rightarrow \frac{180^0 \times 8}{10} = \frac{1440^0}{10} = 144^0$$

e) 13 sides

Sol. n = 13

Interior angles of regular polygon =

$$\frac{180^0\times(n-2)}{n}$$

Where n = number of sides

Interior angles of regular polygon =

$$\frac{180^0\times(13-2)}{13}$$

$$\Rightarrow\frac{180^0\times11}{13}=\frac{1980^0}{13}=152.307^0$$

f) 20 sides

Sol. n = 20

Interior angles of regular polygon =

$$\frac{180^0\times(n-2)}{n}$$

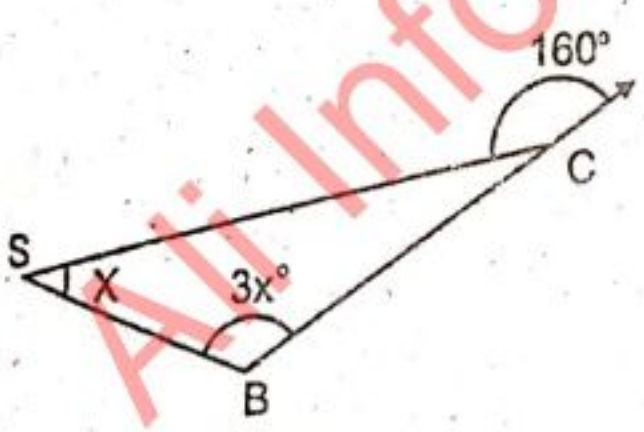
Where n = number of sides

Interior angles of regular polygon =

$$\frac{180^0\times(20-2)}{20}$$

$$\Rightarrow\frac{180^0\times18}{20}=\frac{3240^0}{20}=162^0$$

Q4. Calculate the missing angles.



Sol. Given ΔSBC

Exterior angle = $\angle C=160^0$

Interior angles are $\angle S=x$ and

$\angle B=3x$

As we know that

Exterior angle = Sum of interior angles

$160^0 = x + 3x$

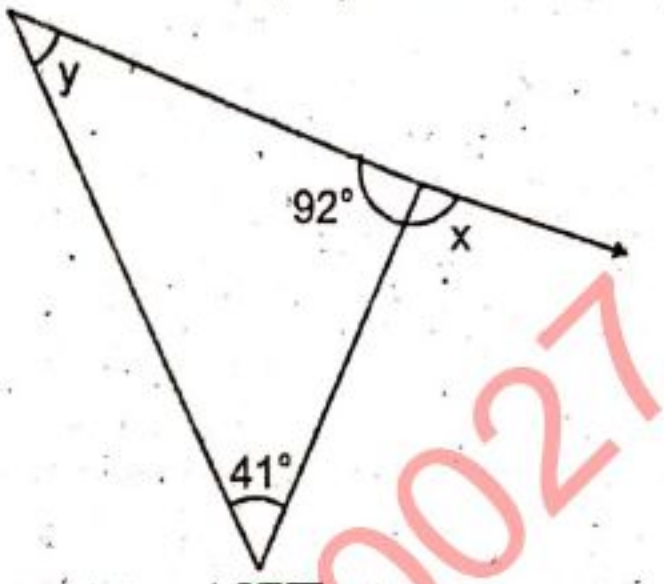
$160^0 = 4x$

Divide both sides 4

$$\frac{160^0}{4}=\frac{4x}{4}\qquad x=40^0$$

$\angle S=x=40^0$ and

$\angle B=3x=3(40)=120^0$



Given that ΔXYZ

Exterior angles = $\angle X$

Interior angles of ΔXYZ =

$\angle y, 41^0$ *and* 92^0

To find $\angle y$

Sum of angles of ΔXYZ =180^0

$\angle y+41^0+92^0=180^0$

$\angle y+133^0=180^0$

$\angle y=180^0-133^0$

$\angle y=47^0$

To find the exterior angle $\angle X$

$\angle X+92^0=180^0$

$\angle X=180^0-92^0$

$\angle X=88^0$

Q5. Find the measure of the exterior angles of an 8-sided regular polygon.

Sol. Number of sides of regular polygon = 8

n = 8

As we know that sum of exterior angles of regular polygon of n-sides = 360^0

Measure of an exterior angle of 8-sided polygon = $\frac{360^0}{8}=45^0$

Q6. Find the measure of the interior angles of a 6-sided regular polygon.

Sol. Number of sides of regular polygon = 6

n = 6

Measure of an interior angle of 6-sided polygon = $\frac{180^0(n-2)}{n}$

Measure of interior angle = $\frac{180^0(6-2)}{6}$

$= \frac{\cancel{180}^{30}{}^{0} \times 4}{\cancel{6}^{1}}$

Measure of interior angle = $30^0 \times 4 = 120^0$ Ans.

Q7. Find the measure of the exterior angles of a 9-sided regular polygon.

Sol. Number of sides of regular polygon = 9

n = 9

As we know that sum of exterior angles of regular polygon of n-sides = 360^0

Measure of an exterior angle of 8-sided polygon = $\frac{360^0}{9} = 40^0$

Q8. Find the measure of the interior angles of an 11-sided regular polygon.

Sol. Number of sides of regular polygon = 11

n = 11

Measure of an interior angle of 6-sided polygon = $\frac{180^0(n-2)}{n}$

Measure of interior angle = $\frac{180^0(11-2)}{11} = \frac{180^0 \times 9}{11}$

Measure of interior angle = $\frac{1620^0}{11} =$

147.27^0 Ans.

Q9. The measures of four interior angles of a pentagon are 115^0, 92^0, 107^0 and 83^0. Find the measure of the fifth interior angle.

Sol. Interior angles of a regular pentagon are 115^0, 92^0, 107^0 and 83^0

As we know that

Sum of interior angles of pentagon = 540^0

Let the required fifth interior angle of pentagon be 'x'

$\angle x + 115^0 + 92^0 + 107^0 + 83^0 = 540^0$

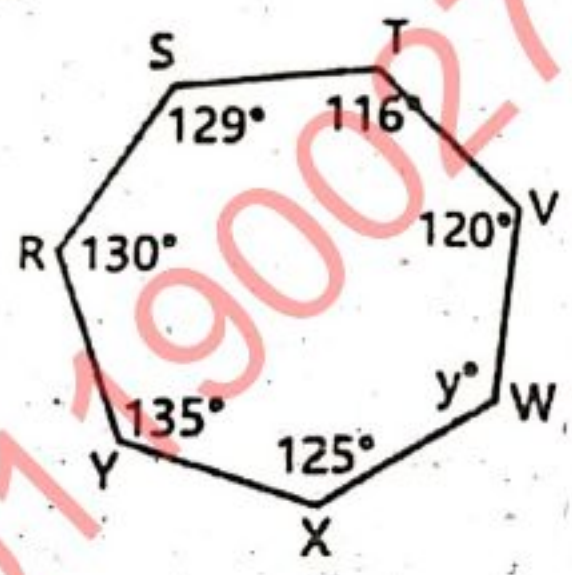
$\angle x + 397^0 = 540^0$

$\angle x = 540^0 - 397^0$

$\angle x = 143^0$ Ans.

Q10. Find the unknown angles.

a)



Sol. The interior angles of a regular 7-sided polygon are 129^0, 116^0, 120^0, 130^0, 135^0, 125^0 and $\angle y$

As we know that sum of interior angles of 7-sided polygon = 900^0

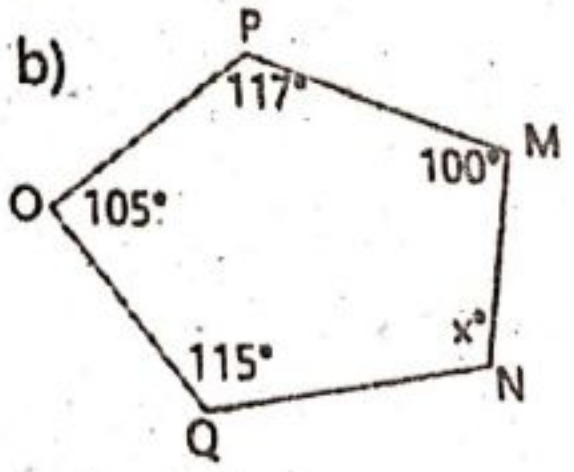
$\angle y + 129^0 + 116^0 + 120^0 + 130^0 + 135^0 + 125^0 = 900^0$

$\angle y + 755^0 = 900^0$

$\angle y = 900^0 - 755^0$

$\angle y = 145^0$ Ans.

b)



Sol. The interior angles of a regular 5-sided polygon are 115^0, 105^0, 117^0, 100^0 and $\angle x$

As we know that sum of interior angles of 5-sided polygon = 540^0

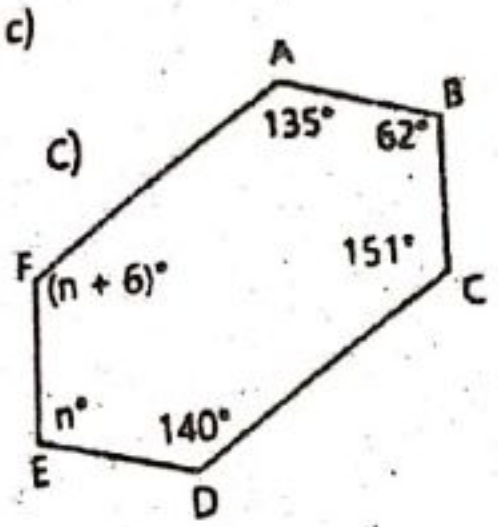
$\angle y + 115^0 + 105^0 + 117^0 + 100^0 = 540^0$

$\angle y + 437^0 = 540^0$

$\angle y = 540^0 - 437^0$

$\angle y = 103^0$ Ans.

c)



Sol. The interior angles of a regular 6-sided polygon are 140^0, 151^0, 62^0, 135^0, $(n+6)^0$ and n^0

As we know that sum of interior angles of 6-sided polygon = 720^0

$n^0 + (n+6)^0 + 140^0 + 151^0 + 62^0 + 135^0 = 720^0$

$2n^0 + 6^0 + 488^0 = 720^0$

$2n^0 = 720^0 - 488^0 - 6^0$

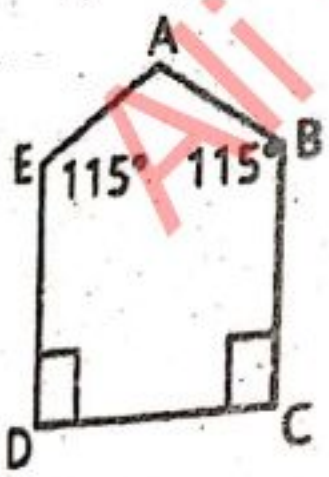
$2n^0 = 226^0$

Divide both sides by 2

$$\frac{2n^0}{2} = \frac{226^0}{2}$$

$n^0 = 113^0$ Ans.

d)



Sol. The interior angles of a regular 5-sided polygon are $\angle B = 115^0$, $\angle C = 90^0$, $\angle D = 90^0$, $\angle E = 115^0$ and $\angle A$

As we know that sum of interior angles of 5-sided polygon = 540^0

$\angle A + \angle B + \angle C + \angle D + \angle E = 540^0$

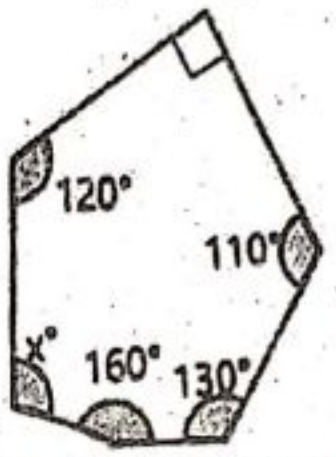
$\angle A + 115^0 + 90^0 + 90^0 + 115^0 = 540^0$

$\angle A + 410^0 = 540^0$

$\angle A = 540^0 - 410^0$

$\angle A = 130^0$ Ans.

e)



Sol. The interior angles of a regular 6-sided polygon are 160^0, 130^0, 110^0, 90^0, 120^0 and $\angle x$

As we know that sum of interior angles of 6-sided polygon = 720^0

$\angle x + 160^0 + 130^0 + 110^0 + 90^0 + 120^0 = 720^0$

$\angle x + 610^0 = 720^0$

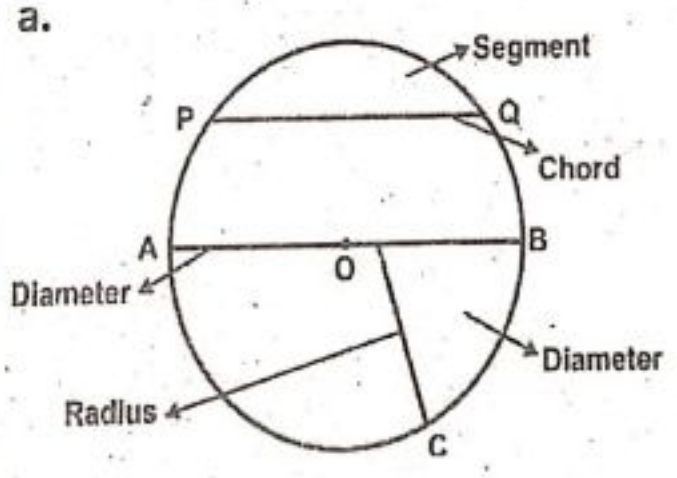
$\angle x = 720^0 - 610^0$

$\angle x = 110^0$ Ans.

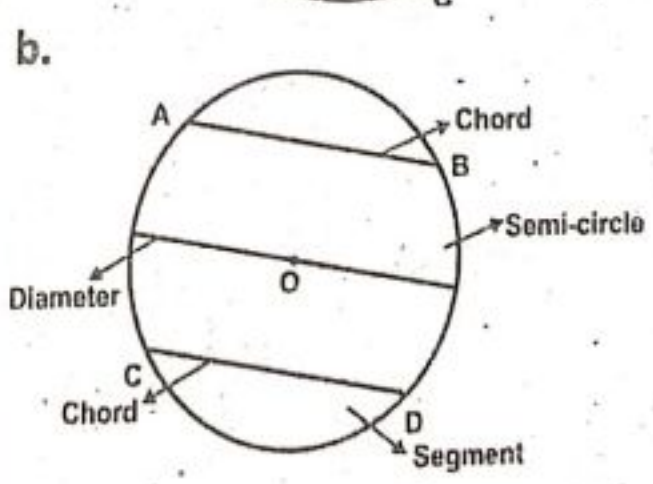
Exercise – 11.4

Q1. Label the parts of the following circles.

a.



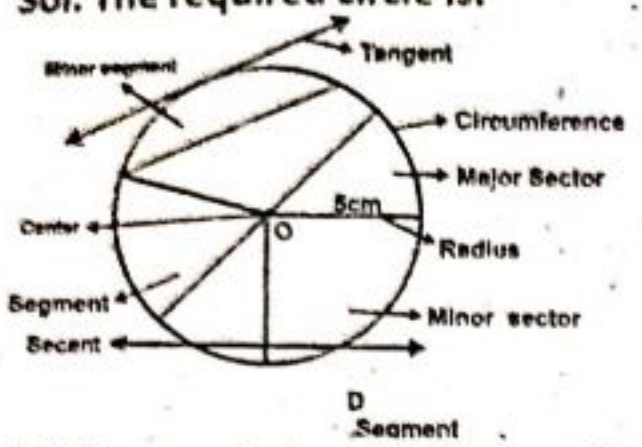
b.



Sol.

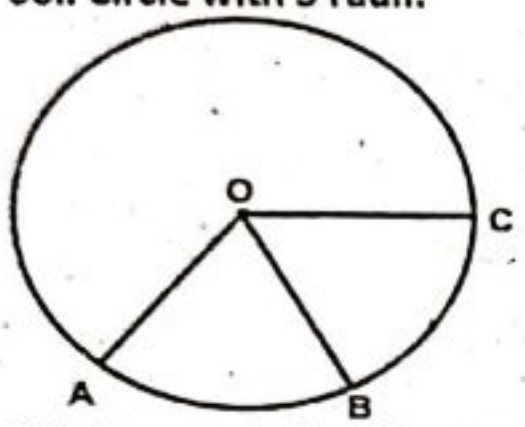
Q2. Draw a circle with a radius of 5cm and label all its parts.

Sol. The required circle is:



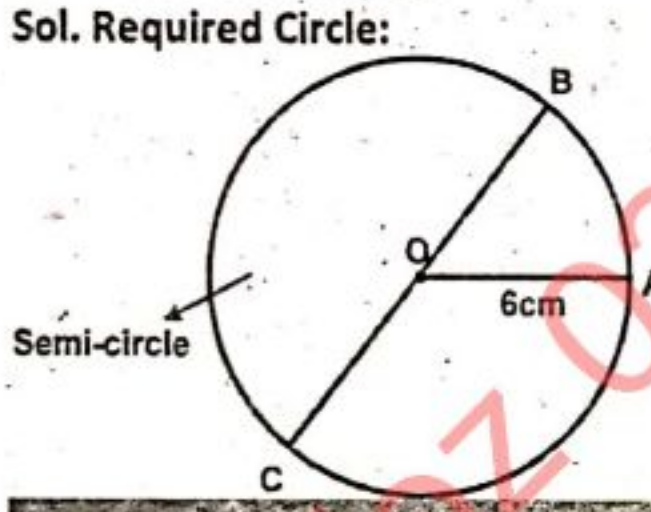
Q3. Draw a circle with three radii.

Sol. Circle with 3 radii:



Q4. Draw a circle of 6cm and then divide it into two semicircles.

Sol. Required Circle:



Review Exercise – 11

Q1. Choose the correct option.

a) The longest chord of the circle is:
   i. Radius
   ii. Segment
   iii. Diameter
   iv. Sectors

b) A circle is a plane figure that is a set of _____
   i. Points
   ii. Lines
   iii. Segments
   iv. Sectors

c) The angle of the semicircle is a/an ___ angle.
   i. Right
   ii. Obtuse
   iii. Acute
   iv. straight

d) Which of these have no lines of symmetry?
   i. Squares
   ii. Rectangles
   iii. Rhombus
   iv. Parallelogram

e) Which of these have only one pair of parallel sides.
   i. Trapezium
   ii. Square
   iii. Rectangle
   iv. Parallelogram

f) A polygon that has no interior reflex angles is called:
   i. Right polygon
   ii. Convex polygon
   iii. Concave polygon
   iv. Reflex polygon

Q2. What is the difference between convex and concave polygon?

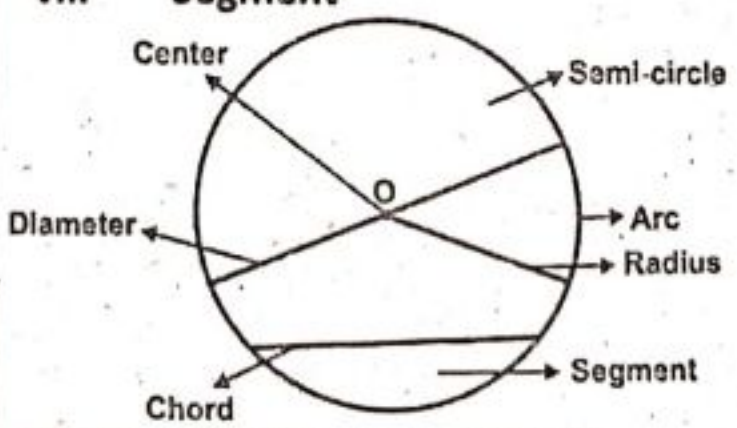
Sol. In convex polygon there is no interior reflex angle while in concave polygon there is at least one reflex angle.

All vertices of a convex polygon pointing outward.

All vertices of a concave polygon pointing inward.

Q3. Draw a circle. Then label and define its:

i. Centre
ii. Radius
iii. Diameter
iv. Chord
v. Arcs
vi. Semi-circle
vii. Segment



Q4. Describe the properties of quadrilaterals.

Sol. Quad means 'four' and Lateral means 'sides'. Any four-sided closed figure with four angles and four vertices is a quadrilateral. The sum of all angles of a quadrilateral is 360^0.
Some of quadrilaterals are: square, rectangle, parallelogram, rhombus, trapezium and Kite.

Q5. Look the figures below and then fill in the blanks.

a) **ABCD is a rhombus. If AB = 10cm, then find the length of the remaining sides.**

Sol. As all sides of rhombus are equal in length
So AD = CD = BC = AB= 10cm
Also find:

i. $\angle x$

Sol. $\angle x = \angle z$

ii. $\angle x + \angle y$

Sol. $\angle x + \angle y = 180^0$.

iii. $\angle w + \angle x$

Sol. $\angle x + \angle w = 180^0$

b) **PQRS is a parallelogram.**
Find:

i. $\angle l + \angle m + \angle n + \angle o =$ ___

Sol. $\angle l + \angle m + \angle n + \angle o = 360^0$

ii. $\angle m = \angle$ ___
and $\angle l = \angle$ ___

Sol. $\angle m = \angle o$ and $\angle l = \angle n$

c) **ABCD is a trapezium,find:**

i. $\angle z + \angle y =$ ___

Sol. $\angle z + \angle y = 180^0$

ii. $\angle w + \angle x =$ ___

Sol. $\angle w + \angle x = 180^0$

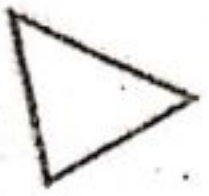
iii. $\angle x + \angle y + \angle z + \angle w =$

Sol. $\angle x + \angle y + \angle z + \angle w = 360^0$

iv. **____ and ____ is the only pair of parallel lines.**

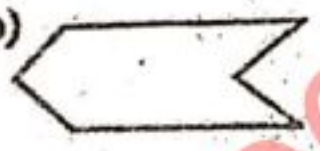
Sol. *AB and CD* is the only pair of parallel lines.

Q6. Tell whether the polygon is regular or not regular. Also explain if it is convex or concave.



Sol. All the sides and angles of the given polygon are equal so the given polygon is regular.
It is convex polygon because no interior angle is reflex.

b)



Sol. All the sides and angles of the given polygon are not equal so the given polygon is not regular.
It is concave polygon because one interior angle is reflex.

c)

Sol. All the sides and angles of the given polygon are equal so the given polygon is regular.
It is convex polygon because no interior angle is reflex.

d)

Sol. All the sides and angles of the given polygon are not equal so the given polygon is not regular.
It is concave polygon because one interior angle is reflex.

Sol. All the sides and angles of the given polygon are not equal so the given polygon is not regular.
It is convex polygon because no interior angle is reflex.

Sol. All the sides and angles of the given polygon are not equal so the given polygon is not regular.
It is convex polygon because no interior angle is reflex.

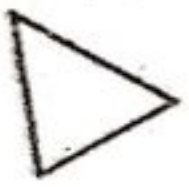
Q7. Draw an irregular polygon that has even number of sides.

Sol.

This is an irregular polygon that has even number of sides.

Q8. Draw a regular polygon that has odd number of sides.

Sol.

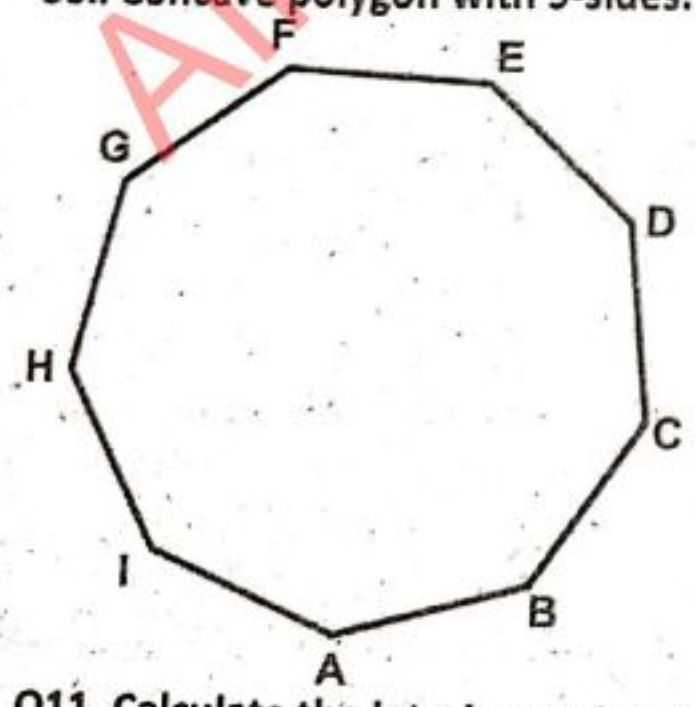


Q9. Draw a concave polygon with 5-sides.

Sol. Concave polygon with 5-sides:

Q10. Draw a convex polygon with 9-sides.

Sol. Concave polygon with 9-sides:



Q11. Calculate the interior angles of a regular polygon having:

a) 5 sides

Sol. Number of sides n = 5
Interior angles of regular polygon =

$$\frac{180^0\times(n-2)}{n}$$

Put n = 5
Interior angles of polygon =

$$\frac{180^0\times(5-2)}{5}$$

Interior angles of polygon = $\frac{180^0\times 3}{5}$

Interior angles of polygon = $\frac{540^0}{5}=108^0$

b) 10 sides

Sol. Number of sides n = 10
Interior angles of regular polygon =

$$\frac{180^0\times(n-2)}{n}$$

Put n = 10
Interior angles of polygon =

$$\frac{180^0\times(10-2)}{10}$$

Interior angles of polygon = $\frac{180^0\times 8}{10}$

Interior angles of polygon =

$$\frac{1440^0}{10}=144^0$$

c) 7 sides

Sol. Number of sides n = 7
Interior angles of regular polygon =

$$\frac{180^0\times(n-2)}{n}$$

Put n = 7
Interior angles of polygon =

$$\frac{180^0\times(7-2)}{7}$$

Interior angles of polygon = $\frac{180^0\times 5}{7}$

Interior angles of polygon =

$$\frac{900^0}{7} = 128.57^0$$

Q12. Describe the relation of:

a) An exterior angle of a triangle and its opposite interior angles.

Sol. Sum of an exterior angle of a triangle and its opposite interior angle is equal to 180^0

b) Interior and exterior angles of polygon

Sol. The sum of exterior angles of any polygon is 360^0. Sum of Interior angles of every polygon is different. **The sum of exterior angles of n-sided polygon = (the sum of interior and exterior angles of n-sided polygon) – (the sum of interior angles of n-sided polygon)**

Q13. Calculate the sum of interior angles of the polygons having the following number of sides using the formula.

a) 5 sides

Sol. Number of sides n = 5

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 5

Sum of interior angles of polygon =

$$180^0 \times (5-2)$$

Sum of interior angles of polygon =

$$180^0 \times 3 = 540^0 \text{ Ans.}$$

b) 3 sides

Sol. Number of sides n = 3

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 3

Sum of interior angles of polygon =

$$180^0 \times (3-2)$$

Sum of interior angles of polygon =

$$180^0 \times 1 = 180^0 \text{ Ans.}$$

c) 7 sides

Sol. Number of sides n = 7

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 7

Sum of interior angles of polygon =

$$180^0 \times (7-2)$$

Sum of interior angles of polygon =

$$180^0 \times 5 = 900^0 \text{ Ans.}$$

d) 4 sides

Sol. Number of sides n = 4

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 4

Sum of interior angles of polygon =

$$180^0 \times (4-2)$$

Sum of interior angles of polygon =

$$180^0 \times 2 = 360^0 \text{ Ans.}$$

e) 8 sides

Sol. Number of sides n = 8

Sum of interior angles of polygon =

$$180^0 \times (n-2)$$

Put n = 8

Sum of interior angles of polygon =

$$180^0 \times (8-2)$$

Sum of interior angles of polygon =

$$180^0 \times 6 = 1080^0 \text{ Ans.}$$

Q14. Find the measure of the exterior angles of a 4-sided regular polygon.

Sol. Four sided regular polygon is called square.

All interior angles and exterior angles are right angles.

Thus exterior angle is 90^0.

Q15. Find the measure of the interior angles of a 5-sided regular polygon.

Sol. Five sided regular polygon is called Pentagon. Number of sides n = 5

Interior angle of Pentagon =

$$\frac{180^0 \times (n-2)}{n}$$ Put n = 5

Interior angle of Pentagon =

$$\frac{180^0\times(5-2)}{5}$$

Interior angles of Pentagon = $\frac{180^0\times3}{5}$

Interior angles of Pentagon =

$\frac{540^0}{5}=108^0$ **Ans.**

Q16. Find the measure of the exterior angles of a 6-sided regular polygon.

Sol. Sum of exterior angles of every polygon is 360^0

Exterior angles of 6-sided regular polygon $= 360^0$

Measure of exterior angle of 6-sided

polygon = $\frac{360^0}{6}=60^0$ **Ans.**

Q17. Find the measure of the interior angles of an 8-sided regular polygon.

Sol. Number of sides n = 8

Interior angle of Pentagon =

$\frac{180^0\times(n-2)}{n}$ Put n = 8

Interior angle of Pentagon =

$$\frac{180^0\times(8-2)}{8}$$

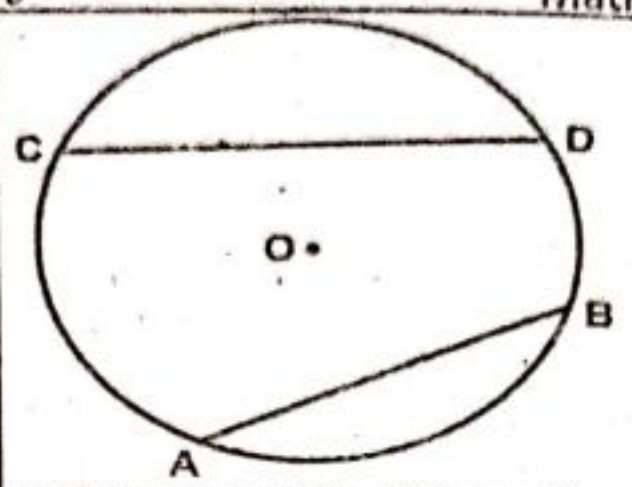
Interior angles of Pentagon = $\frac{180^0\times6}{8}$

Interior angles of Pentagon =

$\frac{1080^0}{8}=135^0$ **Ans.**

Q18. Draw a circle and then draw two chords which are not passing through the centre of the circle.

Sol. Required Circle:



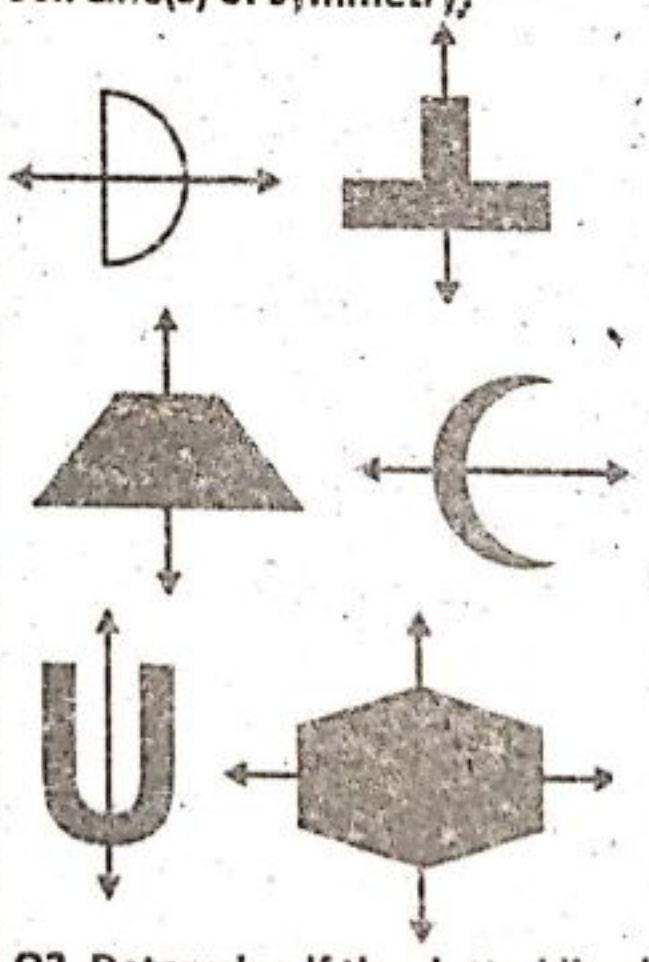
Q19. Draw a circle with a radius of 7cm and draw two segments.

Sol. Circle with 7 cm radius:

Unit – 12
Angles and Transformations
Exercise – 12.1

Q1. Draw line(s) of symmetry for the following.

Sol. Line(s) of symmetry;



Q2. Determine if the dotted line in the following figures is a line of symmetry. Which figure have line of symmetry?

Sol. The given dotted line does not divide the figure into two equal halves. So the line is not the line of symmetry.

Sol. The given dotted line does not divide the figure into two equal halves. So the line is not the line of symmetry.

Sol. The given dotted line divides the figure into two equal halves. So the line is the line of symmetry.

Sol. The given dotted line divides the figure into two equal halves. So the line is the line of symmetry.

Sol. The given dotted line does not divide the figure into two equal halves. So the line is not the line of symmetry.

Sol. The given dotted line divides the figure into two equal halves. So the line is the line of symmetry.

Q3. Write the order of symmetry for each shape that has rotational symmetry.

Sol. When the given figure is rotated about its centre, it looks exactly the same 4 times in a complete rotation. So, it has rotational symmetry of order 4.

Sol. When the given figure is rotated about its centre, it looks exactly the same 2 times in a complete rotation. So, it has rotational symmetry of order 2.

Sol. When the given figure is rotated about its centre, it looks exactly the same 1 times in a complete rotation. So, it has rotational symmetry of order 1.

Sol. When the given figure is rotated about its centre, it looks exactly the same 2 times in a complete rotation. So, it has rotational symmetry of order 2.

Q4. Rotate the given images about the origin.

a) Through 180^0 counter clock wise.

Sol. Vertices of triangle:

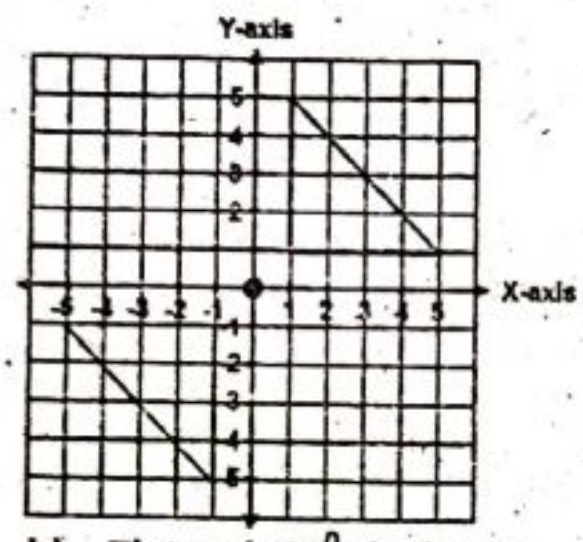
$$A(1,5),\ B(1,1),\ C(5,1)$$

After rotating it 180^0 counter clockwise, the vertices becomes:

$$A(1,5) \rightarrow A'(-1,-5)$$

$$B(1,1) \rightarrow B'(-1,-1)$$

$$C(5,1) \rightarrow C'(-5,-1)$$



b) Through 90^0 clock wise. Figures

Sol. Vertices of figure:

$$A(1,1),\ B(5,1),\ C(5,4)$$

$$D(3,5),\ E(1,4)$$

After rotating it 90^0 clockwise, the vertices becomes:

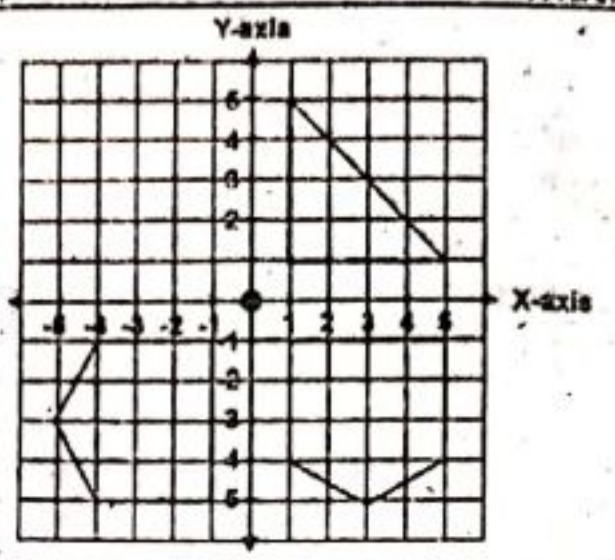
$$A(1,1) \rightarrow A'(1,-1)$$

$$B(5,1) \rightarrow B'(1,-5)$$

$$C(5,4) \rightarrow C'(4,-5)$$

$$D(3,5) \rightarrow D'(5,-3)$$

$$E(1,4) \rightarrow E'(4,-1)$$

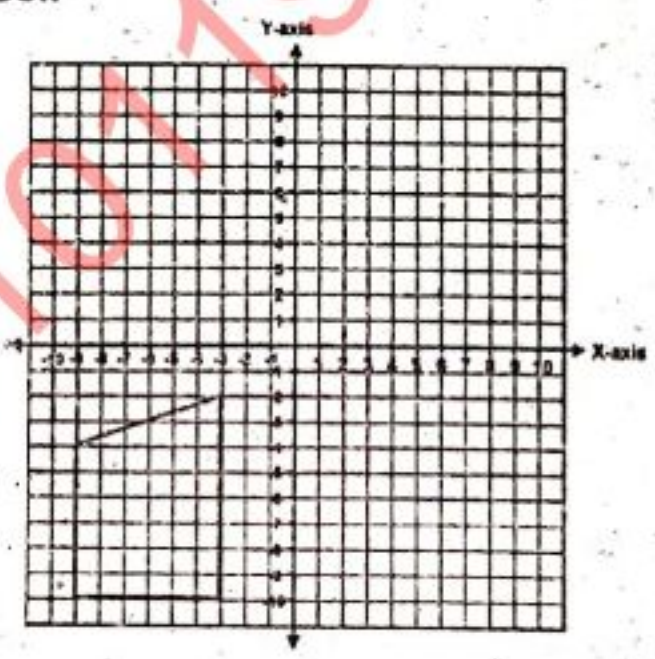


Q5. Draw a triangle on coordinate plane. Then rotate it through 270^0 clock wise about the origin.

Sol.

Q6. Draw a trapezium on coordinate plane. Then rotate it through 90^0 clock wise about the origin.

Sol.



Q7. What will be the values of x and y for "P" if an image having point P(-6, -4) is rotated?

a. 90^0 clock wise

Sol. By rotating the figure at 90^0 clockwise about the origin. The point

$$P(-6,-4) \rightarrow P'(-4,6)$$

b. 180^0 counter clock wise

Sol. By rotating the figure at 180^0 counter clockwise about the origin. The point

$$P(-6,-4) \rightarrow P'(6,4)$$

c. 270^0 clockwise

Sol. By rotating the figure at 270^0 clockwise about the origin. The point

$$P(-6,-4) \rightarrow P'(4,-6)$$

Q8. What will be the values of x and y for "P" if an image having point P(3, 9) is rotated?

d. 90^0 counter clock wise

Sol. By rotating the figure at 90^0 counter clockwise about the origin. The point

$$P(3,9) \rightarrow P'(-9,3)$$

e. 180^0 clock wise

Sol. By rotating the figure at 180^0 clockwise about the origin. The point

$$P(3,9) \rightarrow P'(-3,-9)$$

f. 270^0 counter clockwise

Sol. By rotating the figure at 270^0 counter clockwise about the origin. The point

$$P(3,9) \rightarrow P'(9,-3)$$

Exercise – 12.3

Q1. Translate the given images according to the given description and write the coordinates of the translated image.

a) 2 units left and 4 units down

Sol. Translating the given image 2 units left and 4 units down can be written as

$$(x,y) \rightarrow (x-2, y-4)$$

Coordinate of the given figure:

$$A(-8,3),\ B(-3,3),\ C(-8,8)$$

Coordinate of the figure after translating are:

$$A(-8,3) \rightarrow A'(-8-2,\ 3-4)$$

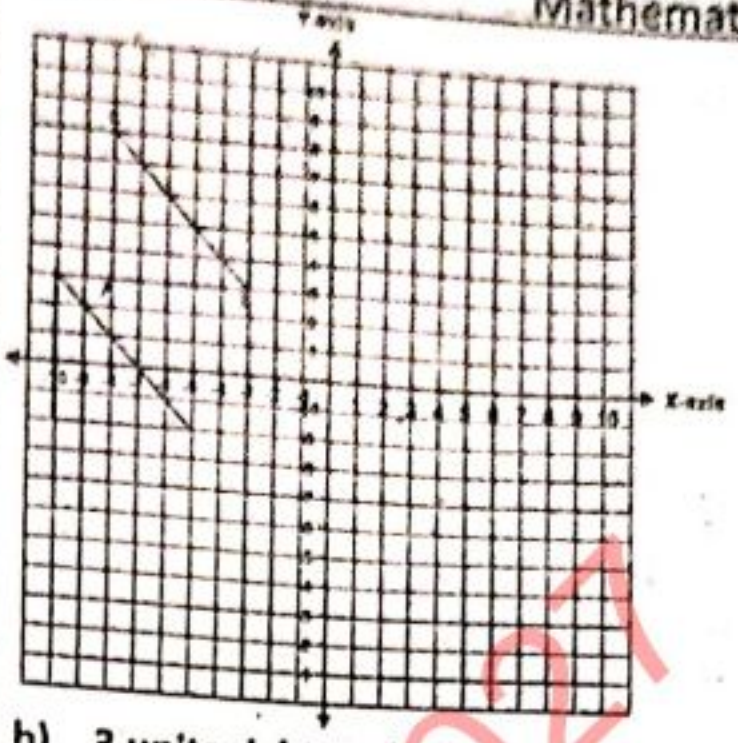
$$A(-8,3) \rightarrow A'(-10,\ -1)$$

$$B(-3,3) \rightarrow B'(-3-2,\ 3-4)$$

$$B(-3,3) \rightarrow B'(-5,\ -1)$$

$$C(-8,8) \rightarrow C'(-8-2,\ 8-4)$$

$$C(-8,8) \rightarrow C'(-10,\ 4)$$



b) 3 units right and 1 unit up

Sol. Translating the given image 3 units right and 1 units up can be written as

$$(x,y) \rightarrow (x+3, y+1)$$

Coordinate of the given figure:

$$A(-9,4),\ B(-9,9),\ C(-4,9)$$

Coordinate of the figure after translating are:

$$A(-9,4) \rightarrow A'(-9+3,\ 4+1)$$

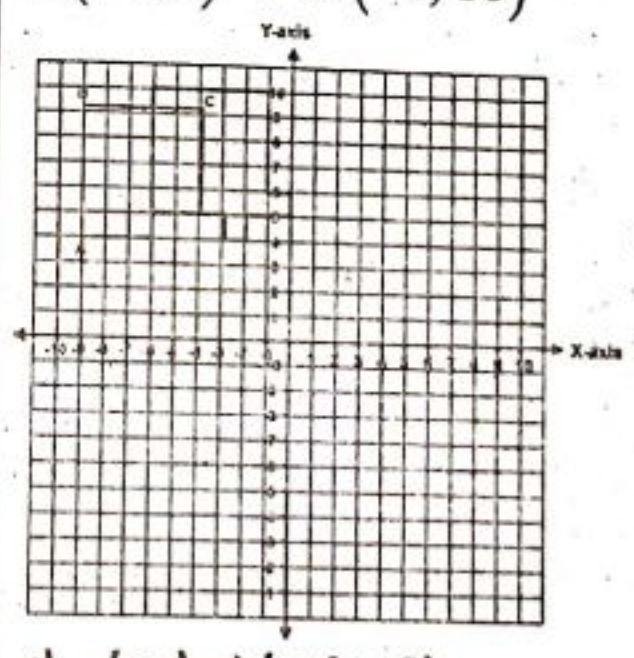
$$A(-9,4) \rightarrow A'(-6,\ 5)$$

$$B(-9,9) \rightarrow B'(-9+3,\ 9+1)$$

$$B(-9,9) \rightarrow B'(-6,\ 10).$$

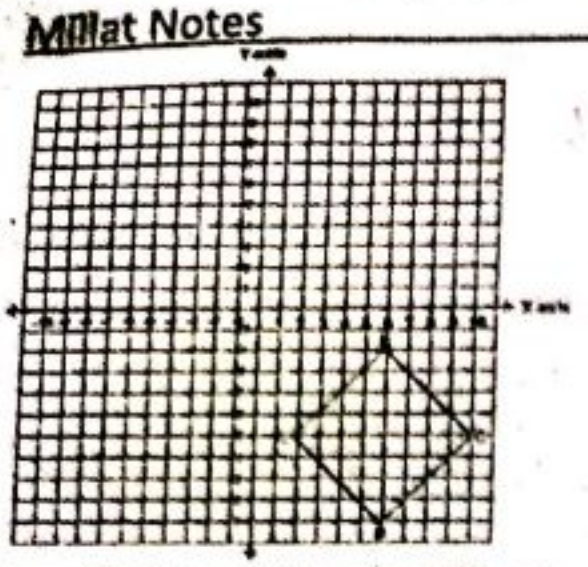
$$C(-4,9) \rightarrow C'(-4+3,\ 9+1)$$

$$C(-4,9) \rightarrow C'(-1,\ 10)$$



c) $(x,y) \rightarrow (x+4,y+3)$

Sol. Translating the image according **(x, y) $\rightarrow$ (x+4,y+3)**



Coordinates of the given figure:

$A(2,-6)$, $B(6,-2)$, $C(10,-6)$

$D(6,-10)$

coordinates of the figure after translating are:

$A(2,-6) \rightarrow A'(2+4,-6+3)$

$A(2,-6) \rightarrow A'(6,-3)$

$B(6,-2) \rightarrow B'(6+4,-2+3)$

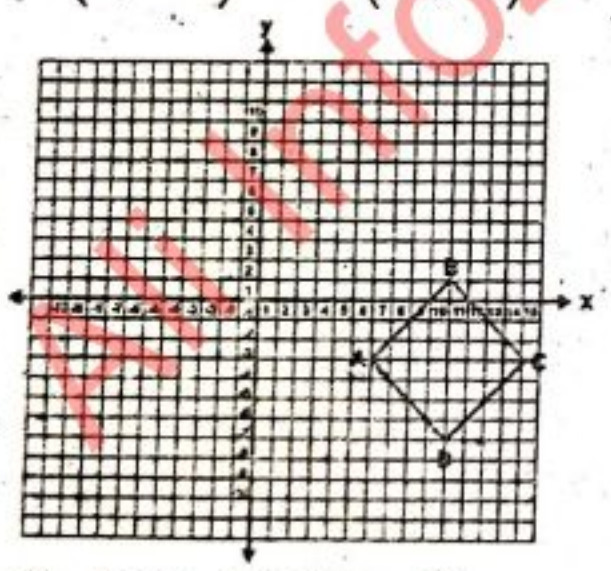
$B(6,-2) \rightarrow B'(10,-1)$

$C(10,-6) \rightarrow C'(10+4,-6+3)$

$C(10,-6) \rightarrow C'(14,-3)$

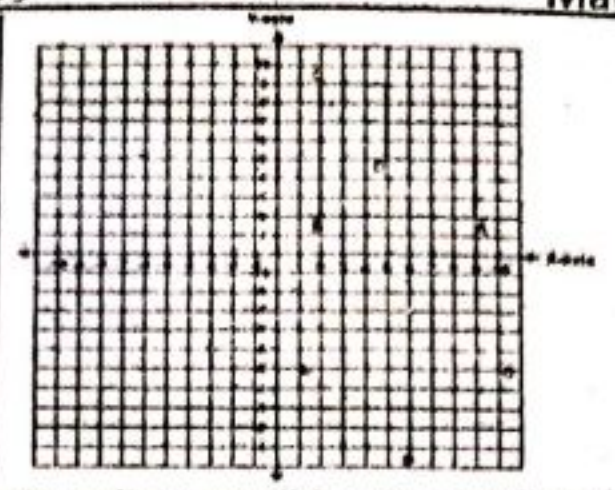
$D(6,-10) \rightarrow D'(6+4,-10+3)$

$D(6,-10) \rightarrow D'(10,-7)$



d) $(x,y) \rightarrow (x+2,y-2)$

Sol. Translating the image according $(x, y) \rightarrow (x+2,y-2)$



Coordinates of the given figure:

$A(9,2)$, $B(2,2)$, $C(2,9)$

$D(5,5)$ coordinates

of the figure after translating are:

$A(9,2) \rightarrow A'(9+2,2-2)$

$A(9,2) \rightarrow A'(11,0)$

$B(2,2) \rightarrow B'(2+2,2-2)$

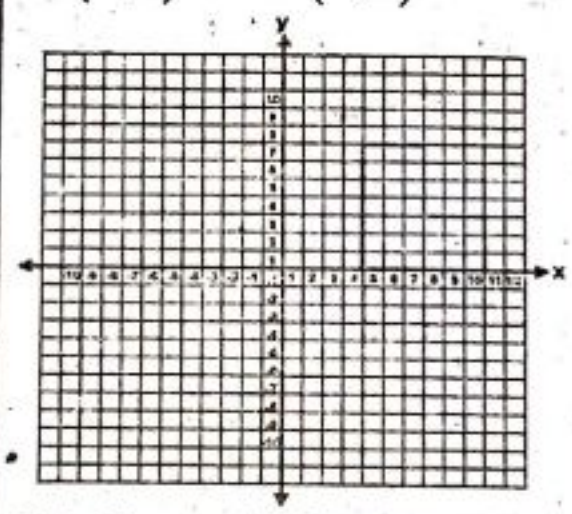
$B(2,2) \rightarrow B'(4,0)$

$C(2,9) \rightarrow C'(2+2,9-2)$

$C(2,9) \rightarrow C'(4,7)$

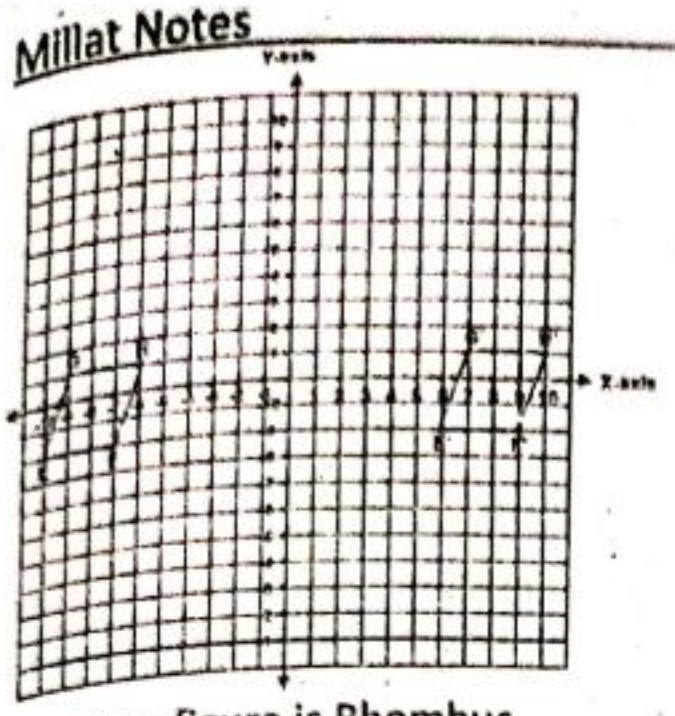
$D(5,5) \rightarrow D'(5+2,5-2)$

$D(5,5) \rightarrow D'(7,3)$



Q2. Name the images. Then describe the translation of the given images (the lighter one is the translated image)

Sol.



The given figure is Rhombus

Coordinate of the pre-image:

$E(-10,-2),\ F(-7,-2)$

$G(-9,1),\ H(-6,1)$

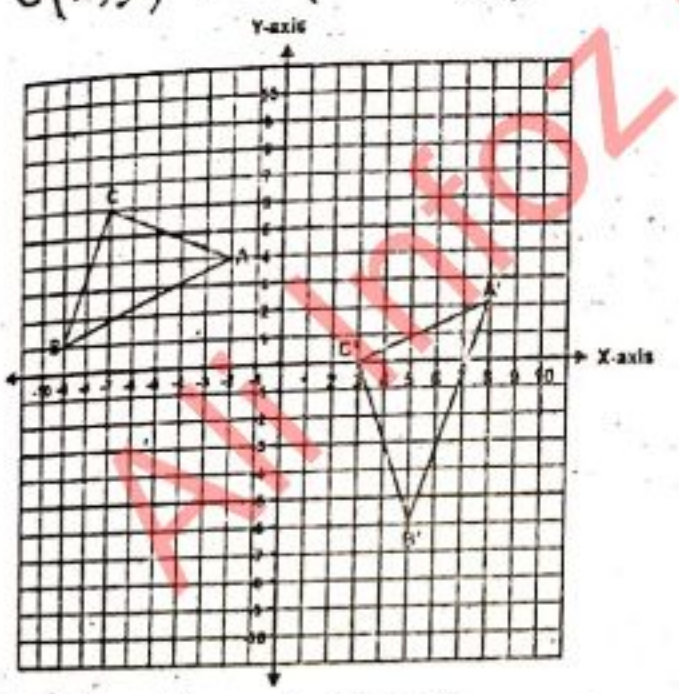
Choose any point of the pre-image. Let

$G(-9,1)$

Now look for its corresponding point on the translated image $G'(7,1)$ has the coordinates (7, 1)

So, the object has moved 16 units right (positive horizontal direction).

$G(x,y) \rightarrow G'(x+16,y)$



The given figure is triangle.

Coordinates of the pre-image:

$A(-2,4),\ B(-9,1),\ C(-7,6)$

Choose any point of the pre-image. Let

$A(-2,4)$

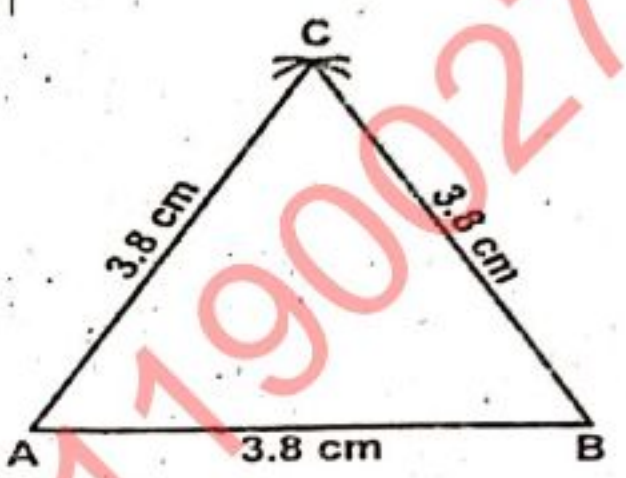
Now look for its corresponding point on the translated image $A(8,2)$ has the coordinates (8, 2)

So, the object has moved 10 units right (positive horizontal direction) and 2 units down (negative vertical direction).

$A(x,y) \rightarrow A'(x+10,y-2)$

Exercise 12.4

Q1. Construct an equilateral triangle ABC where AB = BC = CA = 3.8 cm.

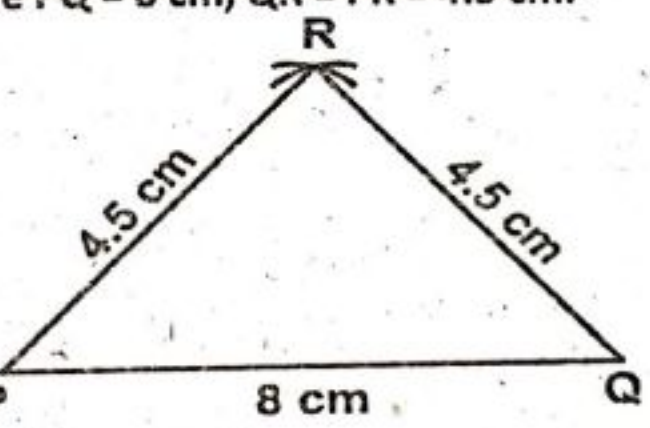


Sol.

Steps of Construction:

1. Draw a line segment AB = 3.8 cm
2. With A as centre, draw an arc of radius 3.8 cm.
3. With B as centre, draw another arc of radius 3.8 cm, which intersect the previous arc at point C.
4. Join C to A and B.
5. ABC is the required equilateral triangle.

Q2. Construct an isosceles triangle PQR where PQ = 8 cm, QR = PR = 4.5 cm.



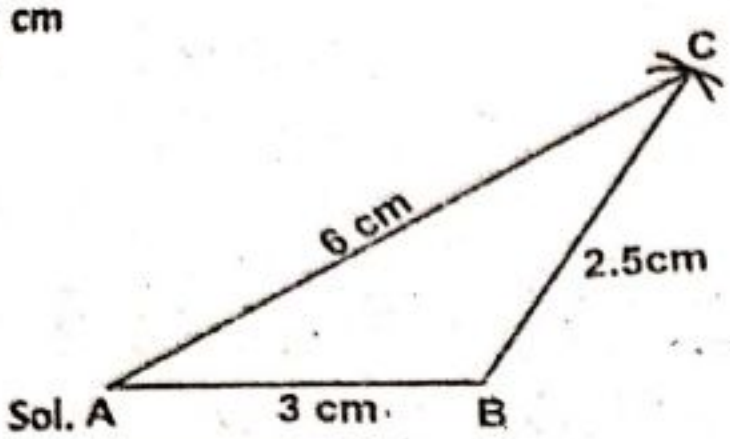
Sol.

Steps of Construction:

1. Draw a line segment PQ = 8 cm
2. With P as centre, draw an arc of radius 4.5 cm.
3. With Q as centre, draw another arc of radius 4.5 cm, which intersect the previous arc at point R.
4. Join R to P and Q.

PQR is the required isosceles triangle.

Q3. Construct a scalene triangle ABC where AB = 3 cm, BC = 6 cm and AC = 2.5 cm

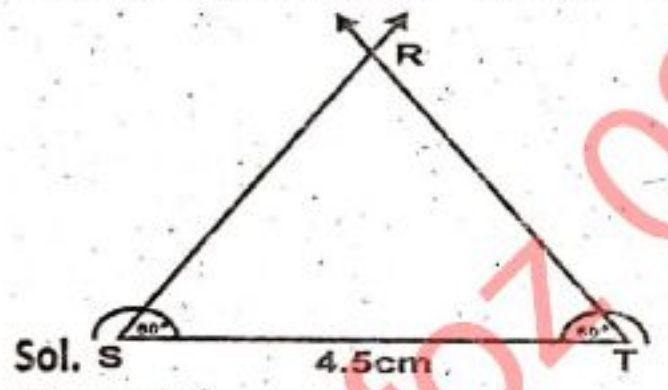


Steps of Construction:

1. Draw a line segment AB = 3 cm
2. With A as centre, draw an arc of radius 2.5 cm.
3. With B as centre, draw another arc of radius 6 cm, which intersect the previous arc at point C.
4. Join C to A and B.

ABC is the required scalene triangle.

Q4. Construct an equilateral triangle RST where $\angle RST = \angle STR = 60^0$ ST = 4.5cm

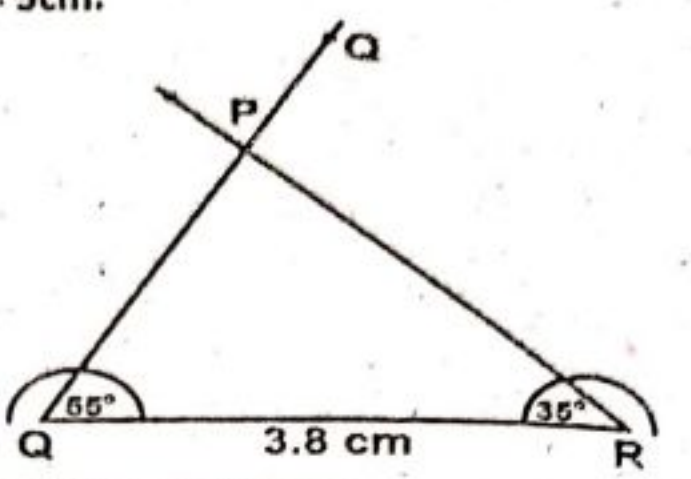


Steps of Construction:

1. Draw a line segment ST = 4.5 cm
2. Place the protractor at point S such that the centre of the protractor is exactly at point S.
3. Read the angle 60^0 on the protractor and mark point P.
4. Place the protractor at point T such that the centre of the protractor is exactly at point T and read the angle 60^0 on the protractor and mark Q.
5. Join S to P and T to Q and name the point where they meet as R. Triangle STR is the required equilateral triangle.

Q5. Construct scalene triangle DEF where $\angle DEF = 35^0, \angle EDF = 55^0$

DE = 5cm.

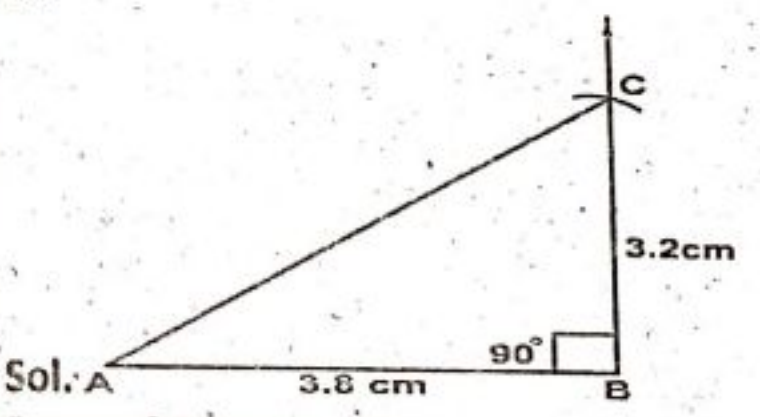


Steps of Construction:

1. Draw a line segment DE = 5 cm
2. Place the protractor at point D such that the centre of the protractor is exactly at point D.
3. Read the angle 55^0 on the protractor and mark point P.
4. Place the protractor at point E such that the centre of the protractor is exactly at point E and read the angle 35^0 on the protractor and mark Q.

Join D to P and E to Q and name the point where they meet as F. Triangle DEF is the required scalene triangle.

Q6. Construct a right angle triangle ABC where $\angle ABC = 90^0$, AB = 7 cm, BC=3.2 cm

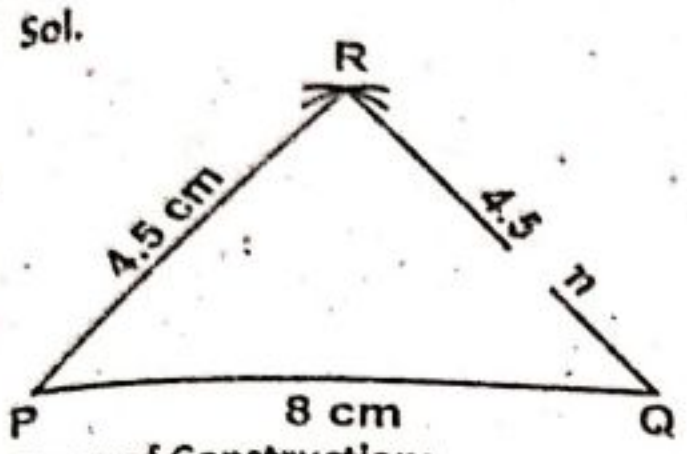


Steps of Construction:

1. Draw a line segment AB = 7 cm
2. Place the protractor at point B such that the centre of the protractor is at point B.
3. Read the angle 90^0 on the protractor and mark point O.
4. With B as centre, draw an arc of 3.2 cm length that intersects the arm BO at point C.
5. Join C to A.
6. Triangle ABC is the required right angled triangle.

Q7. Construct an acute angled triangle PQR where $\angle PQR = 65^0$, PR=4.7 cm, QR=5.2 cm.

Sol.



Steps of Construction:

1. Draw a line segment QR = 5.2 cm
2. Place the protractor at point Q such that the centre of the protractor is at point Q.
3. Read the angle 65^0 on the protractor and mark point O.
4. With R as centre, draw an arc of 4.7 cm length that intersects the arm QO at point P.
5. Join R to P.

Triangle PQR is the required acute angled triangle.

Q8. Construct an obtuse angled triangle DEF where $\angle EFD = 135^0$, EF=8 cm, FD=5 cm.

Sol.

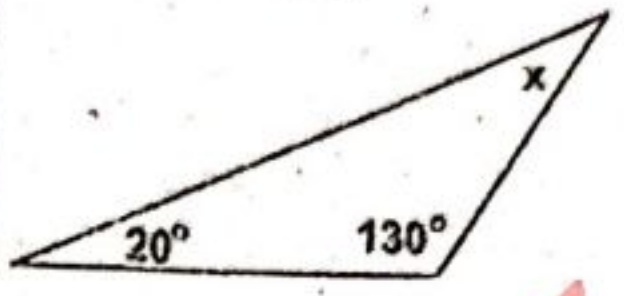
Steps of Construction:

1. Draw a line segment EF = 8 cm
2. Place the protractor at point F such that the centre of the protractor is at point F.
3. Read the angle 135^0 on the protractor and mark point O.
4. With F as centre, draw an arc of 5 cm length that intersects the arm FO at point D.
5. Join D to E.

Triangle DEF is the required obtuse angled triangle.

Exercise – 12.5

Q1. Find the unknown angle of the following triangles.



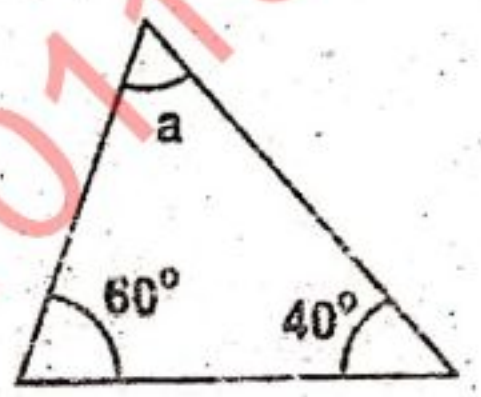
Sol. As we know that sum of three angles of triangle is equal to 180^0.

So, $x + 20^0 + 130^0 = 180^0$

$\Rightarrow x + 150^0 = 180^0$

$\Rightarrow x = 180^0 - 150^0$

$\Rightarrow x = 30^0$ **Ans.**



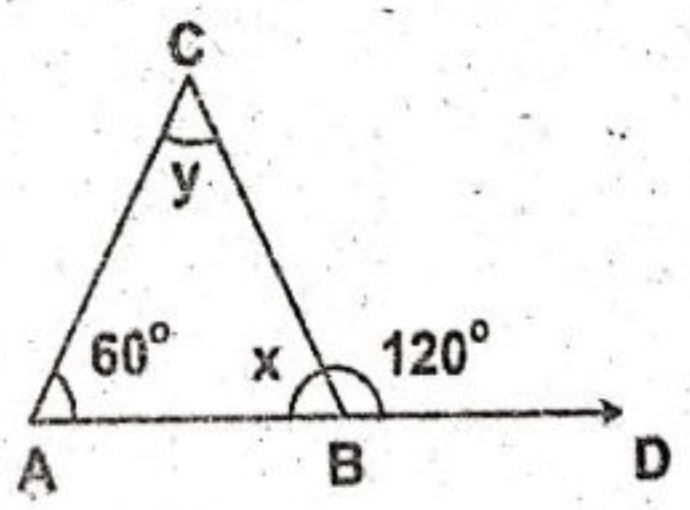
Sol. As we know that sum of three angles of triangle is equal to 180^0.

So, $a + 40^0 + 60^0 = 180^0$

$\Rightarrow a + 100^0 = 180^0$

$\Rightarrow a = 180^0 - 100^0$

$\Rightarrow a = 80^0$ **Ans.**



Sol. As we know that the sum of exterior angle and adjacent interior angle is equal to 180^0.

So, $x + 120^0 = 180^0$

$x = 180^0 - 120^0$

$x = 60^0$

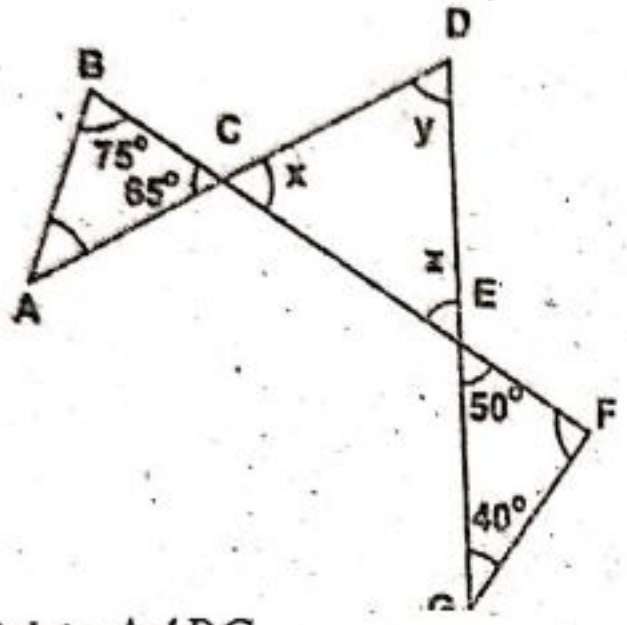
As we know that sum of three angles of triangle is equal to 180^0.

So, $y + 60^0 + 60^0 = 180^0$

$\Rightarrow y + 120^0 = 180^0$

$\Rightarrow y = 180^0 - 120^0$

$\Rightarrow y = 60^0$ **Ans.**



Sol. In ΔABC

$\angle A + \angle B + \angle C = 180^0$

$\angle A + 75^0 + 65^0 = 180^0$

$\angle A + 140^0 = 180^0$

$\angle A = 180^0 - 140^0$

$\angle A = 40^0$

Now in ΔEFG

$\angle E + \angle F + \angle G = 180^0$

$50^0 + \angle F + 40^0 = 180^0$

$\angle F + 90^0 = 180^0$

$\angle F = 180^0 - 90^0$

$\angle F = 90^0$

As we know that vertical angles are equal.

So $\angle x = 65^0$ *and* $\angle z = 50^0$

Now in ΔCDE

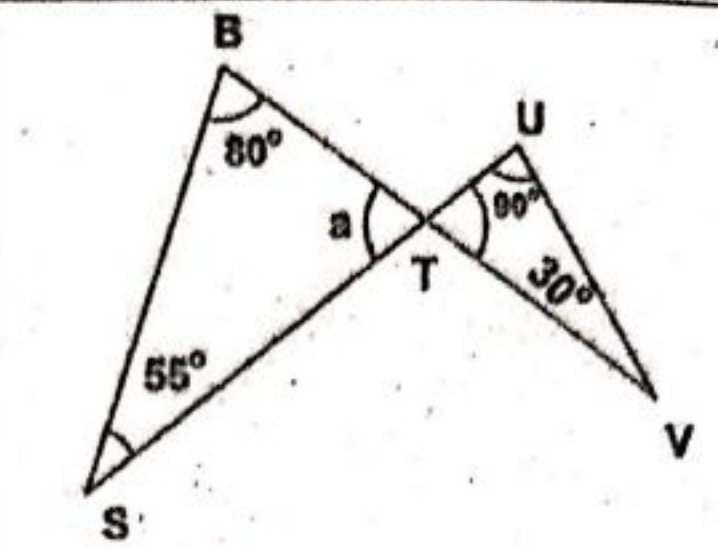
$\angle C + \angle D + \angle E = 180^0$

$65^0 + \angle D + 50^0 = 180^0$

$\angle D + 115^0 = 180^0$

$\angle D = 180^0 - 115^0$

$\angle D = 65^0$



Sol. In ΔRST

$\angle R + \angle S + \angle T = 180^0$

$80^0 + 55^0 + \angle T = 180^0$

$135^0 + \angle T = 180^0$

$\angle T = 180^0 - 135^0$

$\angle T = 45^0$ i.e. $\angle a = 45^0$

In ΔTUV

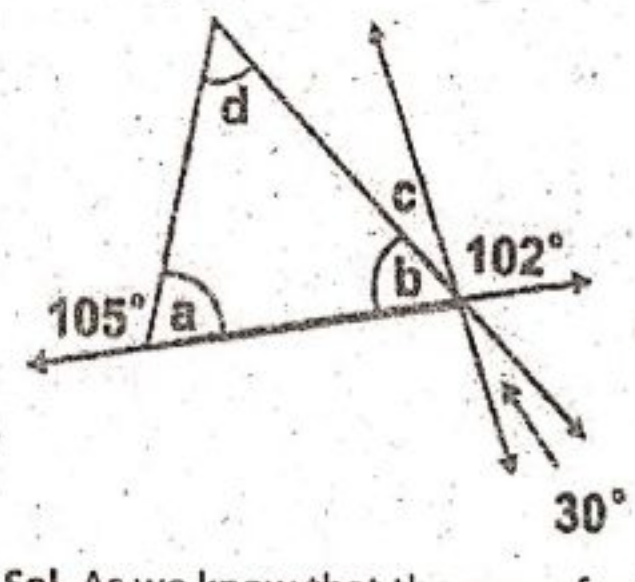
$\angle T + \angle U + \angle V = 180^0$

$\angle b + 90^0 + 30^0 = 180^0$

$\angle b + 120^0 = 180^0$

$\angle b = 180^0 - 120^0$

$\angle b = 60^0$



Sol. As we know that the sum of exterior angle and adjacent interior angle is equal to 180^0.

So, $a + 105^0 = 180^0$

$a = 180^0 - 105^0$

$a = 75^0$

We know that vertical angles are equal.

So, $\angle c = 30^0$

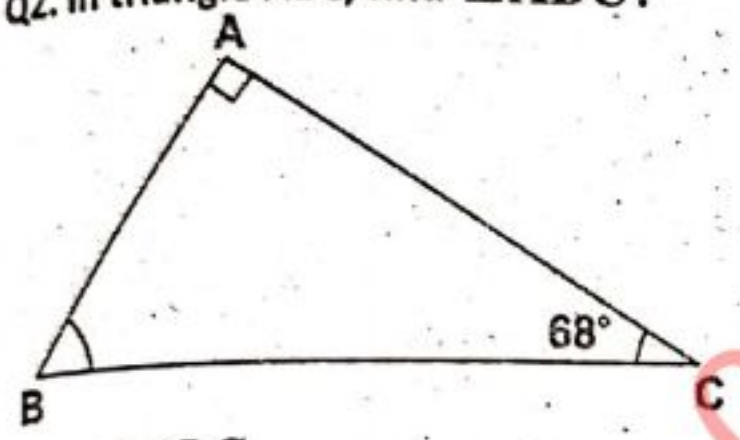
We know that the sum of exterior angle and adjacent interior angle is equal to 180^0.

$$\angle b+\angle c+102^0=180^0$$
$$\angle b+30^0+102^0=180^0$$
$$\angle b+132^0=180^0$$
$$\angle b=180^0-132^0$$
$$\angle b=48^0$$

Now sum of angles of triangle is equal to 180^0.

$$\angle a+\angle b+\angle d=180^0$$
$$75^0+48^0+\angle d=180^0$$
$$123^0+\angle d=180^0$$
$$\angle d=180^0-123^0$$
$$\angle d=57^0$$

Q2. In triangle ABC, find $\angle ABC$.



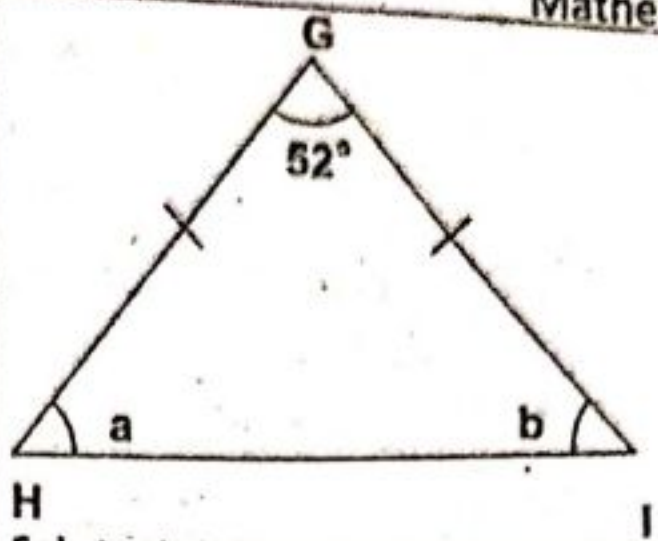
Sol. In ΔABC

$$\angle A=90^0\ \angle C=68^0$$

To find $\angle B$ we take sum of angles of triangle

$$\angle A+\angle B+\angle C=180^0$$
$$90^0+\angle B+68^0=180^0$$
$$\angle B+158^0=180^0$$
$$\angle B=180^0-158^0$$
$$\angle B=22^0$$

Q3. Find $\angle a$ and $\angle b$.



Sol. As the given triangle is an isosceles triangle. So the two base angles $\angle a$ and $\angle b$ are equal.

So, $\angle a+\angle b+52^0=180^0$

As $\angle a=\angle b$.

$$\angle a+\angle a+52^0=180^0$$
$$2\angle a=180^0-52^0$$
$$2\angle a=128^0$$

Divide both sides by 2

$$\frac{2\angle a}{2}=\frac{128^0}{2}$$

$\angle a=64^0$ also $\angle b=64^0$

Review Exercise – 12

Q1. Choose the correct option.

a) Line of symmetry divides the symmetric shape into:
   - i. Quarter
   - **ii. Halves**
   - iii. Thirds
   - iv. Fourths

b) If a shape or object is rotated around a central point and looks exactly the same at least 2 times in a full rotation, we say that is has.
   - i. Translation symmetry
   - ii. Reflexive symmetry
   - **iii. Rotational symmetry**
   - iv. Line symmetry

c) Turning a shape around a fixed point (centre of rotation)
   - i. Reflection
   - ii. Translation
   - **iii. Rotation**
   - iv. Dilation

d) When an object or image moves or shifts from one place to another, this movement is called:
   i. Reflection
   ii. **Translation**
   iii. Rotation
   iv. Dilation

e) Translating an object or image doesn't affect its:
   i. Position
   ii. Location
   iii. Placement
   iv. **Size**

f) 2 units left and 1 unit down is same as:
   i. $(x,y) \rightarrow (x+2,y-1)$
   ii. $(x,y) \rightarrow (x-2,y+1)$
   iii. $(x,y) \rightarrow (x+2,y+1)$
   iv. **$(x,y) \rightarrow (x-2,y-1)$**

g) Rotating 90^0 counter clockwise or 270^0 clockwise about the origin will:
   i. Change the sign of x and switch x,y
   ii. Change the sign of x only
   iii. Change the sign of y only
   iv. **Change the sign of y and switch x,y**

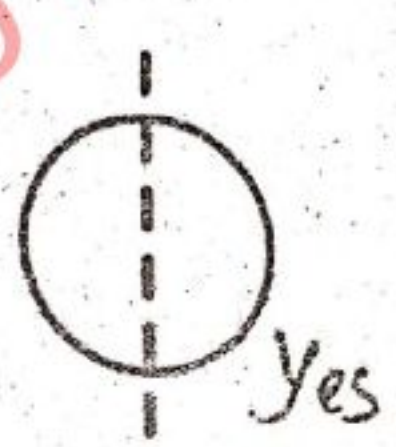
h) $(x, y) \rightarrow (x - 4, y + 6)$ means:
   i. Adding 4 to the x-coordinate and adding 6 to the y-coordinate.
   ii. Subtracting 4 from the y-coordinate and adding 6 to the x-coordinate.
   iii. Adding 4 to the x-coordinate and adding 6 to the y-coordinate.
   iv. **Subtracting 4 from the x-coordinate and adding 6 to the y-coordinate.**

Q2. Does the dotted line represent the line of symmetry for the following figures? Write 'yes' or 'no'.

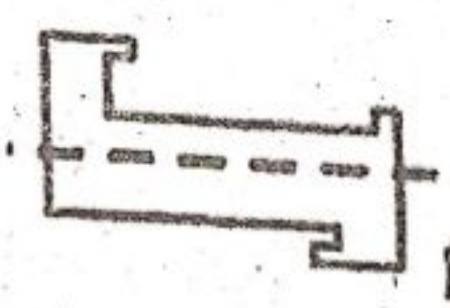
Sol. Yes the dotted line represents the line of symmetry.

Sol. Yes the dotted line represents the line of symmetry.

Sol. Yes the dotted line represents the line of symmetry.



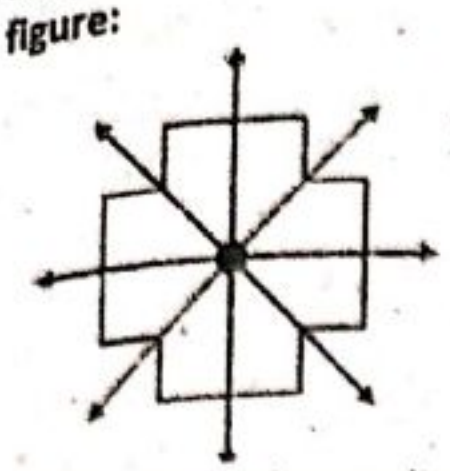
Sol. No the dotted line does not represents the line of symmetry.



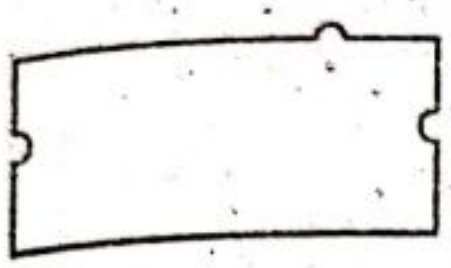
Sol. No the dotted line does not represents the line of symmetry.

Q3. Draw line(s) of symmetry for the shapes (if any)

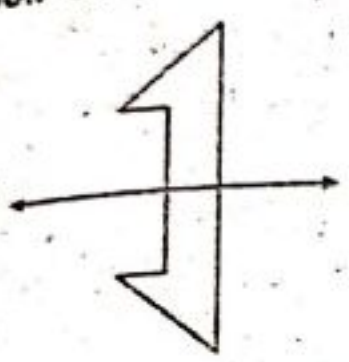
Sol. Lines of symmetry for the given figure:



Sol. This figure has no line of symmetry.

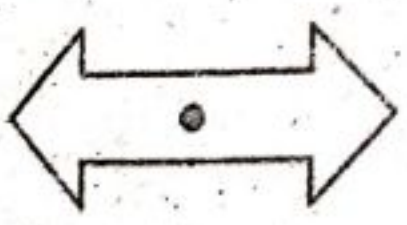


Sol. One line of symmetry

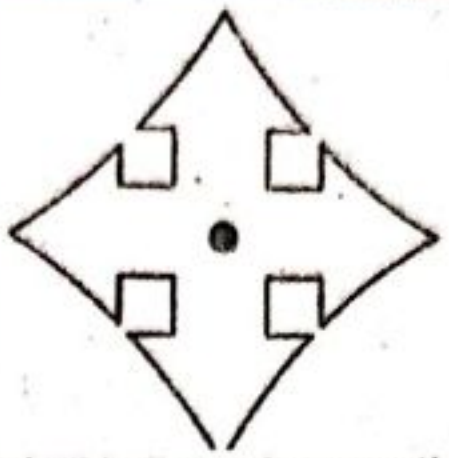


Q4. Tick the figures that have rotational symmetry. Write the order of rotation and mark the point of rotation for the symmetric figures.

Sol. This figure has rotational symmetry of order 1.



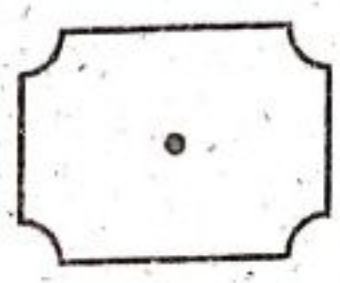
Sol. This figure has rotational symmetry of order 2.



Sol. This figure has rotational symmetry of order 4.

Sol. This figure has rotational symmetry of order 4.

Sol. This figure has no rotational symmetry.



Sol. This figure has rotational symmetry of order 2.

Q5. Rotate the given image through 180^0 counter clockwise about the origin.

Sol. Vertices of figure:

$(-4,5),(-8,5),(-9,8)$

$(-6,10),(-3,8)$

After rotating it 180^0 counter clockwise, the vertices becomes:

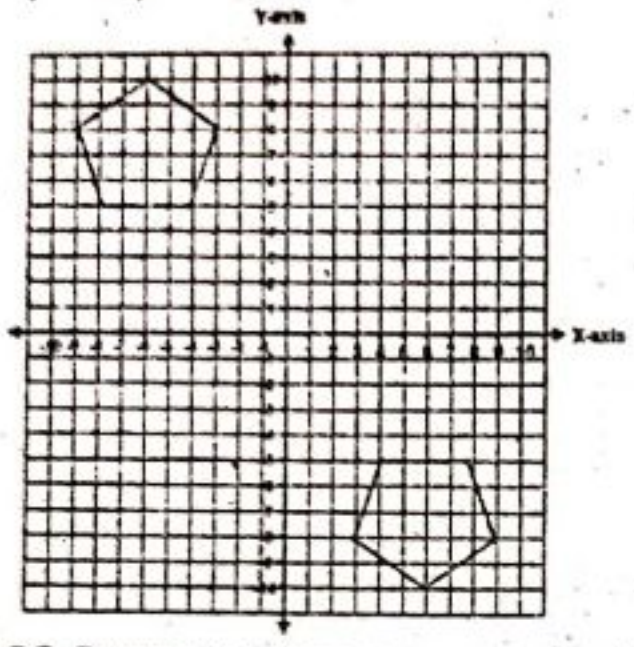
$(-4,5) \rightarrow (4,-5)$

$(-8,5) \rightarrow (8,-5)$

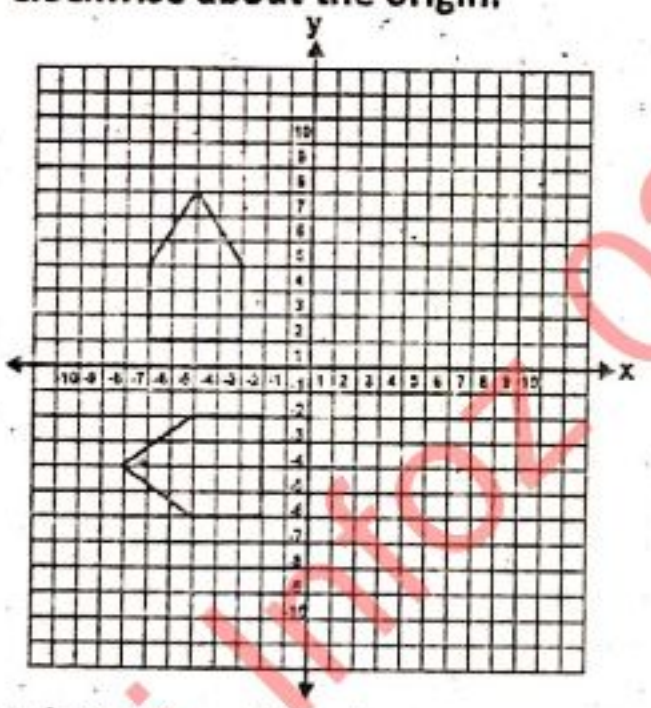
$(-9,8) \rightarrow (9,-8)$

$(-6,10) \rightarrow (6,-10)$

$(-3,8) \rightarrow (3,-8)$



Q6. Draw a pentagon on coordinate plane. Then rotate it through 90 counter clockwise about the origin.



Sol. Vertices of Pentagon:

$(-4,5),(-8,5),(-9,8)$

$(-6,10),(-3,8)$

After rotating it 90^0 counter clockwise, the vertices becomes:

$(-4,5) \rightarrow (-5,-4)$

$(-8,5) \rightarrow (-5,-8)$

$(-9,8) \rightarrow (-8,-9)$

$(-6,10) \rightarrow (-10,-6)$

$(-3,8) \rightarrow (-8,-3)$

Q7. Draw a rectangle on the coordinate plane. The rotate it through 180 counter clockwise about the origin.

Sol. Vertices of rectangle:

$(1,1),(6,1),(6,4),(1,4)$

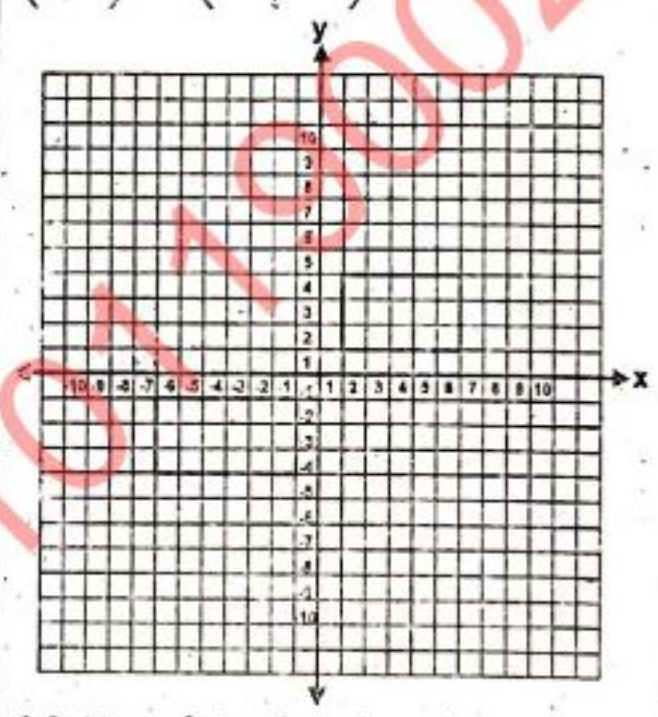
After rotating it 90^0 counter clockwise, the vertices becomes:

$(1,1) \rightarrow (-1,-1)$

$(6,1) \rightarrow (-6,-1)$

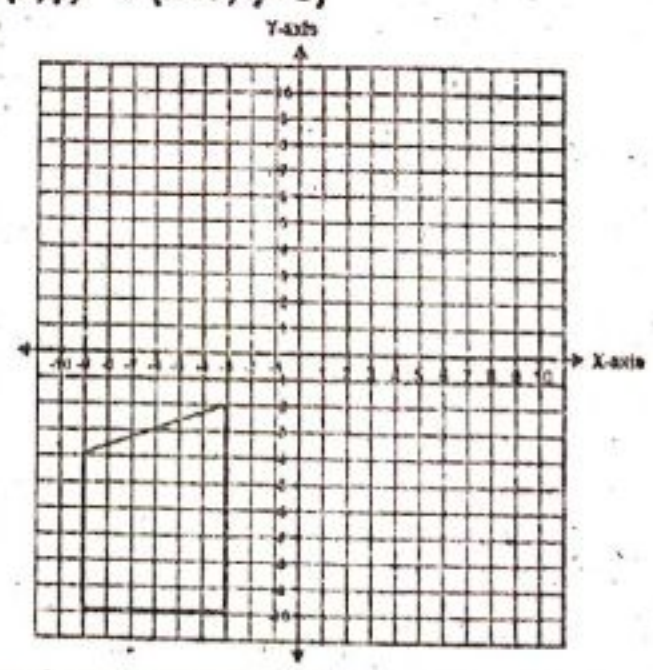
$(6,4) \rightarrow (-6,-4)$

$(1,4) \rightarrow (-1,-4)$



Q8. Translate the given images according to the given description and write the coordinates of the translated image.

(x,y) → (x+5, y+8)



Sol. Coordinates of the given figure are:

$(-9,-10),(-3,-10)$

$(-3,-2),(-9,-4)$

After translating the image according to the given description i.e.

$(x,y) \rightarrow (x+5, y+8)$

The new coordinate will be

$(-9,-10) \rightarrow (-9+5,-10+8)$

$(-9,-10) \rightarrow (-4,-2)$

$(-3,-10) \rightarrow (-3+5,-10+8)$

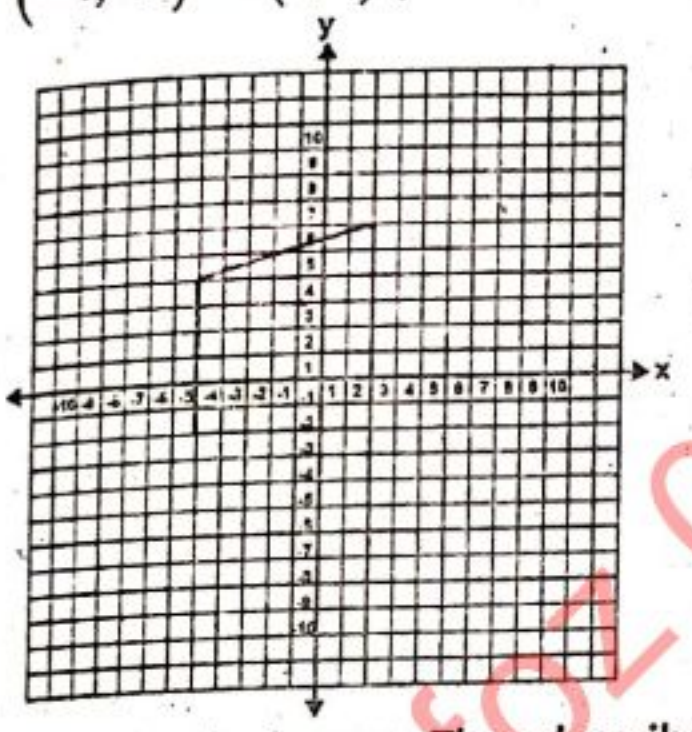
$(-3,-10) \rightarrow (2,-2)$

$(-3,-2) \rightarrow (-3+5,-2+8)$

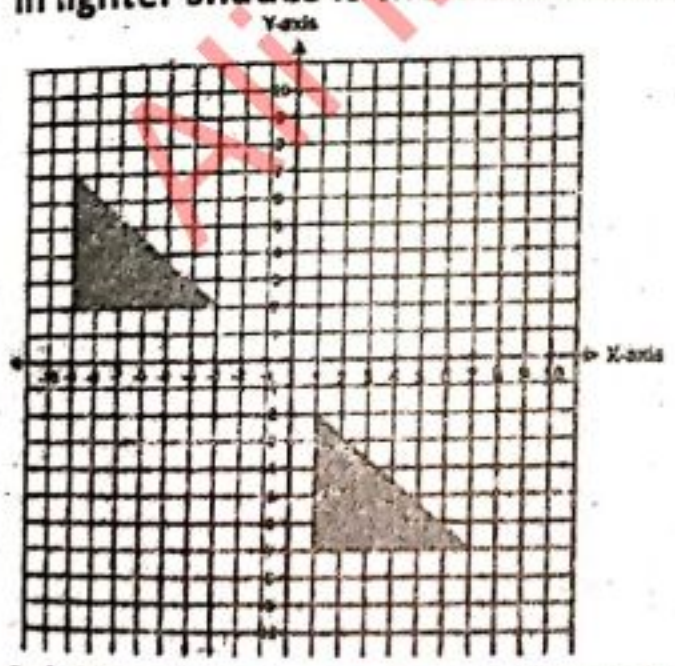
$(-3,-2) \rightarrow (2,6)$

$(-4,-2) \rightarrow (-4+5,-2+8)$

$(-4,-2) \rightarrow (1,6)$



Q9. Name the images. Then describe the translation of the given images (the image in lighter shades is the translated image).



Sol. The given image is a right angled triangle.

Coordinate of the pre-image of right angled triangle are:

$(-3,2), (-9,2), (-9,7)$

Vertices of the translated image are:

$(7,-7), (1,-7), (1,-2)$

Choose any point of the pre-image. Let

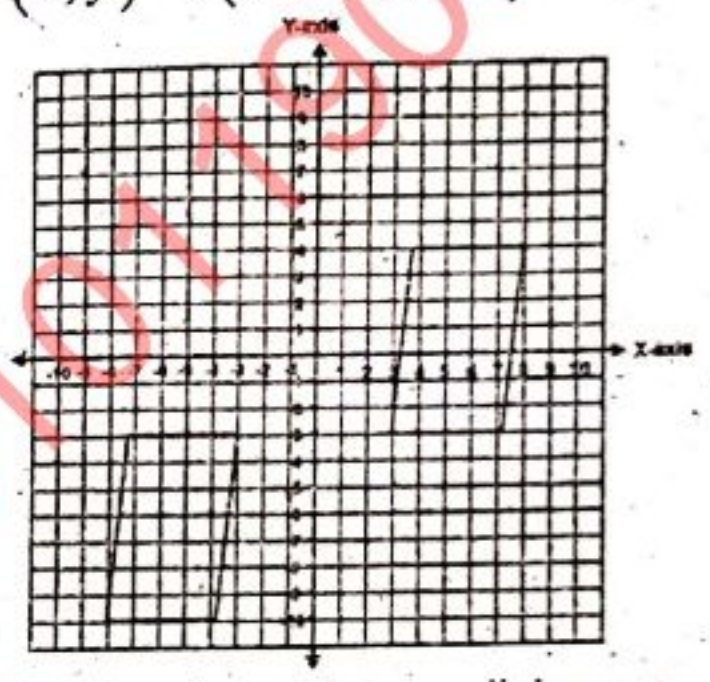
$(-3,2)$

Now look for its corresponding point on the translated image $(7,-7)$ has the coordinates (7, -7)

$-3+10=7$ *and* $2+(-9)=-7$

So, the object has moved 10 units right (positive horizontal direction) and 9 units down (negative vertical direction)

$(x,y) \rightarrow (x+10, y-9)$



The given image is a parallelogram.

Coordinate of the pre-image of parallelogram are:

$(-10,-9), (-10,-4)$

$(-3,-3), (-3,-8)$

Vertices of the translated image are:

$(2,-3), (7,-3)$

$(8,4), (3,4)$

Choose any point of the pre-image. Let

$(-10,-9)$

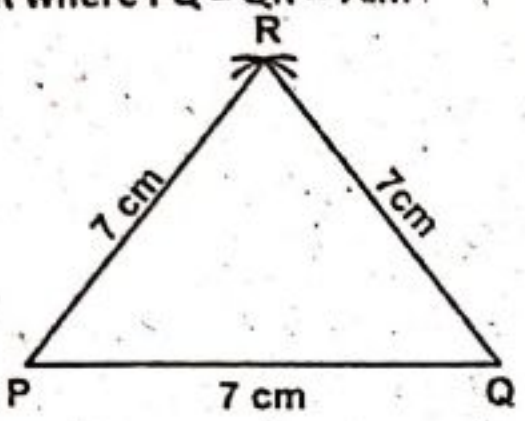
Now look for its corresponding point on the translated image $(2,-3)$ has the coordinates (2, -3)

$-10+12=2$ *and* $-9+6=-3$

So, the object has moved 12 unit right (positive horizontal direction) and 6 units up (positive vertical direction)

$(x, y) \rightarrow (x+12, y+6)$

Q10. Construct an equilateral triangle PQR where PQ = QR = 7cm.

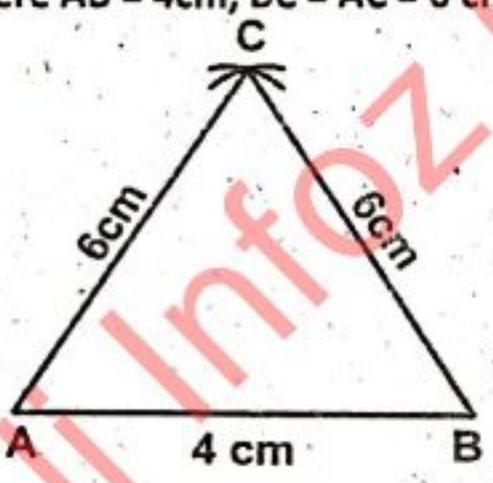


Steps of Construction:

1. Draw a line segment PQ = 7 cm
2. With P as centre, draw an arc of radius 7 cm.
3. With Q as centre, draw another arc of radius 7 cm, which intersect the previous arc at point R.
4. Join R to P and Q.

PQR is the required equilateral triangle.

Q11. Construct an isosceles triangle ABC where AB = 4cm, BC = AC = 6 cm

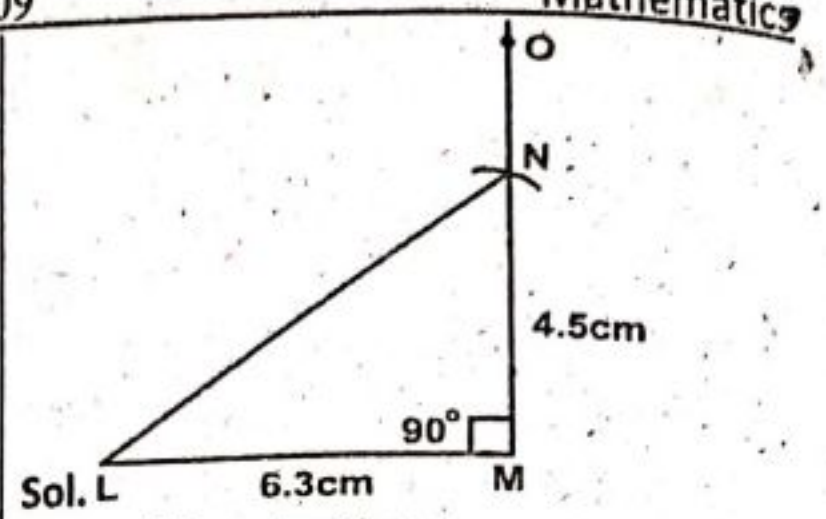


Steps of Construction:

1. Draw a line segment AB = 4 cm
2. With A as centre, draw an arc of radius 6 cm.
3. With B as centre, draw another arc of radius 6 cm, which intersect the previous arc at point C.
4. Join C to A and B.

PQR is the required isosceles triangle.

Q12. Construct a right-angled triangle LMN where $\angle LMN = 90^0$, LM=6.3 cm, MN=4.5 cm.

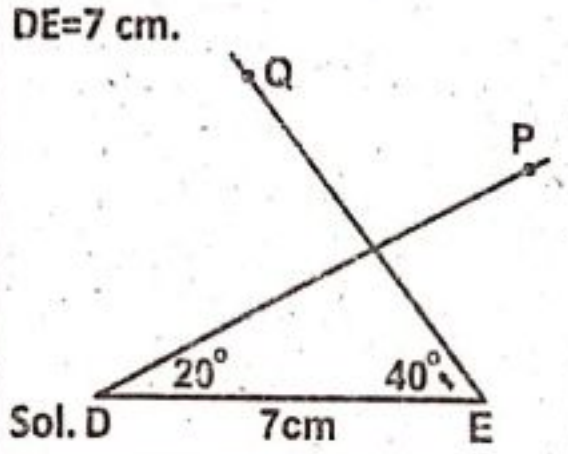


Steps of Construction:

1. Draw a line segment LM = 6.3 cm
2. Place the protractor at point M such that the centre of the protractor is at point M.
3. Read the angle 90^0 on the protractor and mark point O.
4. With M as centre, draw an arc of 4.5 cm length that intersects the arm MO at point N.
5. Join N to L.

Triangle LMN is the required right angled triangle.

Q13. Construct a scalene triangle DEF where $\angle DEF = 40^0, \angle EDF = 20^0$, DE=7 cm.

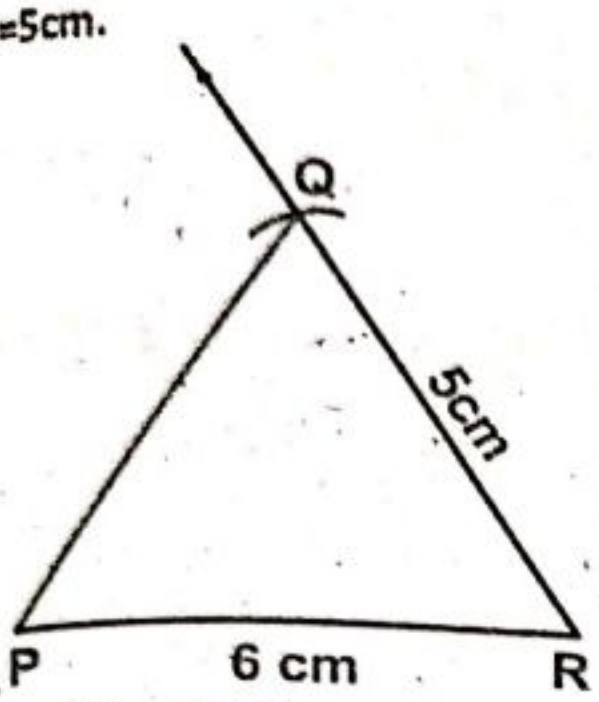


Steps of Construction:

1. Draw a line segment DE = 7 cm
2. Place the protractor at point D such that the centre of the protractor is exactly at point D.
3. Read the angle 20^0 on the protractor and mark point P.
4. Place the protractor at point E such that the centre of the protractor is exactly at point E and read the angle 35^0 on the protractor and mark Q.

Join D to P and E to Q and name the point where they meet as F. Triangle DEF is the required scalene triangle.

Q14. Construct an acute angle triangle PQR where $\angle PRQ = 70^0$, PR=6cm, QR=5cm.



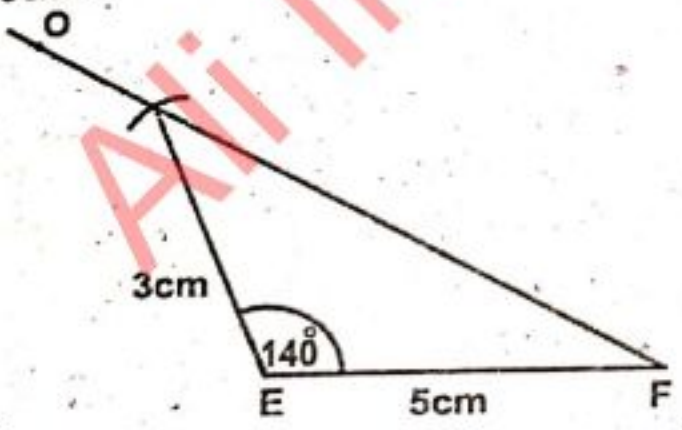
Sol.

Steps of Construction:

1. Draw a line segment PR = 6 cm
2. Place the protractor at point R such that the centre of the protractor is at point R.
3. Read the angle 70^0 on the protractor and mark point O.
4. With R as centre, draw an arc of 5 cm length that intersects the arm RO at pointQP.
5. Join Q to P.

Triangle PQR is the required acute angled triangle

Q15. Construct an obtuse angle triangle DEF where $\angle FED = 140^0$, EF=5cm, FD=3cm.



Sol.

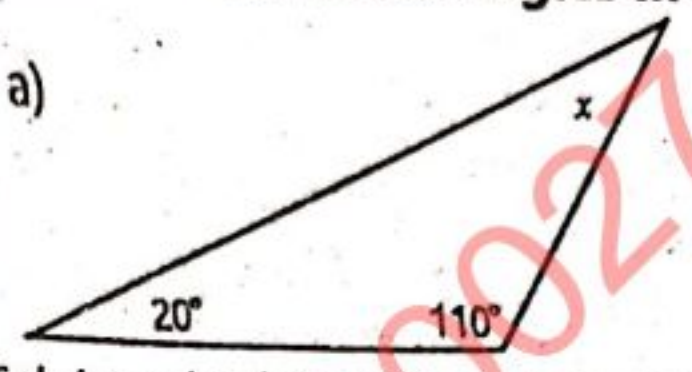
Steps of Construction:

1. Draw a line segment EF = 5 cm
2. Place the protractor at point E such that the centre of the protractor is at point E.
3. Read the angle 140^0 on the protractor and mark point O.
4. With E as centre, draw an arc of 3 cm length that intersects the arm EO at point D.
5. Join D to F.

Triangle DEF is the required obtuse angled triangle.

Q16. Find the unknown angles in the following triangles.

a)



Sol. As we know that sum of three angles of triangle is equal to 180^0.

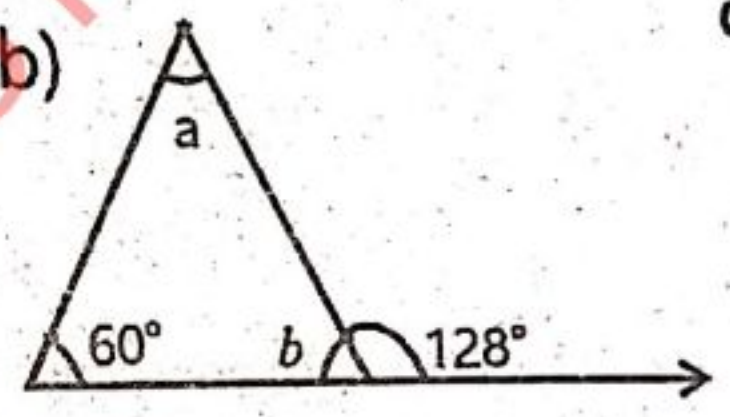
So, $x + 20^0 + 110^0 = 180^0$

$\Rightarrow x + 130^0 = 180^0$

$\Rightarrow x = 180^0 - 130^0$

$\Rightarrow x = 50^0$ **Ans.**

b)



Sol. As we know that the sum of exterior angle and adjacent interior angle is equal to 180^0.

So, $b + 128^0 = 180^0$

$x = 180^0 - 128^0$

$x = 52^0$

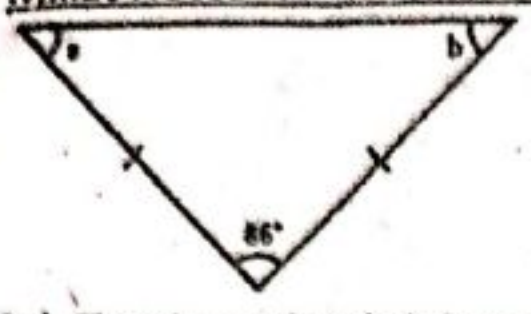
As we know that sum of three angles of triangle is equal to 180^0.

So, $a + 60^0 + 52^0 = 180^0$

$\Rightarrow a + 112^0 = 180^0$

$\Rightarrow a = 180^0 - 112^0$

$\Rightarrow a = 68^0$ **Ans.**



Sol. The given triangle is isosceles triangle.
So the base angles are equal i.e.

$\angle a = \angle b$

Sum of angle of triangle is 180^0.

$\angle a + \angle b + 86^0 = 180^0$

$\angle a + \angle a = 180^0 - 86^0$

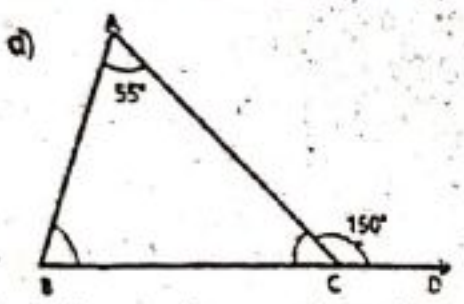
$2\angle a + = 94^0$

Divide both sides by 2

$\frac{2\angle a}{2} = \frac{94^0}{2}$

$\angle a = 47^0$ also $\angle b = 47^0$

d)



Sol. As we know that the sum of exterior angle and adjacent interior angle is equal to 180^0.

So, $\angle C + 150^0 = 180^0$

$\angle C = 180^0 - 150^0$

$\angle C = 300^0$

As we know that sum of three angles of triangle is equal to 180^0.

So, $\angle A + \angle B + \angle C = 180^0$

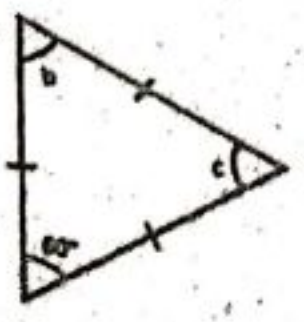
$55^0 + \angle B + 30^0 = 180^0$

$85^0 + \angle B = 180^0$

$\angle B = 180^0 - 85^0$

$\Rightarrow \angle B = 95^0$ **Ans.**

e)



Sol. The given triangle is equilateral triangle. So all angles of the equilateral triangle is equal.

As the given angle = 60^0

The remaining angles will also be equal to 60^0.

So $\angle a = 60^0$ $\angle b = 60^0$

Unit – 13
Data Management and Probability

Exercise - 13.1

Q1. The following data shows the number of new buildings (commercial and residential) constructed during 5 months in a Town. Draw a vertical multiple bar graph for this data using appropriate scale.

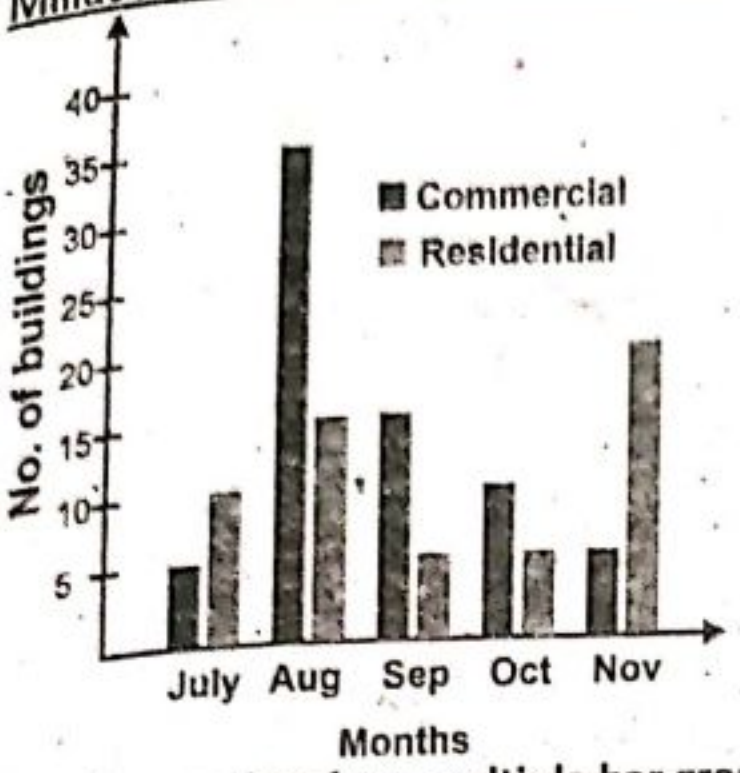
	Commercial	Residential
July	5	10
August	35	15
September	15	5
October	10	5
November	5	20

Sol.

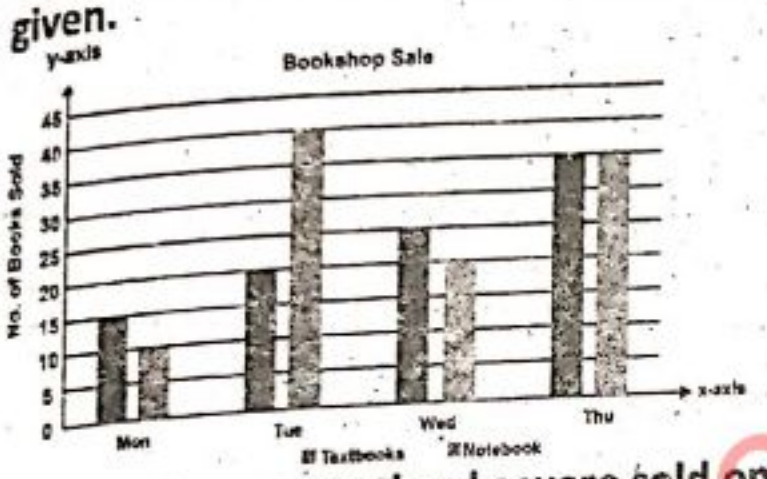
Step I: Draw an x-axis (horizontal line) and y-axis (vertical line) perpendicular to each other.

Step II: Write name of months along x-axis and number of buildings along y-axis. Choose the color for each category. i.e. Commercial and Residential.

Step III: Choose appropriate scale. Draw bars of the given data. The width of the bars must be the same throughout the multiple bar graph.



Q2. Observe the given multiple bar graph in vertical form and answer the questions given.



a) **How many textbooks were sold on Monday?**

Sol. On Monday, 15 books were sold.

b) **How many textbooks were sold on Wednesday?**

Sol. On Wednesday 25 books were sold.

c) **On which day the least number of notebooks were sold?**

Sol. On Monday the least number of notebooks were sold.

d) **On which day the greatest number of notebooks were sold?**

Sol. On Tuesday the greatest number of notebooks were sold.

e) **What is the total number of notebooks sold on Tuesday and Wednesday altogether?**

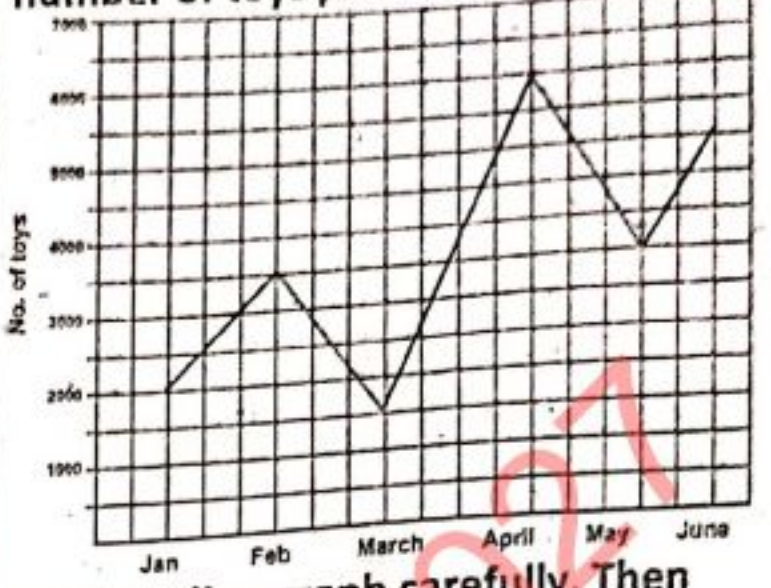
Sol. Notebooks sold on Tuesday = 40
Notebooks sold on Wednesday = 20
Notebooks sold on Tuesday and Wednesday = 40 + 20 = 60

f) **On which day the greatest number of books were sold?**

Sol. On Thursday the greatest number of books were sold.

Exercise – 13.2

Q1. The following line graph shows the number of toys produced in a toy factory.



Read the line graph carefully. Then answer the questions given below.

a) **Which month experienced the highest production?**

Sol. The highest production experienced in the month of April.

b) **Which two months experienced a decrease in production?**

Sol. The production experienced a decrease in the months of March and May.

c) **How many more toys were produced in May than in March?**

Sol. Toys produced in month of May = 3500
Toys produced in month of March = 1500
3500 – 1500 = 2000
2000 more toys were produced in the month of May than March.

d) **What is the total increase in the number of toys from January to April?**

Sol. Toys produced in month of January = 2000
Toys produced in month of April = 6000
6000 – 2000 = 4000
Total number of toys increased from January to April is 4000.

Q3. Read the following table which shows the number of visitors to the ShahiQila, Lahore, in five months: draw a line graph to represent the same data.

Months	No. of visitors

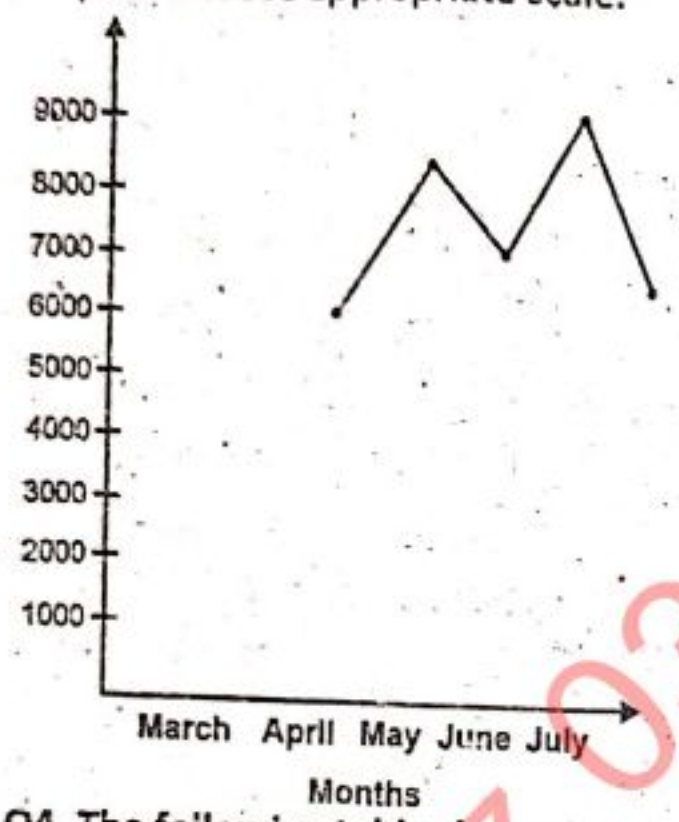
March	6000
April	8500
May	7000
June	9000
July	6500

Sol.

Step I: Draw an x-axis (horizontal line) and y-axis (vertical line) perpendicular to each other.

Step II: Write name of months along x-axis and number of visitors along y-axis.

Step III: Choose appropriate scale.



Q4. The following table shows temperature after every two hours in April. Draw line graph for this data.

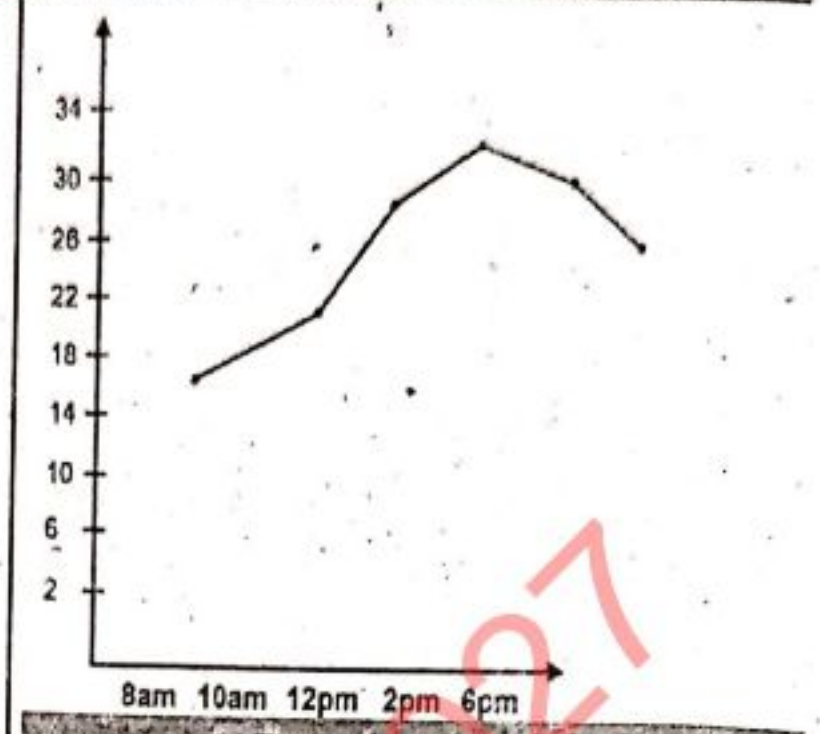
Time	Temperature C^0
8 a.m.	16.5
10 a.m.	20.2
12 p.m.	28.8
2 p.m.	32.4
4 p.m.	30.7
6 p.m.	26.6

Sol.

Step I: Draw an x-axis (horizontal line) and y-axis (vertical line) perpendicular to each other.

Step II: Write time along x-axis and temperature along y-axis.

Step III: Choose appropriate scale.



Exercise – 13.3

Q1. Here is the budget of a family for a month. The total income is Rs.39,800. Show this data in a pie graph and describe the findings.

Category	Amount in Rs
Food	3150
Education	1950
Conveyance	21100
Savings	2400
Miscellaneous	11200

Sol. First we find the measurement of the central angles by using the following method.

Sum of all time = 3150 + 1950 + 21100 + 2400 + 11200 = 39,800

Using formula:

$$\text{Category} = \frac{\text{Spend money}}{\text{Total money}} \times 360$$

$$\text{Food} = \frac{3150}{39800} \times 360 = 28$$

$$\text{Education} = \frac{1950}{39800} \times 360 = 18$$

$$\text{Conveyance} = \frac{21100}{39800} \times 360 = 191$$

$$\text{Savings} = \frac{2400}{39800} \times 360 = 22$$

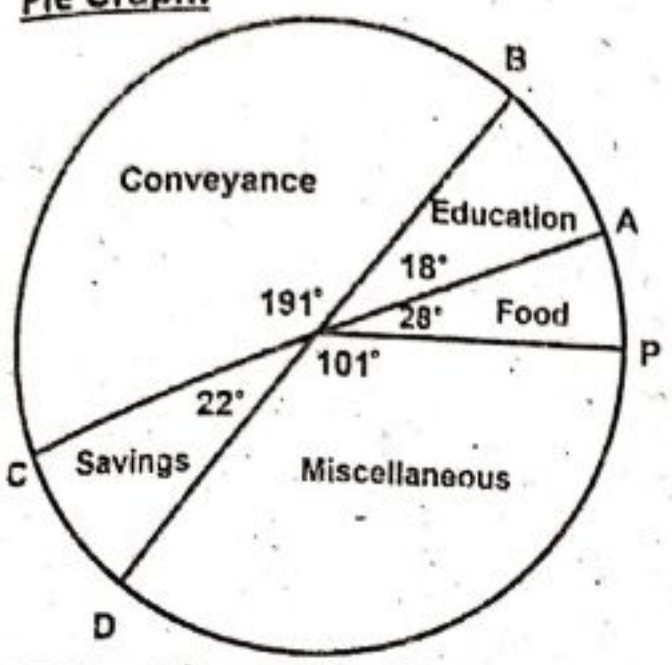
$$\text{Miscellaneous} = \frac{11200}{39800} \times 360 = 101$$

Step I: Draw a circle of suitable radius and draw its radius OP.

Step II: Construct an angle of 28^0 representing the amount of money spend on food.

Step III: Construct angles of 18^0, 191^0, 22^0 and 101^0 representing the amount of money spend for Education, Conveyance, Savings and Miscellaneous respectively.

Pie Graph:



Q2. Junaid saved Rs.45, Rs.56, Rs.65 and Rs.75 in four weeks of a month. Show this data on a pie graph.

Sol. Find the total sum

$45 + 56 + 65 + 75 = 241$

Now calculate the angle for the sector of each category.

$$1^{st}\text{ week} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$1^{st}\text{ week} = \frac{45}{241} \times 360^0$$

$$1^{st}\text{ week} = 67.22^0$$

$$2^{nd}\text{ week} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$2^{nd}\text{ week} = \frac{56}{241} \times 360^0$$

$$2^{nd}\text{ week} = 83.65^0$$

$$3^{rd}\text{ week} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$3^{rd}\text{ week} = \frac{65}{241} \times 360^0$$

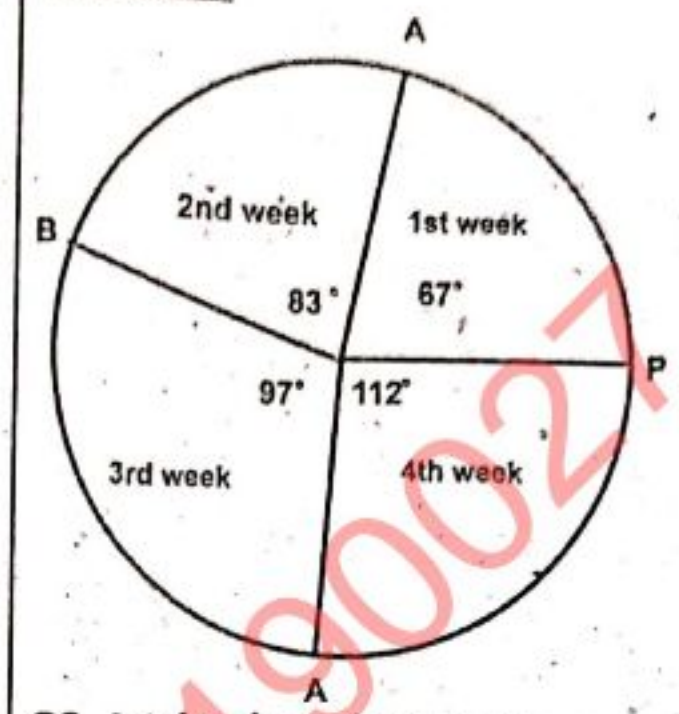
$$3^{rd}\text{ week} = 97.1^0$$

$$4^{th}\text{ week} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$4^{th}\text{ week} = \frac{75}{241} \times 360^0$$

$$4^{th}\text{ week} = 112^0$$

Pie Graph:



Q3. A school conducts a survey on favourite subjects of students. 423 students like Math, 123 students like History, 222 students like English and 86 students like Urdu. Draw a pie graph for the data.

Sol. Find the total sum

$423 + 123 + 222 + 86 = 854$

Now calculate the angle for the sector of each category.

$$\text{Maths} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$\text{Maths} = \frac{423}{854} \times 360^0$$

$$\text{Maths} = 178.3^0$$

$$\text{History} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$\text{History} = \frac{123}{854} \times 360^0$$

$$\text{History} = 51.9^0$$

$$\text{English} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$\text{English} = \frac{222}{854} \times 360^0$$

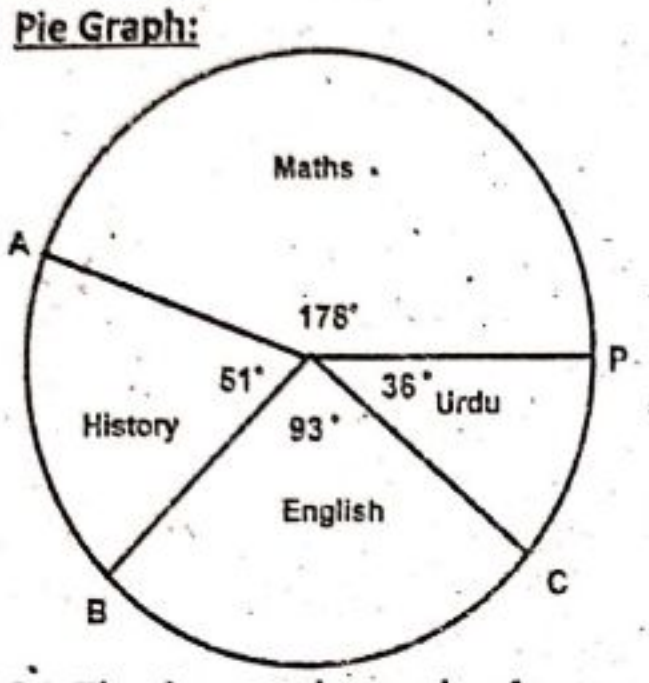
$$\text{English} = 93.6^0$$

$$\text{Urdu} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$\text{Urdu} = \frac{86}{854} \times 360^0$$

$$\text{Urdu} = 36.3^0$$

Pie Graph:



Q4. The data on the mode of transport used by 1080 students are given below. Represent the data in the form of a pie graph and describe the findings.

Mode of transport	No. of Students
Bus	198
Cycle	180
Bike	240
Car	27
On foot	200

Sol. Find the total sum

198 + 180 + 240 + 27 + 200 = 845

Now calculate the angle for the sector of each category.

$$\text{Bus} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$\text{Bus} = \frac{198}{845} \times 360^0$$

$$\text{Bus} = 84.4^0$$

$$\text{Cycle} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$\text{Cycle} = \frac{180}{845} \times 360^0$$

$$\text{Cycle} = 76.7^0$$

$$\text{Bike} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$\text{Bike} = \frac{240}{845} \times 360^0$$

$$\text{Bike} = 102.2^0$$

$$\text{Car} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

$$\text{Car} = \frac{27}{845} \times 360^0$$

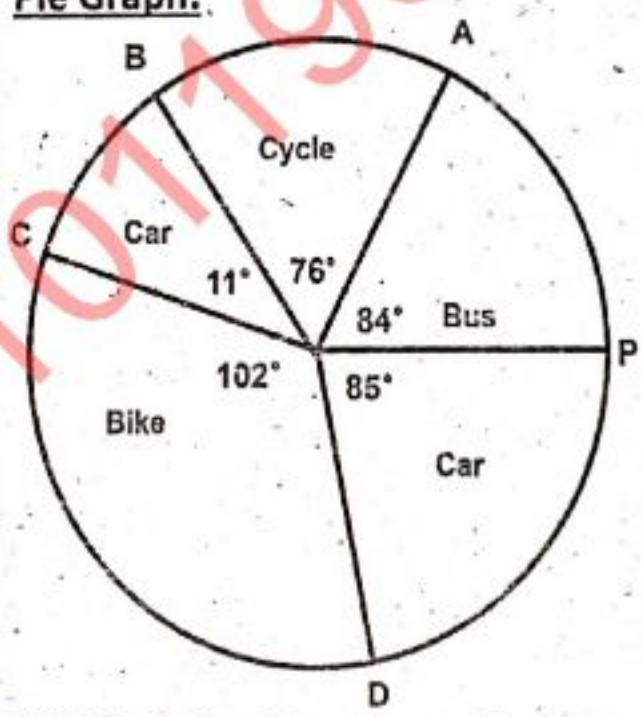
$$\text{Car} = 11.5^0$$

$$\text{On foot} = \frac{\text{Amount spent}}{\text{Total amount}} \times 360^0$$

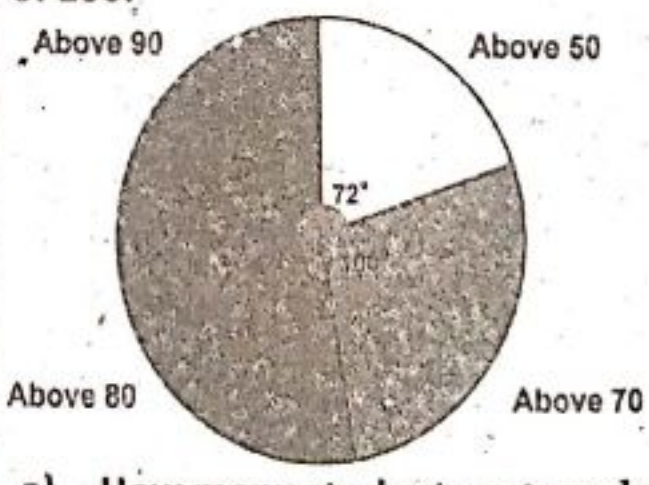
$$\text{On foot} = \frac{200}{845} \times 360^0$$

$$\text{On foot} = 85.2^0$$

Pie Graph:



Q5. The following pie graph shows the marks of 90 students in a Maths test out of 100.



a) **How many students got marks above 50?**

Sol. Central angle of above 50 = 72^0

Number of students got marks more than

$$50 = \frac{72}{360_4} \times \cancel{90}^{1} = 18$$

b) How many students got marks above 70?

Sol. Central angle of above 70 = 100^0

Number of students got marks more than

$$70 = \frac{100}{360_4} \times 90^1 = 25$$

c) How many students got marks above 80?

Sol. Central angle of above 80 = 108^0

Number of students got marks more than

$$50 = \frac{108}{360_4} \times 90^1 = 27$$

d) How many students got marks above 90?

Sol. Central angle of above 90 = 80^0

Number of students got marks more than

$$50 = \frac{80}{360_4} \times 90^1 = 20$$

e) How many students got marks between 50 to 80?

Sol. Number of students got marks more than 50 = 18

Number of students got marks more than 70 = 25

Number of students got marks between 50 and 80 = 18 + 25 = 43

f) How many students got marks between 70 to 90?

Sol. Number of students got marks more than 70 = 25

Number of students got marks more than 80 = 20

Number of students got marks between 70 and 90 = 20 + 25 = 45

g) Find the ratio of students who got marks above 50 and above 90.

Sol. Number of students got marks more than 50 = 18

Number of students got marks more than 90 = 20

Ratio: 18 : 20

9 : 10 Ans.

h) Find the difference between the students who got marks above 50 and above 80.

Sol. Number of students got marks more than 50 = 18

Number of students got marks more than 80 = 25

Difference = 25 – 18 = 7 Ans.

Exercise – 13.4

Q1. The hockey team scored the following number of goals in 20 consecutive matches. Represent it on a frequency table.

3, 0, 1, 4, 4, 1, 2, 0, 2, 2, 0, 2, 0, 1, 3, 1, 2, 1, 1, 3.

Sol. Frequency Table:

Score	Frequency
0	4
1	6
2	5
3	3
4	2

Q2. The blood group of 25 people in a blood donation bank are given below. Represent this data in a frequency distribution table. Also describe the findings about this data.

B, A, A, O, B, B, B, B, A, B, B, B, A, A, O, O, B, B, B, B, B, A, O, O, A.

Sol. Frequency Table:

Blood group	Frequency
O	5
A	7
B	13

Findings: The most common blood group is group B.

The rarest blood group is group O.

Q3. Complete the given grouped frequency table for the height of plants in a nursery with the following measurements (in cm)

130, 125, 125, 126, 127, 127, 128, 128, 128, 129, 125, 140, 142, 143, 144, 144, 146, 146, 147, 149, 134, 135, 135, 136, 136, 137, 137, 138, 138, 139, 139, 130, 131, 131, 131, 132, 132, 133, 133, 133.

Height of plants cm	Tally	Frequency
125 – 129	𝍸 𝍸	10
130 – 134	𝍸 𝍸 |	11
135 – 139	𝍸 𝍸	10
140 – 144	𝍸	5
145 – 149	||||	4

a) What is the size of the class intervals?

Sol. Size of class interval = 5

b) Which two classes have the same frequency?

Sol. 1st and 3rd class have the same frequency.

c) Which class has the highest frequency?

Sol. 2nd class (130 – 134) has the highest frequency.

d) Which class has the lowest frequency?

Sol. Last class (145 – 149) has the lowest frequency.

e) What is the upper limit of the class interval 135 – 139?

Sol. Upper limit of the class interval 135 – 139 is 139.

f) What is the lower limit of the interval 130 – 134?

Sol. The lower limit of the interval 130 – 134 is 130.

Q4. The amount donated by 17 people to construct a Masjid (in Rs) is given. Make a grouped frequency table.

3118, 4123, 6124, 2125, 1127, 4128, 5129, 2130, 2130, 7133, 4136, 7138, 3141, 2142, 5149, 4150, 6154.

Sol. Largest value = 6154

Smallest value = 1127

Range = Largest value – smallest value

Range = 6154 – 1127

Range = 5027

Let number of classes = 5

$$\text{Class size} = \frac{\text{Range}}{\text{No. of Classes}}$$

$$\text{Class size} = \frac{5027}{5}$$

Class size = 1005.4

Height of plants cm	Frequency
1120 – 2370	5
2371 – 3620	2
3621 – 4870	4
4871 – 6120	2
6121 - 7370	4

Q5. The given data is the weight of class 7 students. Construct a frequency table.

20kg, 24kg, 21kg, 18kg, 20kg, 24kg, 21kg, 18kg, 19kg, 24kg, 19kg, 21kg, 24kg, 20kg, 18kg, 18kg, 20kg, 24kg, 18kg, 24kg, 26kg, 21kg, 19kg, 26kg.

Sol. Largest value = 26

Smallest value = 18

Range = Largest value – smallest value

Range = 26 – 18

Range = 8

Let number of classes = 5

$$\text{Class size} = \frac{\text{Range}}{\text{No. of Classes}}$$

$$\text{Class size} = \frac{8}{5}$$

Class size = 1.6

Weight of students	Frequency
17 – 18	5
19 – 20	7
21 – 22	4
23 – 24	6
25 - 26	2

Q6. The data below shows the marks out of 100 of 24 students in a class. Make the grouped frequency table.

55, 70, 57, 73, 55, 59, 64, 72, 60, 48, 58, 54, 69, 51, 63, 78, 75, 64, 65, 57, 71, 78, 76, 68.

Sol. Largest value = 78
Smallest value = 48
Range = Largest value – smallest value
Range = 78 – 48

Class interval	C.B	f
30 – 34	29.5 – 34.5	4
35 – 39	34.5 – 39.5	6
40 – 44	39.5 – 44.5	12
45 – 49	44.5 – 49.5	10
50 – 54	49.5 – 54.5	8

Range = 30
Let number of classes = 4

$$\text{Class size} = \frac{\text{Range}}{\text{No. of Classes}}$$

$$\text{Class size} = \frac{30}{4}$$

Class size = 7.5

Marks of students	Frequency
48 – 55	5
56 – 63	6
64 – 71	7
72 – 79	6

Q7. The following table shows the marks obtained by students in Maths.

Marks	Number of students
55 – 69	24
70 – 84	10
85 – 99	15

a) What is the number of classes?

Sol. There are three classes.

b) Tell the total number of students?

Sol. Total number of students = 24 + 10 + 15 = 49 .

c) What is the lowest data value?

Sol. Lowest data value is 55.

d) How many students got marks between 70 and 84?

Sol. 10 students got marks between 70 and 84.

e) How many students got 70 or more than 70 marks?

Sol. Number of students who got 70 or more than 70 marks are: 10 + 15 = 25

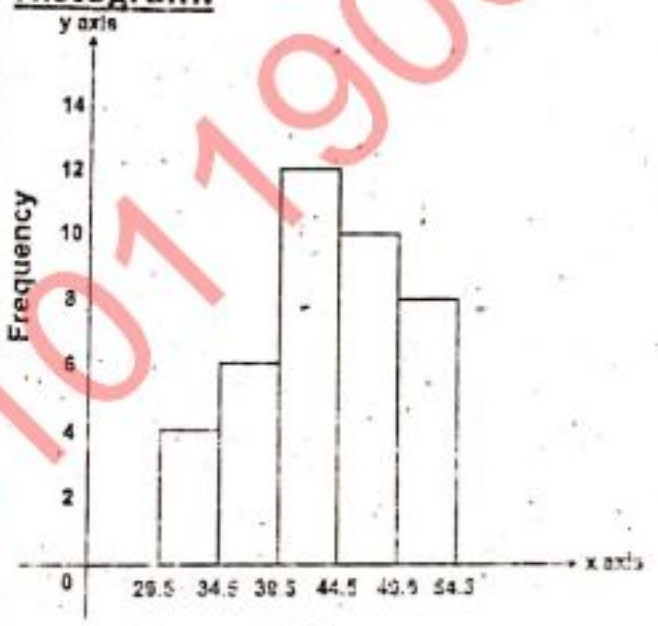
Exercise – 13.5

Q1. Draw a histogram for the following data:

Class interval	Frequency
30 – 34	4
35 – 39	6
40 – 44	12
45 – 49	10
50 – 54	8

Sol. FInd the Class Boundary
Take Class Boundaries on x-axis and frequency on y-axis.

Histogram:



C.B

Q2. Aslam has 30 crate of eggs. The number of rotten eggs are given in the following data.

Rotten eggs	No. of crates (f)
0	2
1	9
4	3
5	4
6	2
7	5
8	1
9	4

Sol.

Q3. Draw a histogram for the following data:

Class interval	Frequency
15 – 19	5
20 – 24	9

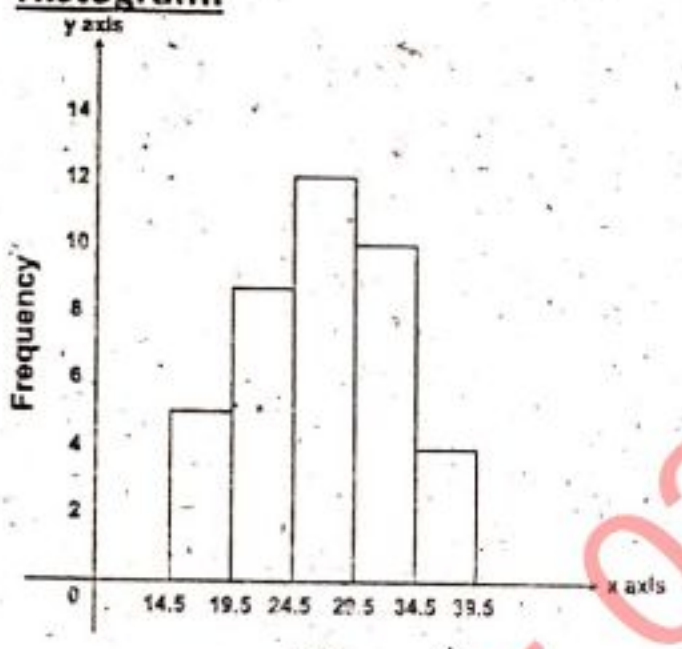
25 – 29	12
30 – 34	10
35 – 39	4
	Total = 40

Sol. Find the Class Boundary

Class interval	C.B	f
15 – 19	14.9 – 19.5	5
20 – 24	19.5 – 24.5	9
25 – 29	24.5 – 29.5	12
30 – 34	29.5- 34.5	10
35 – 39	34.5 – 39.5	4

Take Class Boundaries on x-axis and frequency on y-axis.

Histogram:



Q4. Draw a histogram for the following frequency distribution table.

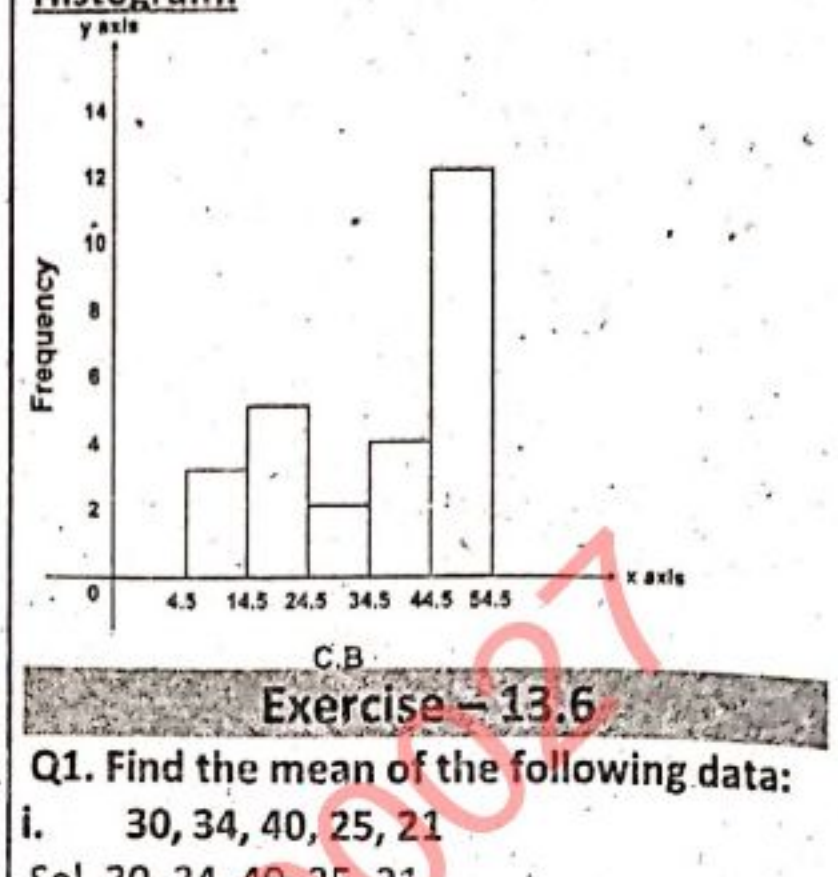
Class interval	Frequency
5 – 14	3
15 – 24	5
25 – 34	2
35 – 44	4
45 – 54	12
	Total = 26

Sol. Find the Class Boundary

Class interval	C.B	f
5 – 14	4.5 – 14.5	3
15 – 24	14.5 – 24.5	5
25 – 34	24.5 – 34.5	2
35 – 44	34.5 – 44.5	4
45 – 54	44.5 – 54.5	12

Take Class Boundaries on x-axis and frequency on y-axis.

Histogram:



Exercise – 13.6

Q1. Find the mean of the following data:

i. 30, 34, 40, 25, 21

Sol. 30, 34, 40, 25, 21

$$\text{Mean} = \frac{\text{Sum of data}}{\text{No. of data}}$$

$$\text{Mean} = \frac{30+34+40+25+21}{5}$$

$$\text{Mean} = \frac{150}{5}$$

Mean = 30 Ans.

ii. 51, 68, 45, 62, 78, 68

Sol. 51, 68, 45, 62, 78, 68

$$\text{Mean} = \frac{\text{Sum of data}}{\text{No. of data}}$$

$$\text{Mean} = \frac{51+68+45+62+78+68}{6}$$

$$\text{Mean} = \frac{372}{6}$$

Mean = 62 Ans.

iii. 114, 154, 240, 112

Sol. 114, 154, 240, 112

$$\text{Mean} = \frac{\text{Sum of data}}{\text{No. of data}}$$

$$\text{Mean} = \frac{114+154+240+112}{4}$$

$$\text{Mean} = \frac{620}{4}$$

Mean = 155 Ans.

iv. 500, 560, 640, 520, 480

Sol. 500, 560, 640, 520, 480

$$\text{Mean} = \frac{\text{Sum of data}}{\text{No. of data}}$$

$$\text{Mean} = \frac{500+560+640+520+280}{5}$$

$$\text{Mean} = \frac{2500}{5}$$

Mean = 500 Ans.

Q2. Weights (in kg) of 10 people are given below. Find their mean weight.

60, 72, 58, 66, 54, 63, 77, 60, 59, 71

Sol. 60, 72, 58, 66, 54, 63, 77, 60, 59, 71

$$\text{Mean} = \frac{\text{Sum of data}}{\text{No. of data}}$$

$$\text{Mean} = \frac{60+72+58+66+54+63+77+60+59+71}{10}$$

$$\text{Mean} = \frac{640}{10}$$

Mean = 64Ans.

Q3. Average daily earning of a person for the first five days of a week is Rs.2400. if he includes the income of the sixth day his average earning become Rs.2500, find the income of the sixth day.

Sol. Average of five days = Rs.2400

Sum of 5 days earning = 5 × 2400 = 12,000

Average of six days = Rs.2500

Sum of 6 days earning = 6 × 2500 = 15,000

Amount of sixth day = 15,000 – 12,000 = 3,000 Ans.

Q4. The following table shows the grouped data for the no. of wires of different lengths in a store. Find the mean length of the wires.

Lengths in (m)	Frequency
1-10	2
11 – 20	7
21 – 30	10
31 – 40	3
41 – 50	1

Sol. First we find the mid-value of each class i.e. 'x'

Mid-value of 1st class = $\frac{1+10}{2}$

Mid-value of 1st class = 5.5

Mid-value of 2nd class = $\frac{11+20}{2}$

Mid-value of 2nd class = 15.5

Mid-value of 3rd class = $\frac{21+30}{2}$

Mid-value of 3rd class = 25.5

Mid-value of 4th class = $\frac{31+40}{2}$

Mid-value of 4th class = 35.5

Mid-value of 5th class = $\frac{41+50}{2}$

Mid-value of 5th class = 45.5

Classes	x	f	fx
1-10	5.5	2	11
11 – 20	15.5	7	108.5
21 – 30	25.5	10	255
31 – 40	35.5	3	106.5
41 – 50	45.5	1	45.5
		$\sum f = 25$	$\sum fx = 526.5$

Using formula:

$$\text{Mean } \bar{x} = \frac{\sum fx}{\sum f}$$

$$\bar{x} = \frac{526.5}{25}$$

$\bar{x}$ = 21.06 Ans.

Q5. The following data shows the duration of job (in years) of employees in a certain office. Find the mean duration of job of employees in that office.

Duration	No. of employee
1 – 3	12
3 – 5	22
5 – 7	27
7 – 9	19

Sol. First we find the mid-value of each class i.e. 'x'

Mid-value of 1st class = $\frac{1+3}{2}$

Mid-value of 1st class = 2

Mid-value of 2nd class = $\frac{3+5}{2}$

Mid-value of 2nd class = 4

Mid-value of 3rd class = $\frac{5+7}{2}$

Mid-value of 3rd class = 6

Mid-value of 4th class = $\frac{7+9}{2}$

Mid-value of 4th class = 8

Classes	x	f	Fx
1 – 3	2	12	24
3 – 5	4	22	88
5 – 7	6	27	162
7 – 9	8	19	152
		$\sum f = 80$	$\sum fx = 426$

Using formula:

Mean $\bar{x} = \frac{\sum fx}{\sum f}$

$\bar{x} = \frac{426}{80}$

$\bar{x}$ = 5.325 **Ans.**

Q6. Marks obtained by 15 students of a class in a test of 40 marks are given below. Find their median and mode.

36, 25, 32, 40, 28, 35, 26, 32, 30, 27, 32, 28, 39, 20, 35.

Sol. First we arrange the given data in ascending order.

20, 25, 26, 27, 28, 28, 30, 32, 32, 32, 35, 35, 36, 39, 40.

The total number of data is 15 which is odd.

n = 15

Using formula:

Median = $\left(\frac{n+1}{2}\right)^{th}$

Median = $\left(\frac{15+1}{2}\right)^{th} = \left(\frac{16}{2}\right)^{th}$

Median = 8th number

Thus median is 32 **Ans.**

Q7. A student got 92 marks in Maths, 75 marks in English, 80 marks in Islamiat and 86 marks in Science. Find the weighted mean if weights of 5, 4, 3, 4 are allotted to these subject respectively.

Sol. Here, $x_1 = 92,\ x_2 = 75$

$x_3 = 80,\ x_4 = 86$

And $w_1 = 5,\ w_2 = 4$

$w_3 = 3,\ w_4 = 4$

Using formula:

Weighted Mean = $\frac{\Sigma x_i \times w_i}{\Sigma w_i}$

Weighted Mean = $\frac{92\times 5 + 75\times 4 + 80\times 3 + 86\times 4}{5+4+3+4}$

Weighted Mean = $\frac{460+300+240+344}{16}$

Weighted Mean = $\frac{1344}{16}$

Weighted Mean = 84 **Ans.**

Q8. Find the median of the following data:

i. 18, 15, 16, 13, 11

Sol. 18, 15, 16, 13, 11

First arrange the data in ascending order:

11, 13, 15, 16, 18

n = 5 which is odd.

Using formula:

Median = $\left(\frac{n+1}{2}\right)^{th}$

Median = $\left(\frac{5+1}{2}\right)^{th} = \left(\frac{6}{2}\right)^{th}$

Median = 3rd number

Thus median is 15 **Ans.**

ii. 200, 150, 230, 175, 300, 250.

Sol. 200, 150, 230, 175, 300, 250.

First we arrange the given number in ascending order;

150, 175, 200, 230, 250, 300.

Here n = 6 which is even.

Median = arithmetic mean of two middle terms

$$\text{Median} = \frac{200+230}{2}$$

$$\text{Median} = \frac{430}{2}$$

Median = 215 Ans.

Q9. Find the mode of the following data:

i. 6, 7, 7, 12, 14, 15, 17

Sol. 6, 7, 7, 12, 14, 15, 17

Mode of the data is the most repeated value from the data.

Here the most repeated value is 7, which is repeated two times.

Mode = 7 **Ans.**

ii. 12, 15, 14, 15, 17, 18,14, 16.

Sol. 12, 15, 14, 15, 17, 18, 14, 16

Mode of the data is the most repeated value from the data.

Here the most repeated values are 14 and 15, which is repeated two times. So the data has two modes

Mode = 14 and 15 **Ans.**

Exercise – 13.7

Q1. Salma chooses a random marble from a bag having 7 blue, 4 green, 4 red and 5 yellow marbles. Find the probability of the following events and tell if any of them is certain, impossible or equally like.

a) P(blue)

Sol. Number of desired outcomes (blue) = 7

Number of possible outcomes = 20

Probability of picking a blue marble = $\frac{7}{20}$

b) P(not blue)

Sol. Probability of picking a marble not blue = $1-\frac{7}{20}$

$$\Rightarrow \frac{1}{1}-\frac{7}{20}=\frac{20-7}{20}$$

Probability of picking a marble not blue = $\frac{13}{20}$

c) P(orange)

Sol. There is no orange marble in the bag. So this probability is impossible.

d) P(marble)

Sol. As the chance of picking a marble of any color is 100% so this probability is certain.

e) P(blue or green)

Sol. Number of desired outcomes (blue) = 7

Number of desired outcomes (green) = 4

Number of desired outcomes (blue or green) = 7 + 4 = 11

Number of possible outcomes = 20

Probability of picking a blue or green marble = $\frac{11}{20}$

Q2. Use the spinner to find the probability of each event. Also find the complement of each event.

a) P(<3)

Sol. Number of possible outcomes =8

Number of desired outcomes (<3) = 3

Probability of < 3 = $\frac{3}{8}$

Complement:

$$1-\frac{3}{8}=\frac{8-3}{8}=\frac{5}{8}$$ **Ans.**

b) P(not 5)

Sol. Number of possible outcomes = 8

Number of desired outcomes (not 5) = 7

Probability of (not 5) = $\frac{7}{8}$

Complement:

$$1-\frac{7}{8}=\frac{8-7}{8}=\frac{1}{8}$$ **Ans.**

c) P(smaller than 6)

Sol. Number of possible outcomes = 8

Number of desired outcomes (smaller than 6) = 7

Probability of (smaller than 6) = $\frac{7}{8}$

Complement:

$1-\frac{7}{8}=\frac{8-7}{8}=\frac{1}{8}$ Ans.

d) P(odd)

Sol. Number of possible outcomes = 8

Number of desired outcomes (odd) = 4

Probability of (odd) = $\frac{4}{8}=\frac{1}{2}$

Equally likely event

Complement:

$1-\frac{4}{8}=\frac{8-4}{8}=\frac{4}{8}$ Ans.

e) P(prime)

Sol. Number of possible outcomes = 8

Number of desired outcomes (prime) = 5

Probability (prime) = $\frac{5}{8}$

Complement:

$1-\frac{5}{8}=\frac{8-5}{8}=\frac{3}{8}$ Ans.

f) P(even)

Sol. Number of possible outcomes = 8

Number of desired outcomes (even) = 4

Probability (even) = $\frac{4}{8}=\frac{1}{2}$

Complement:

$1-\frac{7}{8}=\frac{8-7}{8}=\frac{1}{8}$ Ans.

Equally likely

g) P(10)

Sol. Number of possible outcomes = 8

Number of desired outcomes (10) = 0

Probability (10) = $\frac{0}{8}=0$

Impossible.

Complement: complement of impossible is certain.

Q3. There are 9 buttons in a jar. Sara takes one button randomly without looking at them. Which of these are impossible and which are certain? Also find:

a) The probability of the following events.

b) The complement of these events.

i. The probability of picking a square button.

Sol. Number of possible outcomes = 9

Number of desired outcomes = 3

Probability of picking a square button = $\frac{3}{9}=\frac{1}{3}$

Complement of event:

$\Rightarrow 1-\frac{1}{3}=\frac{3-1}{3}$

$\Rightarrow \frac{2}{3}$ Ans.

ii. The probability of picking a button.

Sol. Number of possible outcomes = 9

Number of desired outcomes = 9

Probability of picking a square button = $\frac{9}{9}=1$ this event is certain.

Complement of event:

Complement of a certain event is impossible.

iii. The probability of not picking a button.

Sol. Number of possible outcomes = 9

Number of desired outcomes = 0

Probability of picking a square button = $\frac{0}{9}=0$

This event is impossible.

Complement of event:

Complement of an impossible event is certain.

iv. The probability of picking a circular button.

Sol. Number of possible outcomes = 9

Number of desired outcomes = 3

Probability of picking a square button = $\frac{3}{9}=\frac{1}{3}$ **Complement of event:**

$$\Rightarrow 1-\frac{1}{3}=\frac{3-1}{3}$$

$$\Rightarrow \frac{2}{3} \text{ Ans.}$$

v. **The probability of picking a triangular button.**

Sol. Number of possible outcomes = 9
Number of desired outcomes = 3
Probability of picking a square button =

$$\frac{3}{9}=\frac{1}{3}$$

Complement of event:

$$\Rightarrow 1-\frac{1}{3}=\frac{3-1}{3}$$

$$\Rightarrow \frac{2}{3} \text{ Ans.}$$

vi. **The probability of not picking a rectangular button.**

Sol. Number of possible outcomes = 9
Number of desired outcomes = 0
Probability of picking a square button =

$$\frac{0}{9}=0$$

This event is impossible.

Complement of event:

Complement of an impossible event is certain.

Q4. Madiha randomly picked a number from the set of number: 1, 8, 4, 10, 3, 6. Find the probability of each event and describe any impossible or certain event. (if any). Also find the compliment of these events.

a) P(1-digit)
b) P(multiple of 2)
c) P(9)
d) P(not a number)
e) P(2 digit even number)

Sol. Set of numbers: 1, 8, 4, 10, 3, 6

a. Number of possible outcomes = 6
Desired outcomes = 1
Probability = $\frac{1}{6}$

Complement:

$$\Rightarrow 1-\frac{1}{6}=\frac{6-1}{6}$$

$$\Rightarrow \frac{5}{6} \text{ Ans.}$$

b. Number of possible outcomes = 6
Desired outcomes = 4
Probability = $\frac{4}{6}=\frac{2}{3}$

Complement:

$$\Rightarrow 1-\frac{2}{3}=\frac{3-2}{3}$$

$$\Rightarrow \frac{1}{3} \text{ Ans.}$$

c. Number of possible outcomes = 6
Desired outcomes = 0
Probability = $\frac{0}{6}=0$

Complement:

$$\Rightarrow 1-0=1 \text{ Ans.}$$

d. Number of possible outcomes = 6
Desired outcomes = 0
Probability = $\frac{0}{6}=0$

Complement:

$$\Rightarrow 1-0=1 \text{ Ans.}$$

e. Number of possible outcomes = 6
Desired outcomes = 1
Probability = $\frac{1}{6}$

Complement:

$$\Rightarrow 1-\frac{1}{6}=\frac{6-1}{6}$$

$$\Rightarrow \frac{5}{6} \text{ Ans.}$$

Review Exercise – 13

Q1. Encircle the correct option.

a) Which of these graph/charts is suitable when we want to show a data that is changing over time?
   i. Bar
   ii. Pie
   iii. Line
   iv. Picture

b) The term "discrete" means:
   i. Joined
   ii. Connected
   iii. Distinct
   iv. Combined

c) How likely something to happen is known as:
   i. Mean
   ii. Probability
   iii. Certainty
   iv. Surety

d) The possible results of a random experiment is called:
   i. An outcome
   ii. An experiment
   iii. A median
   iv. An average

e) When there is 50% chance of an event, i.e. $\frac{1}{2}$, then the event is said to be:
   i. Certain
   ii. Impossible
   iii. Sure
   iv. Equally like

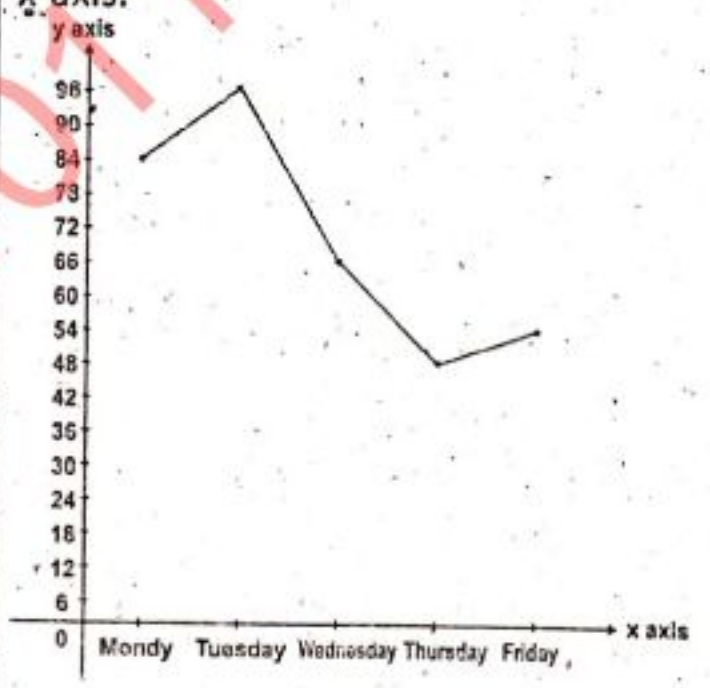
f) The probability of an event in any number from:
   i. 0 to 10
   ii. 1 to 10
   iii. 0 to 1
   iv. 0 to $\frac{1}{2}$

g) The number of times a specific observation occur in the collected data is called the ___ of that value.
   i. Data
   ii. Frequency
   iii. Raw materials
   iv. Grouped data

h) The ____ distribution means to organize the information in the form of a table.
   i. Frequency
   ii. Pie
   iii. Range
   iv. Class interval

Q2. A bakery sold 84 chicken rolls on Monday, 96 chicken rolls on Tuesday, 66 chicken rolls on Wednesday, 48 chicken rolls on Thursday and 54 chicken rolls on Friday. Draw a line graph for the given data.

Sol. Draw two axis i.e. x-axis and y-axis. Take a suitable scale. Take number of chicken rolls on y-axis and name of days on x-axis.

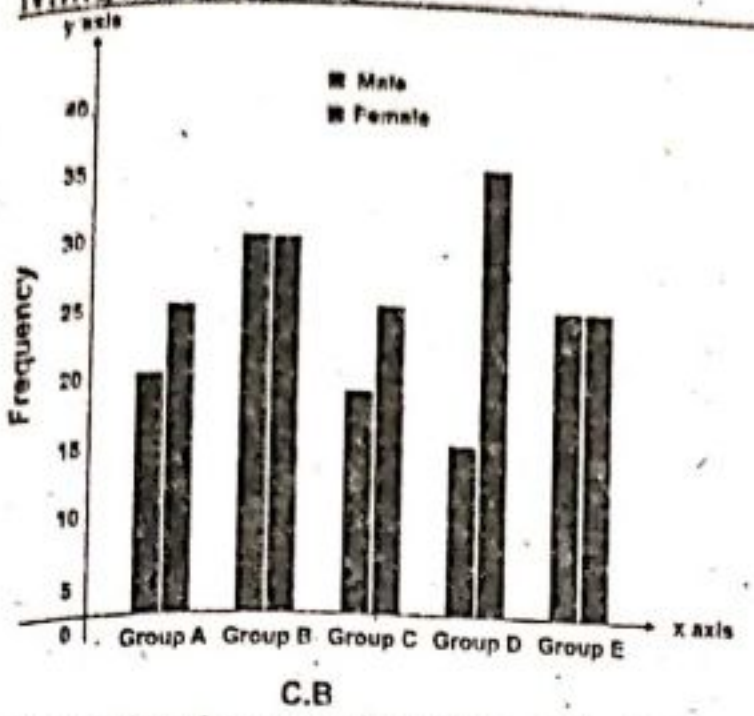


C.B

Q3. The following data shows the number of male and female members in different groups created for the collection of flood fund. Draw a horizontal multiple bar graph for this data using appropriate scale.

Students	Male	Female
Group A	20	25
Group B	30	30
Group C	18	25
Group D	15	35
Group E	25	25

Sol. Draw x-axis and y-axis with a suitable scale. Take number of students on y-axis and names of groups on x-axis. Draw the multiple bar graph.



C.B

Q4. Following are the runs of ShahidAfridi made in a local match in 3 overs. Represent it in a frequency table.

2, 0, 4, 4, 0, 6, 6, 6, 0, 4, 2, 4, 2, 6, 6, 2, 4, 4, 4.

Sol. 2, 0, 4, 4, 0, 6, 6, 6, 0, 4, 2, 4, 2, 6, 6, 2, 4, 4, 4

Frequency Table:

x	f
0	3
2	4
4	7
6	5

Q5. Construct the frequency table for each of the following.

a) 4, 3, 6, 5, 2, 4, 3, 3, 6, 4, 2, 3, 2, 2, 3, 3, 4, 5, 6, 4, 2, 3, 4.

Sol. Frequency Table:

x	f
2	5
3	7
4	6
5	2
6	3

b) 6, 7, 5, 4, 5, 6, 6, 8, 7, 9, 6, 5, 6, 7, 7, 8, 9, 4, 6, 7, 6, 5.

Sol. Frequency Table:

x	f
4	2
5	4
6	7
7	5
8	2
9	2

Q6. The marks obtained out of 25 by 30 students of a class in the examination are given below. Represent the data on a frequency table.

20, 6, 23, 19, 9, 14, 15, 3, 1, 12, 10, 2, 13, 3, 17, 10 ,11, 6, 21, 9, 6, 10, 9, 4, 5, 1, 5, 11, 7, 24.

Sol. Frequency Table:

x	f
1	2
2	1
3	2
4	1
5	2
6	3
7	1
9	3
10	3
11	2
12	1
13	1
14	1
15	1
17	1
19	1
20	1
21	1
23	1
24	1
	$\Sigma f = 30$

Q7. The following table shows the expenditure in percentage incurred on the construction of a house in a city. If the total expenditure is Rs.1,800,000. Represent this data in a pie graph and describe the findings.

Item	Expenditure in %
Brick	15
Cement	20
Steel	10
Labour	25
Miscellaneous	30

Sol. Sum of all expenditures = 15 + 20 + 10 + 25 + 30 = 100

Now we find the central angle of pie graph

$$\text{Brick} = \frac{15}{100} \times 360$$

$$\text{Brick} = 54^0$$

$$\text{Cement} = \frac{20}{100} \times 360$$

$$\text{Cement} = 72^0$$

$$\text{Steel} = \frac{10}{100} \times 360$$

$$\text{Steel} = 36^0$$

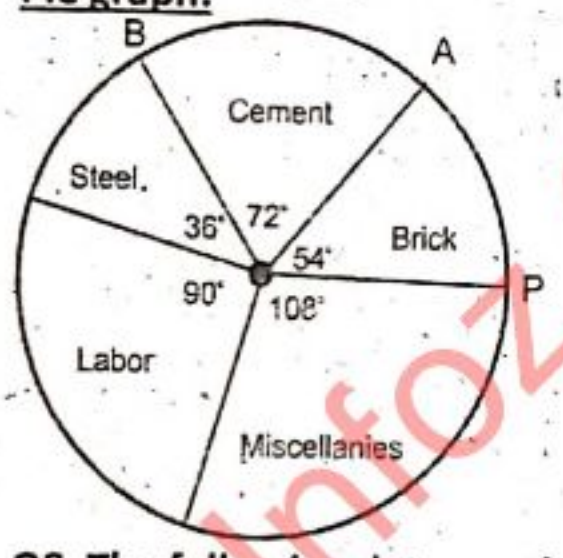
$$\text{Labour} = \frac{25}{100} \times 360$$

$$\text{Labour} = 90^0$$

$$\text{Miscellaneous} = \frac{30}{100} \times 360$$

$$\text{Miscellaneous} = 108^0$$

Pie graph:



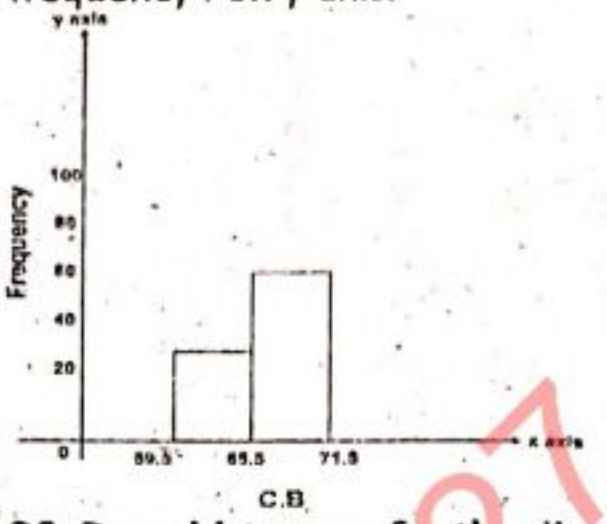
Q8. The following data are the weight (in grams) of different kinds of candies. Draw a histogram for this continuous data.

60, 60.5, 61, 61, 61.5, 63.5, 63.5, 63.5, 64, 64, 64, 64, 64, 64, 64, 64.5, 64.5, 64.5, 64.5, 64.5, 64.5, 64.5, 64.5, 64.5, 66, 66, 66, 66, 66, 66, 66, 66, 66, 66, 66, 66, 66.5, 66.5, 66.5, 66.5, 66.5, 66.5, 66.5, 66.5, 66.5, 66.5, 67, 67, 67, 67, 67, 67, 67, 67, 67, 67, 67, 67, 67.5, 67.5, 67.5, 67.5, 67.5, 67.5, 67.5, 68, 68, 69, 69, 69, 69, 69, 69, 69, 69, 69, 69, 69.5, 69.5, 69.5, 69.5, 69.5, 70, 70, 70, 70, 70, 70, 70.5, 70.5, 70.5, 71, 71, 71.

Sol.

Classes	C.B	f
60 – 65	59.5 – 65.5	23
66 – 71	65.5 – 71.5	69

Take Class Boundaries on x-axis and frequency f on y-axis.



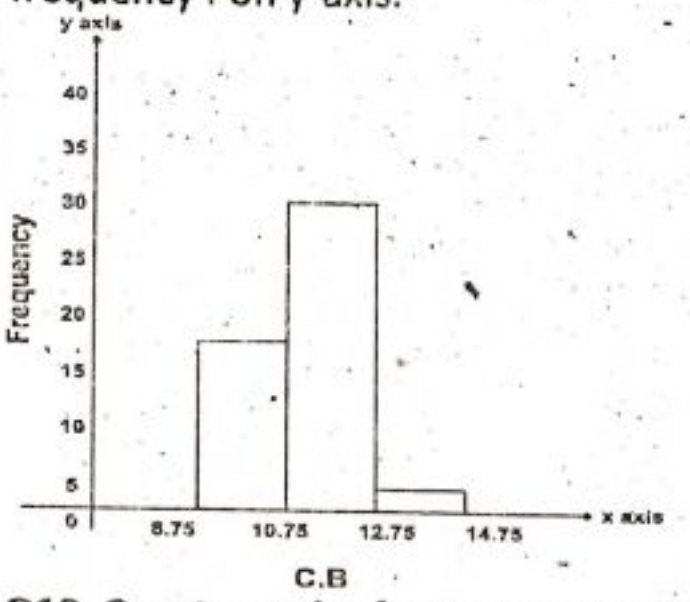
Q9. Draw histogram for the discrete data.

9, 9, 9.5, 9.5, 10, 10, 10, 10, 10, 10, 10.5, 10.5, 10.5, 10.5, 10.5, 10.5, 10.5, 10.5, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11, 11.5, 11.5, 11.5, 11.5, 11.5, 11.5, 11.5, 12, 12, 12, 12, 12, 12, 12, 12.5, 12.5, 12.5, 12.5, 14.

Sol. Table:

Classes	C.B	f
9 – 10.5	8.75 – 10.75	18
11 – 12.5	10.75 – 12.75	31
13 – 14.5	12.75 – 14.75	1

Take Class Boundaries on x-axis and frequency f on y-axis.



Q10. Construct the frequency distribution of 35 persons when their heights (in inches) are given below. Then calculate the mean for the grouped data.

60, 72, 70, 69, 58, 59, 60, 63, 62, 60, 72, 72, 70, 71, 57, 65, 67, 65, 66, 53, 55, 65, 60, 72, 70, 69, 72, 72, 60, 57, 63, 65, 66, 72, 59.

Sol. Smallest value = 53

Largest value = 72

Range = Largest value – Smallest value

Range = 72 – 53

Range = 19

Frequency Table:

Classes	(x)	f	fx
53 – 58	55.5	5	277.5
59 – 64	61.5	10	615
65 – 70	67.5	12	810
71 – 76	73.5	8	588
	$\Sigma f = 35$		$\Sigma fx = 2290$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$\text{Mean} = \frac{2290}{35}$$

Mean = 65.4 Ans.

Q11. Find the mean, median and mode of the following.

a) 250, 125, 620, 180, 200, 125, 200, 180.

b) 12, 18, 15, 16, 12, 15, 18, 18, 18, 18, 16, 19.

Sol. Mean of 250, 125, 620, 180, 200, 125, 200, 180

$$\text{Mean} = \frac{\Sigma x_i}{n}$$

Here n= 8

Σx_i =250 + 125 + 620 + 180 + 200 + 125 + 200 + 180

Σx_i = 1880

$$\text{Mean} = \frac{1880}{8}$$

Mean = 235 Ans.

Median: Arrange the given values in ascending order;

125, 125, 180, 180, 200, 200, 250, 620

Here the number of data is even i.e. 8

So median = Arithmetic mean of two middle terms.

$$\text{Median} = \frac{180+200}{2} = \frac{380}{2}$$

Median = 190 Ans.

b. 12, 18, 15, 16, 12, 15, 18, 18, 18, 18, 16, 19

Sol. Mean of 12, 18, 15, 16, 12, 15, 18, 18, 18, 16, 19

$$\text{Mean} = \frac{\Sigma x_i}{n}$$

Here n= 8

Σx_i =12 + 18 + 15 + 16 + 12 + 15 + 18 + 18 + 18 + 18 + 16 + 19

Σx_i = 195

$$\text{Mean} = \frac{195}{12}$$

Mean = 16.25 Ans.

Median: Arrange the given values in ascending order;

12, 12, 15, 15, 16, 16, 18, 18, 18, 18, 18, 19.

Here the number of data is even i.e. 12

So median = Arithmetic mean of two middle terms.

$$\text{Median} = \frac{16+18}{2} = \frac{34}{2}$$

Median = 17 Ans.

Q12. Look at the marbles. Sidra picked up one marble without looking at it. Find:

a) The probability:
   i. P(red)
   ii. P(green)
   iii. P(blue)
   iv. P(not blue)
   v. P(marble)
   vi. P(yellow)
   vii. P(not a marble)

b) Find the complement of each event.

c) Identify certain, impossible and equally likely events (if any).

Sol. Total marbles = 12

i. Number of possible outcomes = 12

P(red) =?

Number of desired outcomes = 3

Probability = $\frac{3}{12} = \frac{1}{4}$

Complement:

$\Rightarrow 1 - \frac{1}{4} = \frac{4-1}{4}$

$\Rightarrow \frac{3}{4}$ Ans.

ii. Number of possible outcomes = 12

P(green) =?

Number of desired outcomes = 6

Probability = $\frac{6}{12} = \frac{1}{2}$

Equally like event

Complement:

$\Rightarrow 1 - \frac{1}{2} = \frac{2-1}{2}$

$\Rightarrow \frac{1}{2}$ Ans.

iii. Number of possible outcomes = 12

P(blue) =?

Number of desired outcomes = 3

Probability = $\frac{3}{12} = \frac{1}{4}$

Complement:

$\Rightarrow 1 - \frac{1}{4} = \frac{4-1}{4}$

$\Rightarrow \frac{3}{4}$ Ans.

iv. Number of possible outcomes = 12

P(not blue) =?

Number of desired outcomes = 9

Probability = $\frac{9}{12} = \frac{3}{4}$

Complement:

$\Rightarrow 1 - \frac{3}{4} = \frac{4-3}{4}$

$\Rightarrow \frac{1}{4}$ Ans.

v. Number of possible outcomes = 12

P(marble) =?

Number of desired outcomes = 12

Probability = $\frac{12}{12} = 1$

This event is certain.

Complement:

Complement of certain event is impossible.

vi. Number of possible outcomes = 12

P(yellow) =?

Number of desired outcomes = 0

Probability = $\frac{0}{12} = 0$

This event is impossible

Complement:

Complement of impossible event is certain.

vii. Number of possible outcomes = 12

P(not a marble) =?

This event is impossible.

Complement:

Complement of impossible event is certain.