## Unit # 1
## Multiples and Factors
### Exercise 1.1

**Q1. Find all the factors of the following numbers.**

a. 26

Sol. Factors of 26

$26 = 1 \times 26$

$26 = 2 \times 13$

Factors of 26 are 1, 2, 13 and 26.

b. 112

Sol. Factors of 112

$112 = 1 \times 112$

$112 = 2 \times 56$

$112 = 4 \times 28$

$112 = 7 \times 16$

$112 = 8 \times 14$

Factors of 112 are 1, 2, 4, 7, 8, 14, 16, 28, 56 and 112.

c. 150

Sol. Factors of 150

$150 = 1 \times 150$

$150 = 2 \times 75$

$150 = 3 \times 50$

$150 = 5 \times 30$

$150 = 6 \times 25$

$150 = 10 \times 15$

Factors of 150 are 1, 2, 3, 5, 6, 10, 15, 25, 30, 50, 75 and 150.

d. 175

Sol. Factors of 175

$175 = 1 \times 175$

$175 = 5 \times 35$

$175 = 7 \times 25$

Factors of 175 are 1, 5, 7, 25, 35 and 175.

e. 68

Sol. Factors of 68

$68 = 1 \times 68$

$68 = 2 \times 34$

$68 = 4 \times 17$

Factors of 68 are 1, 2, 4, 17, 34 and 68.

f. 145

Sol. Factors of 145

$145 = 1 \times 145$

$145 = 5 \times 29$

Factors of 145 are 1, 5, 29 and 145.

g. 80

Sol. Factors of 80

$80 = 1 \times 80$

$80 = 2 \times 40$

$80 = 4 \times 20$

$80 = 5 \times 16$

$80 = 8 \times 10$

Factors of 80 are 1, 2, 4, 5, 8, 10, 16, 20, 40 and 80.

h. 100

Sol. Factors of 100

$100 = 1 \times 100$

$100 = 2 \times 50$

$100 = 4 \times 25$

$100 = 5 \times 20$

$100 = 10 \times 10$

Factors of 100 are 1, 2, 4, 5, 10, 20, 25, 50 and 100.

i. 23

Sol. Factors of 23

$23 = 1 \times 23$

Factors of 23 are 1 and 23 only.

j. 47

Sol. Factors of 47

$47 = 1 \times 47$

Factors of 47 are 1 and 47 only.

k. 58

Sol. Factors of 58

$58 = 1 \times 58$

$58 = 2 \times 29$

Factors of 58 are 1, 2, 29 and 58.

l. 64

Sol. Factors of 64

$64 = 1 \times 64$

$64 = 2 \times 32$

$64 = 4 \times 16$

$64 = 8 \times 8$

Factors of 64 are 1, 2, 4, 8, 16, 32 and 64.

m. 42

Sol. Factors of 42

$42 = 1 \times 42$

$42 = 2 \times 21$

$42 = 3 \times 14$

$42 = 6 \times 7$

Factors of 42 are 1, 2, 3, 6, 7, 14, 21 and 42.

n. 36

Sol. Factors of 36

$36 = 1 \times 36$

$36 = 2 \times 18$

$36 = 3 \times 12$

$36 = 4 \times 9$

$36 = 6 \times 6$

Factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18 and 36.

o. 70

Sol. Factors of 70

$70 = 1 \times 70$

$70 = 2 \times 35$

$70 = 5 \times 14$

$70 = 7 \times 10$

Factors of 70 are 1, 2, 5, 7, 10, 14, 35 and 70.

p. 90

Sol. Factors of 90

$90 = 1 \times 90$

$90 = 2 \times 45$

$90 = 3 \times 30$

$90 = 5 \times 18$

$90 = 9 \times 10$

Factors of 90 are 1, 2, 3, 5, 9, 10, 18, 30, 45 and 90.

**Q2. Find the multiples of the given number less than 250.**

a. 12

Sol. Multiples of 12 are: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132...

b. 25

Sol. Multiples of 25 are: 25, 50, 75, 100, 125, 150, 175, 200, 225...

c. 37

Sol. Multiples of 37 are: 37, 74, 111, 148, 185, 222...

d. 48

Sol. Multiples of 48 are: 48, 96, 144, 192, 240...

e. 60

Sol. Multiples of 60 are: 60, 120, 180, 240...

f. 75

Sol. Multiples of 75 are: 75, 150, 225...

g. 45

Sol. Multiples of 45 are: 45, 90, 135, 180, 225...

h. 57

Sol. Multiples of 57 are: 57, 114, 171, 228...

**Q3. Find the multiples of 14 less than 500.**

**Sol. Multiples of 14 less than 500 are:** 14, 28, 56, 70, 84, 98, 112, 126, 140, 154, 168, 182, 196, 210, 224, 238, 252, 266, 280, 294, 308, 322, 336, 350, 364, 378, 392, 406, 420, 434, 448, 462, 476, 490.

**Q4. Is 18 a factor of 256?**

Sol. Factors of a number divides the number completely.

$$18\overline{)256}\quad 14,\ 18,\ 76,\ 72,\ 4$$

As 18 does not divides 256 completely so 18 is not a factor of 256.

## Exercise 1.2

**Q1. Find the prime factors of the following numbers and write it in the form of index notation.**

a. 144

Sol. Prime factors of 144

| | |
|---|---|
| 2 | 144 |
| 2 | 72 |
| 2 | 36 |
| 2 | 18 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

$144 = 2\times2\times2\times2\times3\times3$

Prime factorization of

$144 = 2\times2\times2\times2\times3\times3$

index form $= 2^4\times3^2$

b. 314

Sol. Prime factors of 314

| | |
|---|---|
| 2 | 314 |
| 157 | 157 |
| | 1 |

$314 = 2\times157$

Prime factorization of 314=2× 157

Index form = 2 × 157

c. 5624

Sol. Prime factors of 5624

| | |
|---|---|
| 2 | 5624 |
| 2 | 2812 |
| 2 | 1406 |
| 19 | 703 |
| 37 | 37 |
| | 1 |

Prime factorization of

$5624 = 2\times2\times2\times19\times37$

index form = $2^3\times19\times37$

d. 3084

Sol. Prime factors of 3084

| | |
|---|---|
| 2 | 3084 |
| 2 | 1542 |
| 3 | 771 |
| | 257 |

Prime factorization of 3084

= 2 × 2 × 3 × 257

Index form = $2^2\times3\times257$

e. 7880

Sol. Prime factors of 7880

| | |
|---|---|
| 2 | 7880 |
| 2 | 3940 |
| 2 | 1970 |
| 5 | 985 |
| | 197 |

Prime factorization of 7880 = 2 × 2 × 2 × 5 × 197

Index form = $2^3\times5\times197$

f. 6024

Sol. Prime factors of 6024

| | |
|---|---|
| 2 | 6024 |
| 2 | 3012 |
| 2 | 1506 |
| 3 | 753 |
| | 251 |

Prime factorization of

6024 = $2\times2\times2\times3\times251$

Index form = $2^3\times3\times251$

g. 8460

Sol. Prime factors of 8460

| | |
|---|---|
| 2 | 8460 |
| 2 | 4230 |
| 3 | 2115 |
| 3 | 705 |
| 5 | 235 |
| 47 | 47 |
| | 1 |

Prime factorization of 8460=

$2\times2\times3\times3\times5\times47$

Index form= $2^2\times3^2\times5\times47$

h. 2986

Sol. Prime factors of 2986

| | |
|---|---|
| 2 | 2986 |
| | 1493 |

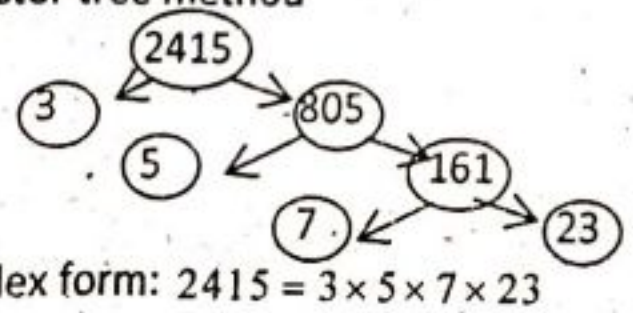
Prime factorization of 2986=$2\times1493$

Index form = $2\times1493$

**Q2. Find the prime factors of the following numbers by using factor tree method and write it in the form of index notation.**

a. 2415

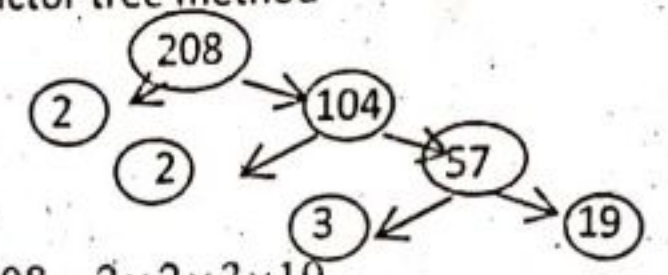
Sol. Prime factorization of 2415 using factor tree method




Index form: $2415 = 3\times5\times7\times23$

b. 208

Sol. Prime factorization of 208 using factor tree method

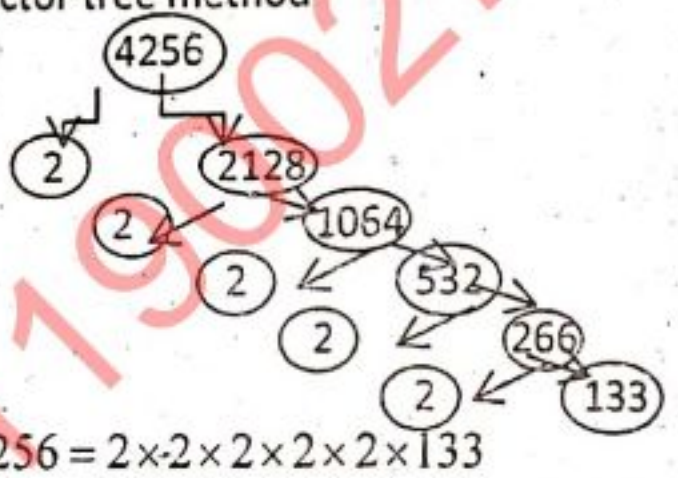



$208 = 2\times2\times3\times19$

Index form: $208 = 2^2\times3\times19$

c. 4256

Sol. Prime factorization of 4256 using factor tree method

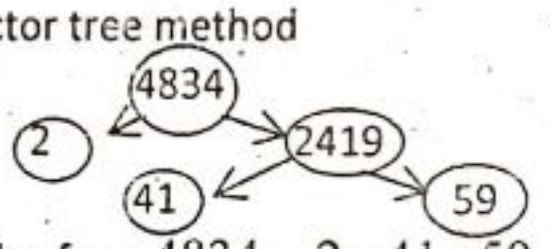



$4256 = 2\times2\times2\times2\times2\times133$

Index form: $4256 = 2^5\times133$

d. 4834

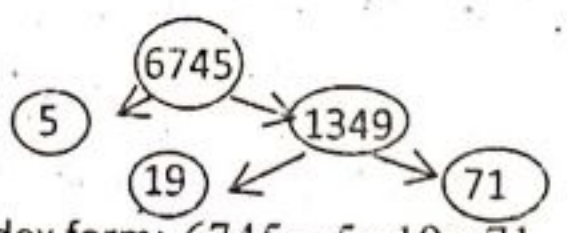
Sol. Prime factorization of 4834 using factor tree method




Index form $4834 = 2\times41\times59$

e. 6745

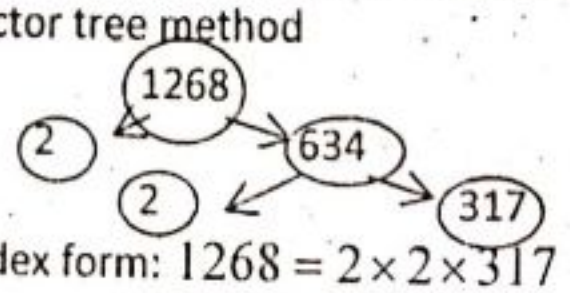
Sol. Prime factorization of 6745 using factor tree method




Index form: $6745 = 5\times19\times71$

f. 1268

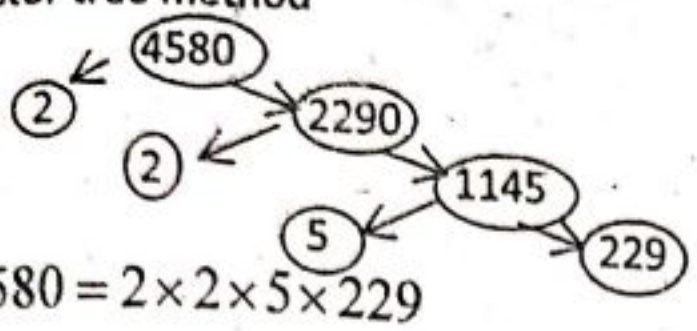
Sol. Prime factorization of 1268 using factor tree method




Index form: $1268 = 2\times2\times317$

g. 4580

Sol. Prime factorization of 4580 using factor tree method

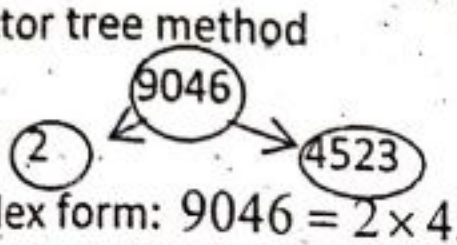



$4580 = 2\times2\times5\times229$

Index form: $4580=2^2\times5\times229$

h. 9046

Sol. Prime factorization of 9046 using factor tree method




Index form: $9046 = 2\times4523$

**Q3. Write the following in expanded form.**

a. $2^6$

Sol. Expanded form of $2^6$

$2^6 = 2\times2\times2\times2\times2\times2$

b. $4\times7^5$

Sol. Expanded form of $4\times7^5$

$4\times7^5 = 2\times2\times7\times7\times7\times7\times7$

c. $3\times5^2\times11^4$

Sol. Expanded form of $3\times5^2\times11^4$

$3\times5^2\times11^4 = 3\times5\times5\times11\times11\times11\times11$

d. $2^2\times3^3\times5^6$

Sol. Expanded form of $2^2\times3^3\times5^6$

$2^2\times3^3\times5^6 = 2\times2\times3\times3\times3\times$

$5\times5\times5\times5\times5\times5$

e. $13^6\times17^3$

Sol. Expanded form of $13^6\times17^3$

$13^6\times17^3 = 13\times13\times13\times13\times$

$13\times13\times17\times17\times17$

f. $4\times7^5$

Sol. Expanded form of $4\times7^5$

$4\times7^5 = 2\times2\times7\times7\times7\times7\times7$

g. $3^2\times5^6\times17^2$

Sol. Expanded form of $3^2\times5^6\times17^2$

$3^2\times5^6\times17^2 = 3\times3\times5\times5\times5\times$

$5\times5\times5\times17\times17$

h. $7^2\times11^3\times29$

Sol. Expanded form of $7^2\times11^3\times29$

$7^2\times11^3\times29$

$=7\times7\times11\times11\times11\times29$

**Q4. Express the following in index notation.**

a. $5\times5\times5$

Sol. Index Notation of

$5\times5\times5 = 5^3$

b. $2\times2\times5\times5\times5\times5$

Sol. Index Notation of

$2\times2\times5\times5\times5\times5 = 2^2\times5^4$

c. $1\times2\times2\times7\times7\times7$

Sol. Index Notation of

$1\times2\times2\times7\times7\times7 = 2^2\times7^3$

d. $11\times11\times13\times13\times13\times19\times19$

Sol. Index Notation of

$11\times11\times13\times13\times13\times19\times19$

$=11^2\times13^3\times19^2$

e. $7\times7\times7\times11\times11$

Sol. Index Notation of

$7\times7\times7\times11\times11 = 7^3\times11^2$

## Exercise 1.3

**Q1. Find HCF of the following numbers using prime factorization method.**

a. 224, 142

Sol. HCF of 224 and 142

| | |
|---|---|
| 2 | 224 |
| 2 | 112 |
| 2 | 56 |
| 2 | 28 |
| 2 | 14 |
| | 7 |

| | |
|---|---|
| 2 | 142 |
| | 71 |

$224 = 2\times2\times2\times2\times2\times7$

$142 = 2\times71$

HCF= 2 Ans.

b. 520, 420, 124

Sol. HCF of 520, 420, 124

| 2 | 520 |
|---|---|
| 2 | 260 |
| 2 | 130 |
| 5 | 65 |
| | 13 |

| 2 | 124 |
|---|---|
| 2 | 62 |
| | 31 |

| 2 | 420 |
|---|---|
| 2 | 210 |
| 3 | 105 |
| 5 | 35 |
| | 7 |

$520 = 2\times2\times2\times5\times13$

$420 = 2\times2\times3\times5\times7$

$124 = 2\times2\times31$

Common Factors = $2\times2$

HCF = 4 Ans.

c. 168, 400, 540

Sol. HCF of 168, 400, 540

| 2 | 168 |
|---|---|
| 2 | 84 |
| 2 | 42 |
| 3 | 21 |
| | 7 |

| 2 | 540 |
|---|---|
| 2 | 270 |
| 3 | 135 |
| 3 | 45 |
| 3 | 15 |
| | 5 |

| 2 | 400 |
|---|---|
| 2 | 200 |
| 2 | 100 |
| 2 | 50 |
| 5 | 25 |
| | 5 |

$168 = 2\times2\times2\times3\times7$

$540 = 2\times2\times3\times3\times3\times5\times5$

$400 = 2\times2\times2\times2\times5\times5$

Common factors = $2\times2$

HCF = 4 Ans.

d. 366, 145, 780

Sol. HCF of 366, 145, 780

| 2 | 145 |
|---|---|
| | 29 |

| 2 | 366 |
|---|---|
| 3 | 183 |
| | 61 |

| 2 | 780 |
|---|---|
| 2 | 390 |
| 3 | 195 |
| 5 | 65 |
| | 13 |

$145 = 2\times29$

$366 = 2\times3\times61$

$780 = 2\times2\times3\times5\times13$

HCF = 2 Ans.

e. 678, 424, 784

Sol. HCF of 678, 424, 784

| 2 | 784 |
|---|---|
| 2 | 392 |
| 2 | 196 |
| 2 | 98 |
| 2 | 48 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

| 2 | 678 |
|---|---|
| 3 | 339 |
| | 113 |

| 2 | 424 |
|---|---|
| 2 | 212 |
| 2 | 106 |
| | 53 |

$678 = 2\times3\times113$

$424 = 2\times2\times2\times53$

$784 = 2\times2\times2\times2\times2\times7\times7$

f. 905, 560

Sol. HCF of 905, 560

| 2 | 905 |
|---|---|
| | 181 |

| 2 | 560 |
|---|---|
| 2 | 280 |
| 2 | 140 |
| 2 | 70 |
| 5 | 35 |
| | 7 |

$905 = 2 \times 181$

$560 = 2 \times 2 \times 2 \times 2 \times 5 \times 7$

g. 248, 104, 565

Sol. HCF of 248, 104, 565

| 2 | 104 |
|---|---|
| 2 | 52 |
| 2 | 26 |
| | 13 |

| 2 | 248 |
|---|---|
| 2 | 124 |
| 2 | 62 |
| | 31 |

| 2 | 565 |
|---|---|
| 113 | 113 |
| | 1 |

$104 = 2 \times 2 \times 2 \times 13$

$248 = 2 \times 2 \times 2 \times 31$

$565 = 2 \times 113$

**HCF = 2 Ans.**

h. 578, 456

Sol. HCF of 578, 456

| 2 | 578 |
|---|---|
| 17 | 289 |
| | 17 |

| 2 | 456 |
|---|---|
| 2 | 228 |
| 2 | 114 |
| 3 | 57 |
| | 19 |

$578 = 2 \times 17 \times 17$

$456 = 2 \times 2 \times 2 \times 3 \times 19$

**HCF = 2 Ans.**

i. 385, 855, 620

Sol. HCF of 385, 855, 620

| 5 | 385 |
|---|---|
| 7 | 77 |
| 11 | 11 |
| | 1 |

| 3 | 855 |
|---|---|
| 3 | 285 |
| 5 | 95 |
| 19 | 19 |
| | 1 |

| 2 | 620 |
|---|---|
| 2 | 310 |
| 3 | 155 |
| 31 | 31 |
| | 1 |

$385 = 5 \times 7 \times 11$

$855 = 3 \times 3 \times 5 \times 19$

$620 = 2 \times 2 \times 3 \times 31$

HCF = 1 Ans.

**Q2. Find HCF of the following numbers using division method.**

a. 100, 350, 480

Sol. HCF of 100, 350, 480 using division method

$$100\overline{)350}\ 3,\quad 300\ 2,\quad 50\overline{)100},\quad 100,\quad \times$$

Now we will find the HCF of 50 and 480

$$50\overline{)480}\ 9,\quad 450\ 1,\quad 30\overline{)50},\quad 30\ 1,\quad 20\overline{)30},\quad 20\ 2,\quad 10\overline{)20},\quad 20,\quad \times$$

Thus HCF of 100, 350 and 480 is 10. Ans

b. 678, 456

Sol. HCF of 678, 456 using division method.

```
        1
456)678
    456  2
    222)456
        444  18
        12)222
           216  2
           6)12
             12
              ×
```

HCF of 456 and 678 is 6 Ans.

c. 400, 350, 250

Sol. HCF of 400, 350, 250 using division method

```
        1
350)400
    350  7
    50)350
       350
        ×
```

Now we will find the HCF of 50 and 250.

```
      5
50)250
  250
   ×
```

HCF of 400, 350 and 250 is 50 Ans.

d. 100, 245, 168

Sol. HCF of 100, 245, 168 using division method

```
        1
168)245
   168  2
   77)168
      154  5
      14)77
         70  2
         7)14
           14
            ×
```

Now we will find the HCF of 7 and 100

```
       14
7)100
  98  3
  2)7
     6  2
     1)2
       2
       ×
```

Thus HCF of 100, 245 and 168 is 1 Ans.

e. 332, 480, 290

Sol. HCF of 332, 480, 290 using division method

```
        1
332)480
   332  6
   48)332
      288  1
      44)48
         44  11
         4)44
           44
            ×
```

Now we find the HCF of 4 and 290

$$\begin{array}{r} 72 \\ 4\overline{)290} \\ \underline{288} \\ 2 \end{array}$$

$$\begin{array}{r} 2 \\ 2\overline{)4} \\ \underline{4} \\ \times \end{array}$$

Thus HCF of 332, 480 and 290 is 2

Ans.

f. 734, 202

Sol. HCF of 734, 202 using division method

$$\begin{array}{r} 3 \\ 202\overline{)734} \\ \underline{606} \\ 128 \end{array}$$

$$\begin{array}{r} 1 \\ 128\overline{)202} \\ \underline{128} \\ 74 \end{array}$$

$$\begin{array}{r} 1 \\ 74\overline{)128} \\ \underline{74} \\ 54 \end{array}$$

$$\begin{array}{r} 1 \\ 54\overline{)74} \\ \underline{54} \\ 20 \end{array}$$

$$\begin{array}{r} 2 \\ 20\overline{)54} \\ \underline{40} \\ 14 \end{array}$$

$$\begin{array}{r} 1 \\ 14\overline{)20} \\ \underline{14} \\ 6 \end{array}$$

$$\begin{array}{r} 2 \\ 6\overline{)14} \\ \underline{12} \\ 2 \end{array}$$

$$\begin{array}{r} 3 \\ 2\overline{)6} \\ \underline{6} \\ \times \end{array}$$

Thus HCF of 734 and 202 is 2.

**Q3. Find the LCM of the given numbers using prime factorization method.**

a. 120, 150, 145

Sol. Prime factorization of 120, 150 and 145

| 2 | 120 |
|---|---|
| 2 | 60 |
| 2 | 30 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

| 2 | 150 |
|---|---|
| 3 | 75 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

| 5 | 145 |
|---|---|
| 29 | 29 |
| | 1 |

$120 = 2\times2\times2\times3\times5$

$150 = 2\times3\times5\times5$

$145 = 5\times29$

LCM = Common factors × Non common factors

LCM = $5\times2\times2\times2\times3\times5\times29$

LCM = 17,400 Ans.

b. 108, 116, 128

Sol. Prime factorization of 108, 116 and 128

| 2 | 108 |
|---|---|
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

| 2 | 116 |
|---|---|
| 2 | 58 |
| 29 | 29 |
| | 1 |

| 2 | 128 |
|---|---|
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

$108 = 2\times2\times3\times3\times3$

$116 = 2\times2\times29$

$128 = 2\times2\times2\times2\times2\times2\times2$

LCM = Common factors × Non common factors

LCM = $2\times2\times2\times2\times2\times2\times2\times3\times3\times3\times29$

LCM = 100,224 Ans.

c. 240, 412

Sol. Prime factorization of 240, and 412

| 2 | 240 |
|---|---|
| 2 | 120 |
| 2 | 60 |
| 2 | 30 |
| 3 | 15 |
| | 5 |

| 2 | 412 |
|---|---|
| 2 | 206 |
| 103 | 103 |
| | 1 |

$240 = 2\times2\times2\times2\times3\times5$

$412 = 2\times2\times103$

LCM = Common factors × Non common factors

LCM = $2\times2\times2\times2\times3\times5\times103$

LCM = 24720 Ans.

d. 158, 250, 240

Sol. Prime factorization of 250, 158 and 240

| 2 | 250 |
|---|---|
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

| 2 | 158 |
|---|---|
| 79 | 79 |
| | 1 |

| 2 | 240 |
|---|---|
| 2 | 120 |
| 2 | 60 |
| 2 | 30 |
| 3 | 15 |
| | 5 |

$250 = 2\times5\times5\times5$

$158 = 2\times79$

$240 = 2\times2\times2\times2\times3\times5$

LCM = Common factors × Non common factors

LCM = $2\times2\times2\times2\times3\times5\times5\times5\times79$

LCM = 474000 Ans.

e. 296, 564, 444

Sol. Prime factorization of 296, 564 and 444

| 2 | 296 |
|---|---|
| 2 | 148 |
| 2 | 74 |
| 37 | 37 |
| | 1 |

| 2 | 564 |
|---|---|
| 2 | 282 |
| 3 | 141 |
| 47 | 47 |
| | 1 |

| 2 | 444 |
|---|---|
| 2 | 222 |
| 3 | 111 |
| | 37 |

$296 = 2\times2\times2\times37$

$564 = 2\times2\times3\times47$

$444 = 2\times2\times3\times37$

LCM = Common factors × Non common factors

LCM = $2\times2\times2\times3\times37\times47$

LCM = 41736 Ans.

f. 246, 378, 984

Sol. Prime factorization of 246, 378 and 984.

| 2 | 246 |
|---|---|
| 3 | 123 |
| 41 | 41 |
| | 1 |

| 2 | 378 |
|---|---|
| 3 | 189 |
| 3 | 63 |
| 3 | 21 |
| | 7 |

| 2 | 984 |
|---|---|
| 2 | 492 |
| 2 | 246 |
| 3 | 123 |
| | 41 |

$246 = 2\times \quad 3\times41$

$378 = 2\times3\times3\times3\times7$

$984 = 2\times2\times2\times3\times41$

LCM = Common factors × Non common factors

LCM = $2\times3\times2\times2\times3\times3\times7\times41$

LCM = 61,992 Ans.

g. 112, 142

Sol. Prime factorization of 112 and 142

| 2 | 112 |
|---|---|
| 2 | 56 |
| 2 | 28 |
| 2 | 14 |
| 7 | 7 |
| | 1 |

| 2 | 142 |
|---|---|
| 71 | 71 |
| | 1 |

LCM = Common factors × Non common factors

LCM = $2 \times 2\times2\times2\times7\times71$

LCM = 7952 Ans.

h. 764, 986, 130

Sol. Prime factorization of 764, 986 and 130

| 2 | 764 |
|---|---|
| 2 | 382 |
| 191 | 191 |
| | 1 |

| 2 | 986 |
|---|---|
| 17 | 493 |
| 29 | 29 |
| | 1 |

| 2 | 130 |
|---|---|
| 5 | 65 |
| | 13 |

$764 = 2\times2\times191$

$130 = 2\times5\times13$

$986 = 2\times17\times29$

LCM = Common factors × Non common factors.

LCM = $2\times2 \times 2\times2\times2\times2 \times2\times3\times3\times3\times29$

LCM = 100,224 Ans.

i. 864, 789, 556

Sol. Prime factorization of 864, 789 and 556

| 2 | 864 |
|---|---|
| 2 | 432 |
| 2 | 216 |
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| | 3 |

| 3 | 789 |
|---|---|
| 263 | 263 |
| | 1 |

| 2 | 556 |
|---|---|
| 2 | 278 |
| | 139 |

$864 = 2\times2\times2\times2\times2\times3\times3\times3$

$789 = 3\times263$

$556 = 2\times2\times139$

LCM = Common factors × Non common factors

LCM = $2\times2\times2\times2\times2\times3 \times3\times3\times139\times263$

LCM = 31,585,248 Ans.

**Q4. Find the LCM of the given numbers using division method.**

a. 280, 250, 290

Sol. LCM of 280, 250 and 290

| 2 | 280 | 250 | 290 |
|---|---|---|---|
| 2 | 140 | 125 | 145 |
| 2 | 70 | 125 | 145 |
| 5 | 35 | 125 | 145 |
| 5 | 7 | 25 | 29 |
| 5 | 7 | 5 | 29 |
| 7 | 7 | 1 | 29 |
| 29 | 1 | 1 | 29 |
| | 1 | 1 | 29 |

$LCM = 2\times2\times2\times5\times5 \times5\times7\times29$

LCM= 203,000 Ans.

b. 456, 230, 900

Sol. LCM of 456, 230 and 900

| 2 | 456 | 230 | 900 |
|---|---|---|---|
| 2 | 228 | 115 | 450 |
| 2 | 114 | 115 | 225 |
| 3 | 57 | 115 | 225 |
| 3 | 19 | 115 | 75 |
| 5 | 19 | 115 | 25 |
| 5 | 19 | 23 | 5 |
| 19 | 19 | 23 | 1 |
| 23 | 1 | 23 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times3\times3 \times5\times5\times19\times23$

$LCM = 786,600\ Ans.$

c. 150, 560, 450

Sol. LCM of 150, 560 and 450

| | | | |
|---|---|---|---|
| 2 | 150 | 560 | 450 |
| 2 | 75 | 280 | 225 |
| 2 | 75 | 140 | 225 |
| 2 | 75 | 70 | 225 |
| 3 | 75 | 35 | 225 |
| 3 | 25 | 35 | 75 |
| 5 | 25 | 35 | 25 |
| 5 | 5 | 7 | 5 |
| 7 | 1 | 7 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times2\times3 \times3\times5\times5\times7$

$LCM = 25,200\ Ans.$

d. 789, 648, 832

Sol. LCM of 789, 648 and 832

| | | | |
|---|---|---|---|
| 2 | 789 | 648 | 832 |
| 2 | 789 | 324 | 416 |
| 2 | 789 | 162 | 208 |
| 2 | 789 | 81 | 104 |
| 3 | 789 | 81 | 57 |
| 3 | 263 | 27 | 19 |
| 3 | 263 | 9 | 19 |
| 3 | 263 | 3 | 19 |
| 19 | 263 | 1 | 19 |
| 263 | 263 | 1 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times2\times3\times3 \times3\times3\times19\times263$

$LCM = 6,476,112\ Ans.$

e. 898, 986, 786

Sol. LCM of 898, 986 and 786

| | | | |
|---|---|---|---|
| 2 | 898 | 986 | 786 |
| 3 | 449 | 493 | 393 |
| 131 | 449 | 493 | 131 |
| 449 | 449 | 493 | 1 |
| 493 | 1 | 493 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times3\times131\times449\times493$

$LCM = 173,986,602\ Ans.$

f. 446, 340, 850

Sol. LCM of 446, 340 and 850

| | | | |
|---|---|---|---|
| 2 | 446 | 340 | 850 |
| 2 | 223 | 170 | 425 |
| 5 | 223 | 85 | 425 |
| 5 | 223 | 17 | 85 |
| 17 | 223 | 17 | 17 |
| 223 | 223 | 1 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times5\times5\times17\times223$

$LCM = 379,100\ Ans.$

g. 908, 682, 672

Sol. LCM of 908, 682 and 672

| | | | |
|---|---|---|---|
| 2 | 908 | 682 | 672 |
| 2 | 454 | 341 | 336 |
| 2 | 227 | 341 | 168 |
| 2 | 227 | 341 | 84 |
| 2 | 227 | 341 | 42 |
| 3 | 227 | 341 | 21 |
| 7 | 227 | 341 | 7 |
| | 227 | 341 | 1 |

$LCM = 2\times2\times2\times2\times2 \times3\times7\times227\times341$

$LCM = 52,017,504\ Ans.$

h. 408, 126, 522

Sol. LCM of 408, 126 and 522

| | | | |
|---|---|---|---|
| 2 | 408 | 126 | 522 |
| 2 | 204 | 63 | 261 |
| 2 | 102 | 63 | 261 |
| 3 | 51 | 63 | 261 |
| 3 | 17 | 21 | 87 |
| 7 | 17 | 7 | 29 |
| 17 | 17 | 1 | 29 |
| 29 | 1 | 1 | 29 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times3$
$\times3\times7\times17\times29$

$LCM = 248,472\ Ans.$

i. 765, 635, 235

Sol. LCM of 765, 635 and 235

| | | | |
|---|---|---|---|
| 3 | 765 | 635 | 235 |
| 3 | 255 | 635 | 235 |
| 5 | 85 | 635 | 235 |
| | 17 | 127 | 47 |

$LCM = 3\times3\times5\times17\times47\times127$

$LCM = 4,566,285\ Ans.$

**Q5. The LCM of two numbers is 456 and HCF is 6. If one number is 24 the find the other number?**

Sol. LCM = 456
HCF = 6
One number (a) = 24
Other number (b) = ?

Let the other number be 'x'

Using formula

HCF × LCM = a × b

$6\times456 = 24\times'x'$

Divide both sides by 24

$\frac{6\times\cancel{456}^{19}}{\cancel{24}^{1}} = \frac{\cancel{24}^{1}\times'x'}{\cancel{24}^{1}}$

$6\times19 = x$

$114 = x$

$\Rightarrow x = 114\ Ans.$

**Q6. The HCF of two numbers if 7 and LCM is 588. Find the product of two numbers?**

Sol. LCM = 588
HCF = 7
Product of two numbers = ?

Using formula

HCF × LCM = a × b

$588\times7 = a\times b$

$4116 = a\times b$

Thus product of two numbers is 4116 Ans.

**Q7. The HCF of two numbers is 4 and the product of the two numbers is 512. Find the LCM of the numbers?**

Sol. HCF = 4
Product of two numbers = 512
LCM = ?

Using formula

HCF × LCM = a × b

$4\times LCM = 512$

Divide both sides by 4

$\frac{\cancel{4}\times LCM}{\cancel{4}} = \frac{\cancel{512}^{128}}{\cancel{4}^{1}}$

$\Rightarrow LCM = 128\ Ans.$

## Exercise 1.4

**Q1. Find the minimum capacity of a water tank that can completely measure the amounts of 460 ℓ, 250 ℓ and 525 ℓ.**

Sol. To find the minimum capacity of water tank we will find the HCF of 460 ℓ, 250 ℓ and 525 ℓ.

| 5 | 460 | 250 | 525 |
|---|---|---|---|
| | 92 | 50 | 105 |

Common factor = 5

HCF = 5

So the minimum capacity of water tank than can completely measure the given amount of water is 5 $\ell$ .

**Q2. Find the greatest number that can divide 460, 648 and 984.**

Sol. The greatest number that can divide 460, 648 and 984 is the HCF of these numbers.

| 2 | 460 | 648 | 984 |
|---|---|---|---|
| 2 | 230 | 324 | 492 |
| 3 | 165 | 162 | 246 |
| | 55 | 54 | 82 |

Common factors = $2\times2\times3$

HCF = 12

So the greatest number that can divide the given numbers is 12.

**Q3. Find the smallest number which exactly divides 406, 348 and 256.**

Sol. The smallest number which is exactly divisible by 406, 348 and 256 is their LCM.

| 2 | 406 | 348 | 256 |
|---|---|---|---|
| 2 | 203 | 174 | 128 |
| 2 | 203 | 87 | 64 |
| 2 | 203 | 87 | 32 |
| 2 | 203 | 87 | 16 |
| 2 | 203 | 87 | 8 |
| 2 | 203 | 87 | 4 |
| 2 | 203 | 87 | 2 |
| 2 | 203 | 87 | 1 |
| 29 | 203 | 29 | 1 |
| | 7 | 1 | 1 |

$$LCM = 2\times2\times2\times2\times2\times2\times2\times2\times2\times7\times29$$

$$LCM = 103{,}936 \ Ans.$$

So the smallest number is 103,936.

**Q4. The LCM of two numbers is 96 and HCF is 24. In one number is 32 then find the other number.**

Sol. LCM = 96

HCF = 24

One number (a) = 32

Other number (b) = ?

Let the other number be 'x'

Using formula

LCM × HCF = a × b

$$96\times24 = 32\times x$$

Divide both sides by 32

$$\frac{\cancel{96}^{3}\times24}{\cancel{32}^{1}} = \frac{\cancel{32}\times x}{\cancel{32}}$$

$$3\times24 = x$$

$$\Rightarrow x = 72 \ Ans.$$

So the other number (b) is 72.

**Q5. The HCF of two numbers is 18 and LCM is 75. Find the product of two numbers.**

Sol. HCF = 18

LCM = 75

Product of two numbers = ?

Using formula

HCF × LCM = a × b

$$18\times75 = a\times b$$

$$1350 = a\times b$$

Product of two number is 1350.

**Q6. LCM of two numbers is 678 and the product of the tow numbers is 4746. Find the HCF of two numbers.**

Sol. LCM = 678

Product of two numbers = 4746

HCF = ?

Using formula

HCF × LCM = Product of two numbers

$$HCF\times678 = 4746$$

Divide both sides by 678

$$\frac{HCF\times\cancel{678}}{\cancel{678}} = \frac{\cancel{4746}^{7}}{\cancel{678}^{1}}$$

$$\Rightarrow HCF = 7 \ Ans.$$

**Q7. Umar has two pieces of rope. One is 18 meters long and the other is 112 meters long. He wants to cut it into pieces that are all of the same length, without any remainder. What is the greatest length that he can cut them into?**

Sol. To find the greatest length of rope, we will find the HCF of 18 and 112.

Factors of $18 = 2\times3\times3$

Factors of $112 = 2\times2\times2\times2\times7$

Common factors = 2

HCF = 2

Thus the greatest length of rope is 2 meter.

**Q8. For an Iftar party, Aiza wants to serve chicken bread and nuggets to the guests invited. She wants to do it in such a way that each serving contains the same combination of chicken bread and nuggets. If there are 24 slices of chicken bread and 120 nuggets, find the maximum number of serving she can prepare.**

Sol. To find the maximum number of serving we will find the HCF of 24 and 120

Factors of $24 = 2\times2\times2\times3$

Factors of $120 = 2\times2\times2\times3\times5$

Common factors $= 2\times2\times2\times3$

HCF = 24

The maximum number of serving is 24.

**Q9. Nida goes for a walk every 10 days and Sehrish goes for a walk every 25 days to the same park. If they both went for a walk today, then how many days from now will they next be in the park on the same day?**

Sol. To find the number of days we will find the LCM of 10 and 25

Multiples of 10 are: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110...

Multiples of 25 are: 25, 50, 75, 100, 125, 150, 175, 200...

Common multiples: 50, 100...

Least common multiple = 50

Thus after 50 days the will be in the park.

**Q10. Find the smallest number which is exactly divisible by 40, 224 and 400 without leaving any remainder.**

Sol. The smallest number which is exactly divisible by 40, 224 and 400 is the LCM of these numbers.

| | | | |
|---|---|---|---|
| 2 | 40 | 224 | 400 |
| 2 | 20 | 112 | 200 |
| 2 | 10 | 56 | 100 |
| 2 | 5 | 28 | 50 |
| 2 | 5 | 14 | 25 |
| 5 | 5 | 7 | 25 |
| 5 | 1 | 7 | 5 |
| 7 | 1 | 7 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times2\times2\times5\times5\times7$

LCM = 5600

So the smallest number is 5600.

## Exercise 1.5

**Q1. Find the square of the following numbers.**

**a. 25**

Sol. 25

Taking square

$(25)^2 = 25\times25$

$(25)^2 = 625$

**b. 77**

Sol. 77

Taking square

$(77)^2 = 77\times77$

$(77)^2 = 5,929$

**c. 98**

Sol. 98

Taking square

$(98)^2 = 98 \times 98$

$(98)^2 = 9,604$

**d. 11**

Sol. 11

Taking square

$(11)^2 = 11 \times 11$

$(11)^2 = 121$

**e. 46**

Sol. 46

Taking square

$(46)^2 = 46 \times 46$

$(46)^2 = 2.116$

**f. 69**

Sol. 69

Taking square

$(69)^2 = 69 \times 69$

$(69)^2 = 4,761$

**g. 13**

Sol. 13

Taking square

$(13)^2 = 13 \times 13$

$(13)^2 = 169$

**h. 37**

Sol. 37

Taking square

$(37)^2 = 37 \times 37$

$(37)^2 = 1,369$

**i. 45**

Sol. 45

Taking square

$(45)^2 = 45 \times 45$

$(45)^2 = 2,025$

**j. 79**

Sol. 79

Taking square

$(79)^2 = 79 \times 79$

$(79)^2 = 6,241$

**k. 67**

Sol. 67

Taking square

$(67)^2 = 67 \times 67$

$(67)^2 = 4,489$

**l. 50**

Sol. 50

Taking square

$(50)^2 = 50 \times 50$

$(50)^2 = 2,500$

**Q2. A glass is cut into square shape. If the length of the glass is 98 cm, what is the area of the surface of the glass?**

**( Hint: Area of Square = Length × Length )**

Sol. As given that the glass is now in square shape so length will be equal to width

As length = 98 cm

So width = 98 cm

Area of surface of glass = $length \times width$

Area of surface of glass = $98 \times 98$

Area of surface of glass = 9,604 $cm^2$

## Review Exercise – 1

**Q1. Circle the correct option.**

a. The prime factors of 24 are _____.

i) $2 \times 2 \times 2 \times 3$

ii) $2 \times 2 \times 3 \times 3$

iii) $2 \times 2 \times 2 \times 2$

iv) $3 \times 3 \times 2 \times 3$

b. The HCF of two or more prime numbers is equal to their _____.

i) Sum

ii) **Product**

iii) Difference

iv) one

c. The LCM of two or more prime numbers is equal to their _____.
   i) Sum
   **ii) product**
   iii) difference
   iv) one

d. The $2\times2\times2\times2\times2\times3\times3\times5$ is exponent notation of _____.
   i) $2^5\times3^2\times5^2$
   ii) $2^4\times3^2\times5$
   iii) $2^5\times3\times5$
   **iv) $2^5\times3^2\times5$**

e. The product of two numbers is equal to the product of their LCM and _____.
   i) First number
   ii) Second number
   iii) common multiple
   **iv) HCF**

**Q2. Define the following terms.**

a) Factors

Sol. **Definition:**

Factor is a number that divides another number without leaving any remainder.

For example: 3 is a factor of 15, because 3 divide 15 completely leaving no remainder.

b) Multiples

Sol. **Definition:**

Multiples are the numbers obtained by multiplying a certain number by another number.

For example: multiples of 18 are: 18, 36, 54, 72 and so on.

c) Prime Factorization

Sol. **Definition:**

Prime factorization is a process in which a number can be written as a product of its prime factors.

For example: prime factorization of $60 = 2\times2\times3\times5$

d) Highest Common Factor

Sol. **Definition:**

The Highest Common Factor (HCF) of two or more numbers is the greatest factor that divides the given numbers exactly without any remainder.

e) Least Common Multiple

Sol. **Definition:**

The Least Common Multiple (LCM) of two or more numbers is the smallest common multiple of the given numbers.

**Q3. Find the factors of the following numbers.**

**a) 78**

Sol. Factors of 78 are 1, 2, 3, 6, 13, 26, 39 and 78.

**b) 840**

Sol. Factors of 840 are 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 15, 20, 21, 24, 28, 30, 35, 40, 42, 56, 60, 70, 84, 105, 120, 140, 168, 210, 280, 420 and 840.

**c) 144**

Sol. Factors of 144 are 1, 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, 36, 48, 72 and 144.

**d) 705**

Sol. Factors of 705 are 1, 3, 5, 15, 47, 141, 235 and 705.

**Q4. Find the multiples of the given number less the 250.**

**a) 18**

Sol. Multiples of 18 are 18,36, 54, 72, 90, 108, 126, 144, 162, 180...

**b) 30**

Sol. Multiples of 30, 60, 90, 120, 150, 180, 210, 240, 270, 300...

**c) 55**

Sol. Multiples of 55, 110, 165, 220...

**d) 82**

Sol. Multiples of 82 are 82, 164, 246, 328...

**Q5. Find the prime factors of the following numbers and write it in the form of index notation.**

**a) 566**

Sol. Prime factorization of 566

| 2 | 566 |
|---|---|
| | 283 |

Prime factors of 566 = 2× 283

Index notation = 2× 283

**b) 788**

Sol. Prime factorization of 788

| 2 | 788 |
|---|---|
| 2 | 394 |
| | 197 |

Prime factors of 788 = 2× 2× 197

Index notation = $2^2 \times 197$

**c) 1000**

Sol. Prime factorization of 1000

| 2 | 1000 |
|---|---|
| 2 | 500 |
| 2 | 250 |
| 5 | 125 |
| 5 | 25 |
| | 5 |

Prime factors of 1000 = 2× 2× 2× 5× 5×5

Index notation = $2^3 \times 5^3$

**d) 3088**

Sol. Prime factorization of 3088

| 2 | 3088 |
|---|---|
| 2 | 1544 |
| 2 | 772 |
| 2 | 386 |
| | 193 |

Prime factors of 3088 = 2× 2× 2× 2× 193

Index notation = $2^4 \times 193$

**e) 8777**

Sol. Prime factorization of 8777

It is a prime number so its prime factorization is 1× 8777

Index notation = $1 \times 8777$

**f) 4026**

Sol.Prime factorization of 4026

| 2 | 4026 |
|---|---|
| 3 | 2013 |
| 3 | 621 |
| 3 | 207 |
| 3 | 69 |
| | 23 |

Prime factors of 4026 = 2× 3× 3× 3× 3× 23

Index notation = $2 \times 3^4 \times 23$

**g) 6054**

Sol.Prime factorization of 6054

| 2 | 6054 |
|---|---|
| 3 | 3027 |
| | 1009 |

Prime factors of 6054 = 2× 3× 1009

Index notation = $2 \times 3 \times 1009$

**h) 5478**

Sol.Prime factorization of 5478

| 2 | 5478 |
|---|---|
| 3 | 2739 |
| 11 | 913 |
| | 83 |

Prime factors of 5478 = 2× 3× 11× 83

Index notation = $2 \times 3 \times 11 \times 83$

**Q6. Write the following in expanded form.**

**a)** $5^6$

Sol. $5^6 = 5 \times 5 \times 5 \times 5 \times 5 \times 5$

**b)** $2^3 \times 5^5$

Sol. $2^3 \times 5^5 = 2 \times 2 \times 2 \times 5 \times 5 \times 5 \times 5 \times 5$

**c)** $3^7 \times 7^2 \times 11^4$

Sol. $\times 7^2 \times 11^4 \times 3^7$

$= 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 7 \times 7 \times 11 \times 11 \times 11 \times 11$

**d)** $1^2 \times 5^3 \times 3^6$

Sol. $1^2 \times 5^3 \times 3^6 =$

$1\times1\times5\times5\times5\times3\times3$

$\times3\times3\times3\times3$

**Q7. Find the HCF of the following numbers using prime factorization method.**

**a) 455, 254**

Sol. HCF using prime factorization

| 5 \| 455 | 2 \| 254 |
|---|---|
| 7 \| 91 | 127 |
| 13 | |

$455 = 1\times5\times7\times13$

$254 = 1\times2\times127$

These numbers are co-prime.

Common factors = 1

So their HCF is 1.

**b) 569, 369, 545**

Sol. HCF using prime factorization

| 569 \| 569 | 3 \| 369 | 5 \| 545 |
|---|---|---|
| 1 | 3 \| 123 | 109 |
| | 41 | |

$569 = 1\times569$

$369 = 1\times3\times3\times41$

$545 = 1\times5\times109$

Common factors = 1

So their HCF = 1

**c) 690, 468**

Sol. HCF using prime factorization

| 2 \| 690 | 2 \| 468 |
|---|---|
| 3 \| 345 | 2 \| 234 |
| 5 \| 115 | 3 \| 117 |
| 23 | 3 \| 39 |
| | 13 \| 13 |
| | 1 |

$690 = 2\times3\times5\times23$

$468 = 2\times3\times2\times3\times13$

Common factors = $2\times3$

HCF = 6 Ans.

**d) 255, 751, 155**

Sol. HCF using prime factorization

| 3 \| 255 | 751 \| 751 | 5 \| 155 |
|---|---|---|
| 5 \| 85 | 1 | 31 |
| 17 | | |

$255 = 1\times3\times5\times17$

$751 = 1\times751$

$155 = 1\times5\times31$

Common factors = 1

HCF = 1 Ans.

**Q8. Find the HCF of the following numbers by division method.**

**a) 256, 164, 144**

Sol. First we find the HCF of 256 and 164

$$144\overline{)164}\ (1$$
$$\underline{144}$$
$$20\overline{)144}\ (7$$
$$\underline{140}$$
$$4\overline{)20}\ (5$$
$$\underline{20}$$
$$\times$$

Now we find the HCF of 4 and 256

$$4\overline{)256}\ (64$$
$$\underline{256}$$
$$\times$$

HCF of 144, 164 and 256 is 4 **Ans.**

**b) 178, 278, 240**

Sol.First we find the HCF of 178 and 240

$$178\overline{)240}\ 1,\quad 178\overline{)62}\ 2,\quad 62\overline{)178}\ 1,\quad 58\overline{)62}\ 14,\quad 4\overline{)58}\ 2,\quad 2\overline{)4}$$

Now we find the HCF of 2 and 278

$$2\overline{)278}\ 139$$

HCF of 178, 278 and 240 is 2Ans.

**c) 448, 385, 245**

Sol. First we find the HCF of 245 and 385

$$245\overline{)385}\ 1,\quad 140\overline{)245}\ 1,\quad 105\overline{)140}\ 7,\quad 35\overline{)105}$$

Now we find the HCF of 5 and 448

$$35\overline{)448}\ 12,\quad 28\overline{)35}\ 1,\quad 7\overline{)28}\ 4$$

HCF of 448, 285 and 245 is 7Ans.

**d) 212, 380, 180**

Sol. First we find the HCF of 180 and 380

$$180\overline{)380}\ 2,\quad 20\overline{)180}\ 9$$

Now we find the HCF of 20 and 212

$$20\overline{)212}\ 10,\quad 12\overline{)20}\ 1,\quad 8\overline{)12}\ 1,\quad 4\overline{)8}\ 2$$

HCF of 212, 180 and 380 is 4 Ans.

**Q9. Find the LCM of the following numbers using prime factorization method.**

**a) 600, 345, 476**

Sol. Prime factorization of 600, 345 and 476

| 3 | 345 |
|---|---|
| 5 | 115 |
| 23 | 23 |
| | 1 |

| 2 | 600 |
|---|---|
| 2 | 300 |
| 2 | 150 |
| 3 | 75 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

| 2 | 476 |
|---|---|
| 2 | 238 |
| | 119 |

$345 = 3 \times 5 \times 23$

$600 = 2 \times 2 \times 2 \times 3 \times 5 \times 5$

$476 = 2 \times 2 \times 119$

LCM = Common factors × Non common factors

LCM = $2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 23 \times 119$

LCM = 1,642,200 Ans.

**b) 620, 434, 545**

Sol.Prime factorization of 620, 434 and 545

| 2 | 434 |
|---|---|
| 7 | 217 |
| 31 | 31 |
| | 1 |

| 2 | 620 |
|---|---|
| 2 | 310 |
| 5 | 155 |
| 31 | 31 |
| | 1 |

| 5 | 545 |
|---|---|
| 109 | 109 |
| | 1 |

$434 = 2 \times 7 \times 31$

$620 = 2 \times 2 \times 5 \times 31$

$545 = 5 \times 109$

LCM = Common factors × Non common factors

LCM = $2 \times 2 \times 5 \times 7 \times 31 \times 109$

LCM = 473,060 Ans.

**c) 156, 135, 215**

Sol.Prime factorization of 156, 135 and 215

| 2 | 156 |
|---|---|
| 2 | 78 |
| 3 | 39 |
| | 13 |

| 3 | 135 |
|---|---|
| 3 | 45 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

| 5 | 215 |
|---|---|
| 43 | 43 |
| | 1 |

$345 = 2 \times 2 \times 3 \times 13$

$135 = 3 \times 3 \times 3 \times 5$

$215 = 5 \times 43$

LCM = Common factors × Non common factors

LCM = $2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 13 \times 43$

LCM = 301,860 Ans.

**d) 165, 425, 725**

Sol.Prime factorization of 165, 425 and 725

| 3 | 165 |
|---|---|
| 5 | 55 |
| 11 | 11 |
| | 1 |

| 5 | 725 |
|---|---|
| 5 | 145 |
| 29 | 29 |
| | 1 |

| 5 | 425 |
|---|---|
| 5 | 85 |
| | 17 |

$165 = 3 \times 5 \times 11$

$725 = 5 \times 5 \times 29$

$425 = 5 \times 5 \times 17$

LCM = Common factors × Non common factors

LCM = $5 \times 5 \times 3 \times 11 \times 29 \times 17$

LCM = 406,725 Ans.

**Q10. Find the LCM of the following numbers by using division method.**

**a) 212, 404, 68**

Sol. LCM of 212, 404 and 68 by division method

| 2 | 212 | 404 | 68 |
|---|---|---|---|
| 2 | 106 | 202 | 34 |
| | 53 | 101 | 17 |

$LCM = 2 \times 2 \times 17 \times 53 \times 101$

$LCM = 364,004\ Ans.$

**b) 306, 428, 845**

Sol. LCM of 306, 428 and 845 by division method

| | | | |
|---|---|---|---|
| 2 | 306 | 428 | 845 |
| 2 | 153 | 214 | 845 |
| 3 | 153 | 107 | 845 |
| 3 | 51 | 107 | 845 |
| 5 | 17 | 107 | 845 |
| 13 | 17 | 107 | 169 |
| | 17 | 107 | 13 |

$LCM = 2\times2\times3\times3\times5\times13\times13\times17\times107$

$LCM = 55,333,980\ Ans.$

**c) 340, 146, 456**

Sol. LCM of 340, 146 and 456 by division method

| | | | |
|---|---|---|---|
| 2 | 340 | 146 | 456 |
| 2 | 170 | 73 | 228 |
| 2 | 85 | 73 | 114 |
| 3 | 85 | 73 | 57 |
| 5 | 85 | 73 | 19 |
| | 17 | 73 | 19 |

$LCM = 2\times2\times2\times3\times5\times17\times73\times19$

$LCM = 2,829,480\ Ans.$

**d) 560, 956, 890**

Sol. LCM of 560, 956 and 890 by division method

| | | | |
|---|---|---|---|
| 2 | 560 | 956 | 890 |
| 2 | 280 | 478 | 445 |
| 2 | 140 | 239 | 445 |
| 2 | 70 | 239 | 445 |
| 5 | 35 | 239 | 445 |
| | 7 | 239 | 89 |

$LCM = 2\times2\times2\times2\times5\times7\times89\times239$

$LCM = 11,911,760\ Ans.$

**Q11. Find square of the following numbers.**

**a) 16**

Sol. 16

Taking square

$(16)^2 = 16\times16$

$(16)^2 = 256$

**b) 12**

Sol. 12

Taking square

$(12)^2 = 12\times12$

$(12)^2 = 144$

**c) 44**

Sol. 44

Taking square

$(44)^2 = 44\times44$

$(44)^2 = 1,936$

**d) 62**

Sol. 62

Taking square

$(62)^2 = 62\times62$

$(62)^2 = 3,844$

**Q12. The length, breadth and height of a room is 680cm, 510cm and 340cm respectively. Find the longest tape which can measure the dimensions of the room exactly?**

Sol. To find the longest tape for measuring these lengths, we will find the HCF.

| | | | | | |
|---|---|---|---|---|---|
| 2 | 680 | 2 | 510 | 2 | 340 |
| 2 | 340 | 5 | 255 | 2 | 170 |
| 2 | 170 | 5 | 85 | 5 | 85 |
| 5 | 85 | | 17 | | 17 |
| | 17 | | | | |

| 2 | 905 |
|---|---|
| | 181 |

| 2 | 560 |
|---|---|
| 2 | 280 |
| 2 | 140 |
| 2 | 70 |
| 5 | 35 |
| | 7 |

$905 = 2 \times 181$

$560 = 2 \times 2 \times 2 \times 2 \times 5 \times 7$

g. 248, 104, 565

Sol. HCF of 248, 104, 565

| 2 | 104 |
|---|---|
| 2 | 52 |
| 2 | 26 |
| | 13 |

| 2 | 248 |
|---|---|
| 2 | 124 |
| 2 | 62 |
| | 31 |

| 2 | 565 |
|---|---|
| 113 | 113 |
| | 1 |

$104 = 2 \times 2 \times 2 \times 13$

$248 = 2 \times 2 \times 2 \times 31$

$565 = 2 \times 113$

**HCF = 2 Ans.**

h. 578, 456

Sol. HCF of 578, 456

| 2 | 578 |
|---|---|
| 17 | 289 |
| | 17 |

| 2 | 456 |
|---|---|
| 2 | 228 |
| 2 | 114 |
| 3 | 57 |
| | 19 |

$578 = 2 \times 17 \times 17$

$456 = 2 \times 2 \times 2 \times 3 \times 19$

**HCF = 2 Ans.**

i. 385, 855, 620

Sol. HCF of 385, 855, 620

| 5 | 385 |
|---|---|
| 7 | 77 |
| 11 | 11 |
| | 1 |

| 3 | 855 |
|---|---|
| 3 | 285 |
| 5 | 95 |
| 19 | 19 |
| | 1 |

| 2 | 620 |
|---|---|
| 2 | 310 |
| 3 | 155 |
| 31 | 31 |
| | 1 |

$385 = 5 \times 7 \times 11$

$855 = 3 \times 3 \times 5 \times 19$

$620 = 2 \times 2 \times 3 \times 31$

HCF = 1 Ans.

**Q2. Find HCF of the following numbers using division method.**

a. 100, 350, 480

Sol. HCF of 100, 350, 480 using division method

$$100\overline{)350}\ 3,\quad 300\ 2,\quad 50\overline{)100},\quad 100,\quad \times$$

Now we will find the HCF of 50 and 480

$$50\overline{)480}\ 9,\quad 450\ 1,\quad 30\overline{)50},\quad 30\ 1,\quad 20\overline{)30},\quad 20\ 2,\quad 10\overline{)20},\quad 20,\quad \times$$

Thus HCF of 100, 350 and 480 is 10.

Ans

b. 678, 456

Sol. HCF of 678, 456 using division method.

$$\begin{array}{r} 1 \\ 456\overline{)678} \\ 456 \quad 2 \\ \hline 222\overline{)456} \\ 444 \quad 18 \\ \hline 12\overline{)222} \\ 216 \quad 2 \\ \hline 6\overline{)12} \\ 12 \\ \hline \times \end{array}$$

HCF of 456 and 678 is 6 Ans.

c. 400, 350, 250

Sol. HCF of 400, 350, 250 using division method

$$\begin{array}{r} 1 \\ 350\overline{)400} \\ 350 \quad 7 \\ \hline 50\overline{)350} \\ 350 \\ \hline \times \end{array}$$

Now we will find the HCF of 50 and 250.

$$\begin{array}{r} 5 \\ 50\overline{)250} \\ 250 \\ \hline \times \end{array}$$

HCF of 400, 350 and 250 is 50 Ans.

d. 100, 245, 168

Sol. HCF of 100, 245, 168 using division method

$$\begin{array}{r} 1 \\ 168\overline{)245} \\ 168 \quad 2 \\ \hline 77\overline{)168} \\ 154 \quad 5 \\ \hline 14\overline{)77} \\ 70 \quad 2 \\ \hline 7\overline{)14} \\ 14 \\ \hline \times \end{array}$$

Now we will find the HCF of 7 and 100

$$\begin{array}{r} 14 \\ 7\overline{)100} \\ 98 \quad 3 \\ \hline 2\overline{)7} \\ 6 \quad 2 \\ \hline 1\overline{)2} \\ 2 \\ \hline \times \end{array}$$

Thus HCF of 100, 245 and 168 is 1 Ans.

e. 332, 480, 290

Sol. HCF of 332, 480, 290 using division method

$$\begin{array}{r} 1 \\ 332\overline{)480} \\ 332 \quad 6 \\ \hline 48\overline{)332} \\ 288 \quad 1 \\ \hline 44\overline{)48} \\ 44 \quad 11 \\ \hline 4\overline{)44} \\ 44 \\ \hline \times \end{array}$$

Now we find the HCF of 4 and 290

$$4\overline{)290}\quad 72,\ 288,\ 2$$
$$2\overline{)4}$$
$$4$$
$$\times$$

Thus HCF of 332, 480 and 290 is 2

Ans.

f. 734, 202

Sol. HCF of 734, 202 using division method

$$202\overline{)734}\quad 3,\ 606,\ 1$$
$$128\overline{)202}\quad 1,\ 128,\ 1$$
$$74\overline{)128}\quad 1,\ 74,\ 1$$
$$54\overline{)74}\quad 2,\ 54,\ 2$$
$$20\overline{)54}\quad 1,\ 40,\ 1$$
$$14\overline{)20}\quad 2,\ 14,\ 2$$
$$6\overline{)14}\quad 3,\ 12,\ 3$$
$$2\overline{)6}$$
$$6$$
$$\times$$

Thus HCF of 734 and 202 is 2.

**Q3. Find the LCM of the given numbers using prime factorization method.**

a: 120, 150, 145

Sol. Prime factorization of 120, 150 and 145

| 2 \| 120 | 2 \| 150 | 5 \| 145 |
|---|---|---|
| 2 \| 60 | 3 \| 75 | 29 \| 29 |
| 2 \| 30 | 5 \| 25 | 1 |
| 3 \| 15 | 5 \| 5 | |
| 5 \| 5 | 1 | |
| 1 | | |

$120 = 2\times2\times2\times3\times5$

$150 = 2\times3\times5\times5$

$145 = 5\times29$

LCM = Common factors × Non common factors

LCM = $5\times2\times2\times2\times3\times5\times29$

LCM = 17,400 Ans.

b. 108, 116, 128

Sol. Prime factorization of 108, 116 and 128

| 2 \| 108 | 2 \| 116 | 2 \| 128 |
|---|---|---|
| 2 \| 54 | 2 \| 58 | 2 \| 64 |
| 3 \| 27 | 29 \| 29 | 2 \| 32 |
| 3 \| 9 | 1 | 2 \| 16 |
| 3 \| 3 | | 2 \| 8 |
| 1 | | 2 \| 4 |
| | | 2 \| 2 |
| | | 1 |

$108 = 2\times2\times3\times3\times3$

$116 = 2\times2\times29$

$128 = 2\times2\times2\times2\times2\times2\times2$

LCM = Common factors × Non common factors

LCM = $2\times2\times2\times2\times2\times2\times2\times3\times3\times3\times29$

LCM = 100,224 Ans.

c. 240, 412

Sol. Prime factorization of 240, and 412

| 2 | 240 |
|---|---|
| 2 | 120 |
| 2 | 60 |
| 2 | 30 |
| 3 | 15 |
| | 5 |

| 2 | 412 |
|---|---|
| 2 | 206 |
| 103 | 103 |
| | 1 |

$240 = 2\times2\times2\times2\times3\times5$

$412 = 2\times2\times103$

LCM = Common factors × Non common factors

LCM = $2\times2\times2\times2\times3\times5\times103$

LCM = 24720 Ans.

d. 158, 250, 240

Sol. Prime factorization of 250, 158 and 240

| 2 | 250 |
|---|---|
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

| 2 | 158 |
|---|---|
| 79 | 79 |
| | 1 |

| 2 | 240 |
|---|---|
| 2 | 120 |
| 2 | 60 |
| 2 | 30 |
| 3 | 15 |
| | 5 |

$250 = 2\times5\times5\times5$

$158 = 2\times79$

$240 = 2\times2\times2\times2\times3\times5$

LCM = Common factors × Non common factors

LCM = $2\times2\times2\times2\times3\times5\times5\times5\times79$

LCM = 474000 Ans.

e. 296, 564, 444

Sol. Prime factorization of 296, 564 and 444

| 2 | 296 |
|---|---|
| 2 | 148 |
| 2 | 74 |
| 37 | 37 |
| | 1 |

| 2 | 564 |
|---|---|
| 2 | 282 |
| 3 | 141 |
| 47 | 47 |
| | 1 |

| 2 | 444 |
|---|---|
| 2 | 222 |
| 3 | 111 |
| | 37 |

$296 = 2\times2\times2\times37$

$564 = 2\times2\times3\times47$

$444 = 2\times2\times3\times37$

LCM = Common factors × Non common factors

LCM = $2\times2\times2\times3\times37\times47$

LCM = 41736 Ans.

f. 246, 378, 984

Sol. Prime factorization of 246, 378 and 984

| 2 | 246 |
|---|---|
| 3 | 123 |
| 41 | 41 |
| | 1 |

| 2 | 378 |
|---|---|
| 3 | 189 |
| 3 | 63 |
| 3 | 21 |
| | 7 |

| 2 | 984 |
|---|---|
| 2 | 492 |
| 2 | 246 |
| 3 | 123 |
| | 41 |

$246 = 2\times \quad 3\times41$

$378 = 2\times3\times3\times3\times7$

$984 = 2\times2\times2\times3\times41$

LCM = Common factors × Non common factors

LCM = $2\times3\times2\times2\times3\times3\times7\times41$

LCM = 61,992 Ans.

g. 112, 142

Sol. Prime factorization of 112 and 142

| 2 | 112 |
|---|---|
| 2 | 56 |
| 2 | 28 |
| 2 | 14 |
| 7 | 7 |
| | 1 |

| 2 | 142 |
|---|---|
| 71 | 71 |
| | 1 |

LCM = Common factors × Non common factors

$LCM = 2 \times 2\times2\times2\times7\times71$

LCM = 7952 Ans.

h. 764, 986, 130

Sol. Prime factorization of 764, 986 and 130

| 2 | 764 |
|---|---|
| 2 | 382 |
| 191 | 191 |
| | 1 |

| 2 | 986 |
|---|---|
| 17 | 493 |
| 29 | 29 |
| | 1 |

| 2 | 130 |
|---|---|
| 5 | 65 |
| | 13 |

$764 = 2\times2\times191$

$130 = 2\times5\times13$

$986 = 2\times17\times29$

LCM = Common factors × Non common factors

$LCM = 2\times2 \times 2\times2\times2\times2 \times2\times3\times3\times3\times29$

LCM = 100,224 Ans.

i. 864, 789, 556

Sol. Prime factorization of 864, 789 and 556

| 2 | 864 |
|---|---|
| 2 | 432 |
| 2 | 216 |
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| | 3 |

| 3 | 789 |
|---|---|
| 263 | 263 |
| | 1 |

| 2 | 556 |
|---|---|
| 2 | 278 |
| | 139 |

$864 = 2\times2\times2\times2\times2\times3\times3\times3$

$789 = 3\times263$

$556 = 2\times2\times139$

LCM = Common factors × Non common factors

$LCM = 2\times2\times2\times2\times2\times3 \times3\times3\times139\times263$

LCM = 31,585,248 Ans.

**Q4. Find the LCM of the given numbers using division method.**

a. 280, 250, 290

Sol. LCM of 280, 250 and 290

| 2 | 280 | 250 | 290 |
|---|---|---|---|
| 2 | 140 | 125 | 145 |
| 2 | 70 | 125 | 145 |
| 5 | 35 | 125 | 145 |
| 5 | 7 | 25 | 29 |
| 5 | 7 | 5 | 29 |
| 7 | 7 | 1 | 29 |
| 29 | 1 | 1 | 29 |
| | 1 | 1 | 29 |

$LCM = 2\times2\times2\times5\times5 \times5\times7\times29$

LCM= 203,000 Ans.

b. 456, 230, 900

Sol. LCM of 456, 230 and 900

| 2 | 456 | 230 | 900 |
|---|---|---|---|
| 2 | 228 | 115 | 450 |
| 2 | 114 | 115 | 225 |
| 3 | 57 | 115 | 225 |
| 3 | 19 | 115 | 75 |
| 5 | 19 | 115 | 25 |
| 5 | 19 | 23 | 5 |
| 19 | 19 | 23 | 1 |
| 23 | 1 | 23 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times3\times3 \times5\times5\times19\times23$

$LCM = 786,600\ Ans.$

c. 150, 560, 450

Sol. LCM of 150, 560 and 450

| | | | |
|---|---|---|---|
| 2 | 150 | 560 | 450 |
| 2 | 75 | 280 | 225 |
| 2 | 75 | 140 | 225 |
| 2 | 75 | 70 | 225 |
| 3 | 75 | 35 | 225 |
| 3 | 25 | 35 | 75 |
| 5 | 25 | 35 | 25 |
| 5 | 5 | 7 | 5 |
| 7 | 1 | 7 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times2\times3$
$\times3\times5\times5\times7$
$LCM = 25,200\ Ans.$

d. 789, 648, 832

Sol. LCM of 789, 648 and 832

| | | | |
|---|---|---|---|
| 2 | 789 | 648 | 832 |
| 2 | 789 | 324 | 416 |
| 2 | 789 | 162 | 208 |
| 2 | 789 | 81 | 104 |
| 3 | 789 | 81 | 57 |
| 3 | 263 | 27 | 19 |
| 3 | 263 | 9 | 19 |
| 3 | 263 | 3 | 19 |
| 19 | 263 | 1 | 19 |
| 263 | 263 | 1 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times2\times3\times3$
$\times3\times3\times19\times263$
$LCM = 6,476,112\ Ans.$

e. 898, 986, 786

Sol. LCM of 898, 986 and 786

| | | | |
|---|---|---|---|
| 2 | 898 | 986 | 786 |
| 3 | 449 | 493 | 393 |
| 131 | 449 | 493 | 131 |
| 449 | 449 | 493 | 1 |
| 493 | 1 | 493 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times3\times131\times449\times493$
$LCM = 173,986,602\ Ans.$

f. 446, 340, 850

Sol. LCM of 446, 340 and 850

| | | | |
|---|---|---|---|
| 2 | 446 | 340 | 850 |
| 2 | 223 | 170 | 425 |
| 5 | 223 | 85 | 425 |
| 5 | 223 | 17 | 85 |
| 17 | 223 | 17 | 17 |
| 223 | 223 | 1 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times5\times5\times17\times223$
$LCM = 379,100\ Ans.$

g. 908, 682, 672

Sol. LCM of 908, 682 and 672

| | | | |
|---|---|---|---|
| 2 | 908 | 682 | 672 |
| 2 | 454 | 341 | 336 |
| 2 | 227 | 341 | 168 |
| 2 | 227 | 341 | 84 |
| 2 | 227 | 341 | 42 |
| 3 | 227 | 341 | 21 |
| 7 | 227 | 341 | 7 |
| | 227 | 341 | 1 |

$LCM = 2\times2\times2\times2\times2$
$\times3\times7\times227\times341$
$LCM = 52,017,504\ Ans.$

h. 408, 126, 522

Sol. LCM of 408, 126 and 522

| | | | |
|---|---|---|---|
| 2 | 408 | 126 | 522 |
| 2 | 204 | 63 | 261 |
| 2 | 102 | 63 | 261 |
| 3 | 51 | 63 | 261 |
| 3 | 17 | 21 | 87 |
| 7 | 17 | 7 | 29 |
| 17 | 17 | 1 | 29 |
| 29 | 1 | 1 | 29 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times3$
$\times3\times7\times17\times29$
$LCM = 248,472\ Ans.$

i. 765, 635, 235

Sol. LCM of 765, 635 and 235

| | | | |
|---|---|---|---|
| 3 | 765 | 635 | 235 |
| 3 | 255 | 635 | 235 |
| 5 | 85 | 635 | 235 |
| | 17 | 127 | 47 |

$LCM = 3\times3\times5\times17\times47\times127$
$LCM = 4,566,285\ Ans.$

**Q5. The LCM of two numbers is 456 and HCF is 6. If one number is 24 the find the other number?**

Sol. LCM = 456
HCF = 6
One number (a) = 24
Other number (b) = ?

Let the other number be 'x'
Using formula
HCF × LCM = a × b
$6\times456 = 24\times'x'$
Divide both sides by 24

$\frac{6\times\cancel{456}^{19}}{\cancel{24}^{1}} = \frac{\cancel{24}^{1}\ x'x'}{\cancel{24}^{1}}$

$6\times19 = x$
$114 = x$
$\Rightarrow x = 114\ Ans.$

**Q6. The HCF of two numbers if 7 and LCM is 588. Find the product of two numbers?**

Sol. LCM = 588
HCF = 7
Product of two numbers = ?
Using formula
HCF × LCM = a × b
$588\times7 = a\times b$
$4116 = a\times b$
Thus product of two numbers is 4116 Ans.

**Q7. The HCF of two numbers is 4 and the product of the two numbers is 512. Find the LCM of the numbers?**

Sol. HCF = 4
Product of two numbers = 512
LCM = ?
Using formula
HCF × LCM = a × b
$4\times LCM = 512$
Divide both sides by 4

$\frac{\cancel{4}\times LCM}{\cancel{4}} = \frac{\cancel{512}^{128}}{\cancel{4}^{1}}$

$\Rightarrow LCM = 128\ Ans.$

**Exercise 1.4**

**Q1. Find the minimum capacity of a water tank that can completely measure the amounts of 460 ℓ, 250 ℓ and 525 ℓ.**

Sol. To find the minimum capacity of water tank we will find the HCF of 460 ℓ, 250 ℓ and 525 ℓ.

| 5 | 460 | 250 | 525 |
|---|---|---|---|
| | 92 | 50 | 105 |

Common factor = 5

HCF = 5

So the minimum capacity of water tank than can completely measure the given amount of water is 5 $\ell$ .

**Q2. Find the greatest number that can divide 460, 648 and 984.**

Sol. The greatest number that can divide 460, 648 and 984 is the HCF of these numbers.

| 2 | 460 | 648 | 984 |
|---|---|---|---|
| 2 | 230 | 324 | 492 |
| 3 | 165 | 162 | 246 |
| | 55 | 54 | 82 |

Common factors = $2\times2\times3$

HCF = 12

So the greatest number that can divide the given numbers is 12.

**Q3. Find the smallest number which exactly divides 406, 348 and 256.**

Sol. The smallest number which is exactly divisible by 406, 348 and 256 is their LCM.

| 2 | 406 | 348 | 256 |
|---|---|---|---|
| 2 | 203 | 174 | 128 |
| 2 | 203 | 87 | 64 |
| 2 | 203 | 87 | 32 |
| 2 | 203 | 87 | 16 |
| 2 | 203 | 87 | 8 |
| 2 | 203 | 87 | 4 |
| 2 | 203 | 87 | 2 |
| 2 | 203 | 87 | 1 |
| 29 | 203 | 29 | 1 |
| | 7 | 1 | 1 |

$LCM = 2\times2\times2\times2\times2\times2$

$\times2\times2\times2\times7\times29$

$LCM = 103{,}936\ Ans.$

So the smallest number is 103,936.

**Q4. The LCM of two numbers is 96 and HCF is 24. In one number is 32 then find the other number.**

Sol. LCM = 96

HCF = 24

One number (a) = 32

Other number (b) = ?

Let the other number be 'x'

Using formula

LCM × HCF = a × b

$96\times24 = 32\times x$

Divide both sides by 32

$$\frac{96^{3}\times24}{\cancel{32}^{1}} = \frac{\cancel{32}\times x}{\cancel{32}}$$

$3\times24 = x$

$\Rightarrow x = 72\ Ans.$

So the other number (b) is 72.

**Q5. The HCF of two numbers is 18 and LCM is 75. Find the product of two numbers.**

Sol. HCF = 18

LCM = 75

Product of two numbers = ?

Using formula

HCF × LCM = a × b

$18\times75 = a\times b$

$1350 = a\times b$

Product of two number is 1350.

**Q6. LCM of two numbers is 678 and the product of the tow numbers is 4746. Find the HCF of two numbers.**

Sol. LCM = 678

Product of two numbers = 4746

HCF = ?

Using formula

HCF × LCM = Product of two numbers

$HCF\times678 = 4746$

Divide both sides by 678

$$\frac{HCF\times\cancel{678}}{\cancel{678}} = \frac{\cancel{4746}^{7}}{\cancel{678}^{1}}$$

$\Rightarrow HCF = 7\ Ans.$

**Q7. Umar has two pieces of rope. One is 18 meters long and the other is 112 meters long. He wants to cut it into pieces that are all of the same length, without any remainder. What is the greatest length that he can cut them into?**

Sol. To find the greatest length of rope, we will find the HCF of 18 and 112.

Factors of $18 = 2 \times 3 \times 3$

Factors of $112 = 2 \times 2 \times 2 \times 2 \times 7$

Common factors = 2

HCF = 2

Thus the greatest length of rope is 2 meter.

**Q8. For an Iftar party, Aiza wants to serve chicken bread and nuggets to the guests invited. She wants to do it in such a way that each serving contains the same combination of chicken bread and nuggets. If there are 24 slices of chicken bread and 120 nuggets, find the maximum number of serving she can prepare.**

Sol. To find the maximum number of serving we will find the HCF of 24 and 120

Factors of $24 = 2 \times 2 \times 2 \times 3$

Factors of $120 = 2 \times 2 \times 2 \times 3 \times 5$

Common factors $= 2 \times 2 \times 2 \times 3$

HCF = 24

The maximum number of serving is 24.

**Q9. Nida goes for a walk every 10 days and Sehrish goes for a walk every 25 days to the same park. If they both went for a walk today, then how many days from now will they next be in the park on the same day?**

Sol. To find the number of days we will find the LCM of 10 and 25

Multiples of 10 are: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110...

Multiples of 25 are: 25, 50, 75, 100, 125, 150, 175, 200...

Common multiples: 50, 100...

Least common multiple = 50

Thus after 50 days the will be in the park.

**Q10. Find the smallest number which is exactly divisible by 40, 224 and 400 without leaving any remainder.**

Sol. The smallest number which is exactly divisible by 40, 224 and 400 is the LCM of these numbers.

| | | | |
|---|---|---|---|
| 2 | 40 | 224 | 400 |
| 2 | 20 | 112 | 200 |
| 2 | 10 | 56 | 100 |
| 2 | 5 | 28 | 50 |
| 2 | 5 | 14 | 25 |
| 5 | 5 | 7 | 25 |
| 5 | 1 | 7 | 5 |
| 7 | 1 | 7 | 1 |
| | 1 | 1 | 1 |

$LCM = 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 7$

LCM = 5600

So the smallest number is 5600.

## Exercise 1.5

**Q1. Find the square of the following numbers.**

**a. 25**

Sol. 25

Taking square

$(25)^2 = 25 \times 25$

$(25)^2 = 625$

**b. 77**

Sol. 77

Taking square

$(77)^2 = 77 \times 77$

$(77)^2 = 5,929$

**c. 98**

Sol. 98

Taking square

$(98)^2 = 98 \times 98$

$(98)^2 = 9,604$

**d. 11**

Sol. 11

Taking square

$(11)^2 = 11 \times 11$

$(11)^2 = 121$

**e. 46**

Sol. 46

Taking square

$(46)^2 = 46 \times 46$

$(46)^2 = 2,116$

**f. 69**

Sol. 69

Taking square

$(69)^2 = 69 \times 69$

$(69)^2 = 4,761$

**g. 13**

Sol. 13

Taking square

$(13)^2 = 13 \times 13$

$(13)^2 = 169$

**h. 37**

Sol. 37

Taking square

$(37)^2 = 37 \times 37$

$(37)^2 = 1,369$

**i. 45**

Sol. 45

Taking square

$(45)^2 = 45 \times 45$

$(45)^2 = 2,025$

**j. 79**

Sol. 79

Taking square

$(79)^2 = 79 \times 79$

$(79)^2 = 6,241$

**k. 67**

Sol. 67

Taking square

$(67)^2 = 67 \times 67$

$(67)^2 = 4,489$

**l. 50**

Sol. 50

Taking square

$(50)^2 = 50 \times 50$

$(50)^2 = 2,500$

**Q2. A glass is cut into square shape. If the length of the glass is 98 cm, what is the area of the surface of the glass?**

**( Hint: Area of Square = Length × Length )**

Sol. As given that the glass is now in square shape so length will be equal to width

As length = 98 cm

So width = 98 cm

Area of surface of glass = $length \times width$

Area of surface of glass = $98 \times 98$

Area of surface of glass = 9,604 $cm^2$

## Review Exercise – 1

**Q1. Circle the correct option.**

a. The prime factors of 24 are _____.

i) $2 \times 2 \times 2 \times 3$

ii) $2 \times 2 \times 3 \times 3$

iii) $2 \times 2 \times 2 \times 2$

iv) $3 \times 3 \times 2 \times 3$

b. The HCF of two or more prime numbers is equal to their _____.

i) Sum

ii) **Product**

iii) Difference

iv) one

c. The LCM of two or more prime numbers is equal to their _____.
   i) Sum
   **ii) product**
   iii) difference
   iv) one

d. The $2\times2\times2\times2\times2\times3\times3\times5$ is exponent notation of _____.
   i) $2^5\times3^2\times5^2$
   ii) $2^4\times3^2\times5$
   iii) $2^5\times3\times5$
   **iv) $2^5\times3^2\times5$**

e. The product of two numbers is equal to the product of their LCM and _____.
   i) First number
   ii) Second number
   iii) common multiple
   **iv) HCF**

**Q2. Define the following terms.**

a) Factors

Sol. **Definition:**

Factor is a number that divides another number without leaving any remainder.

For example: 3 is a factor of 15, because 3 divide 15 completely leaving no remainder.

b) Multiples

Sol. **Definition:**

Multiples are the numbers obtained by multiplying a certain number by another number.

For example: multiples of 18 are: 18, 36, 54, 72 and so on.

c) Prime Factorization

Sol. **Definition:**

Prime factorization is a process in which a number can be written as a product of its prime factors.

For example: prime factorization of $60 = 2\times2\times3\times5$

d) Highest Common Factor

Sol. **Definition:**

The Highest Common Factor (HCF) of two or more numbers is the greatest factor that divides the given numbers exactly without any remainder.

e) Least Common Multiple

Sol. **Definition:**

The Least Common Multiple (LCM) of two or more numbers is the smallest common multiple of the given numbers.

**Q3. Find the factors of the following numbers.**

**a) 78**

Sol. Factors of 78 are 1, 2, 3, 6, 13, 26, 39 and 78.

**b) 840**

Sol. Factors of 840 are 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 15, 20, 21, 24, 28, 30, 35, 40, 42, 56, 60, 70, 84, 105, 120, 140, 168, 210, 280, 420 and 840.

**c) 144**

Sol. Factors of 144 are 1, 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, 36, 48, 72 and 144.

**d) 705**

Sol. Factors of 705 are 1, 3, 5, 15, 47, 141, 235 and 705.

**Q4. Find the multiples of the given number less the 250.**

**a) 18**

Sol. Multiples of 18 are 18,36, 54, 72, 90, 108, 126, 144, 162, 180...

**b) 30**

Sol. Multiples of 30, 60, 90, 120, 150, 180, 210, 240, 270, 300...

**c) 55**

Sol. Multiples of 55, 110, 165, 220...

**d) 82**

Sol. Multiples of 82 are 82, 164, 246, 328...

**Q5. Find the prime factors of the following numbers and write it in the form of index notation.**

**a) 566**

Sol. Prime factorization of 566

| 2 | 566 |
|---|---|
| | 283 |

Prime factors of 566 = 2× 283

Index notation = 2× 283

**b) 788**

Sol. Prime factorization of 788

| 2 | 788 |
|---|---|
| 2 | 394 |
| | 197 |

Prime factors of 788 = 2× 2× 197

Index notation = $2^2 \times 197$

**c) 1000**

Sol. Prime factorization of 1000

| 2 | 1000 |
|---|---|
| 2 | 500 |
| 2 | 250 |
| 5 | 125 |
| 5 | 25 |
| | 5 |

Prime factors of 1000 = 2× 2× 2× 5× 5× 5

Index notation = $2^3 \times 5^3$

**d) 3088**

Sol. Prime factorization of 3088

| 2 | 3088 |
|---|---|
| 2 | 1544 |
| 2 | 772 |
| 2 | 386 |
| | 193 |

Prime factors of 3088 = 2× 2× 2× 2× 193

Index notation = $2^4 \times 193$

**e) 8777**

Sol. Prime factorization of 8777

It is a prime number so its prime factorization is 1× 8777

Index notation = $1 \times 8777$

**f) 4026**

Sol.Prime factorization of 4026

| 2 | 4026 |
|---|---|
| 3 | 2013 |
| 3 | 621 |
| 3 | 207 |
| 3 | 69 |
| | 23 |

Prime factors of 4026 = 2× 3× 3× 3× 3× 23

Index notation = $2 \times 3^4 \times 23$

**g) 6054**

Sol.Prime factorization of 6054

| 2 | 6054 |
|---|---|
| 3 | 3027 |
| | 1009 |

Prime factors of 6054 = 2× 3× 1009

Index notation = $2 \times 3 \times 1009$

**h) 5478**

Sol.Prime factorization of 5478

| 2 | 5478 |
|---|---|
| 3 | 2739 |
| 11 | 913 |
| | 83 |

Prime factors of 5478 = 2× 3× 11× 83

Index notation = $2 \times 3 \times 11 \times 83$

**Q6. Write the following in expanded form.**

**a)** $5^6$

Sol. $5^6 = 5 \times 5 \times 5 \times 5 \times 5 \times 5$

**b)** $2^3 \times 5^5$

Sol. $2^3 \times 5^5 = 2 \times 2 \times 2 \times 5 \times 5 \times 5 \times 5 \times 5$

**c)** $3^7 \times 7^2 \times 11^4$

Sol. $\times 7^2 \times 11^4 \times 3^7$

$= 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 7 \times 7 \times 11 \times 11 \times 11 \times 11$

**d)** $1^2 \times 5^3 \times 3^6$

Sol. $1^2 \times 5^3 \times 3^6 =$

$1\times1\times5\times5\times5\times3\times3$

$\times3\times3\times3\times3$

**Q7. Find the HCF of the following numbers using prime factorization method.**

**a) 455, 254**

Sol. HCF using prime factorization

| 5 \| 455 | 2 \| 254 |
|---|---|
| 7 \| 91 | 127 |
| 13 | |

$455 = 1\times5\times7\times13$

$254 = 1\times2\times127$

These numbers are co-prime.

Common factors = 1

So their HCF is 1.

**b) 569, 369, 545**

Sol. HCF using prime factorization

| 569 \| 569 | 3 \| 369 | 5 \| 545 |
|---|---|---|
| 1 | 3 \| 123 | 109 |
| | 41 | |

$569 = 1\times569$

$369 = 1\times3\times3\times41$

$545 = 1\times5\times109$

Common factors = 1

So their HCF = 1

**c) 690, 468**

Sol. HCF using prime factorization

| 2 \| 690 | 2 \| 468 |
|---|---|
| 3 \| 345 | 2 \| 234 |
| 5 \| 115 | 3 \| 117 |
| 23 | 3 \| 39 |
| | 13 \| 13 |
| | 1 |

$690 = 2\times3\times5\times23$

$468 = 2\times3\times2\times3\times13$

Common factors = $2\times3$

HCF = 6 Ans.

**d) 255, 751, 155**

Sol. HCF using prime factorization

| 3 \| 255 | 751 \| 751 | 5 \| 155 |
|---|---|---|
| 5 \| 85 | 1 | 31 |
| 17 | | |

$255 = 1\times3\times5\times17$

$751 = 1\times751$

$155 = 1\times5\times31$

Common factors = 1

HCF = 1 Ans.

**Q8. Find the HCF of the following numbers by division method.**

**a) 256, 164, 144**

Sol. First we find the HCF of 256 and 164

$$144\overline{)164}\ 1$$
$$\underline{144}$$
$$20\overline{)144}\ 7$$
$$\underline{140}$$
$$4\overline{)20}\ 5$$
$$\underline{20}$$
$$\times$$

Now we find the HCF of 4 and 256

$$4\overline{)256}\ 64$$
$$\underline{256}$$
$$\times$$

HCF of 144, 164 and 256 is 4 **Ans.**

**b) 178, 278, 240**

Sol.First we find the HCF of 178 and 240

$$\begin{array}{r} 1 \\ 178\overline{)240} \\ 178 \quad\quad 2 \\ \hline 62\overline{)178} \\ 120 \quad\quad 1 \\ \hline 58\overline{)62} \\ 58 \quad\quad 14 \\ \hline 4\overline{)58} \\ 56 \quad\quad 2 \\ \hline 2\overline{)4} \\ 4 \\ \hline \times \end{array}$$

Now we find the HCF of 2 and 278

$$\begin{array}{r} 139 \\ 2\overline{)278} \\ 278 \\ \hline \times \end{array}$$

HCF of 178, 278 and 240 is 2Ans.

**c) 448, 385, 245**

Sol. First we find the HCF of 245 and 385

$$\begin{array}{r} 1 \\ 245\overline{)385} \\ 245 \quad\quad 1 \\ \hline 140\overline{)245} \\ 140 \quad\quad 1 \\ \hline 105\overline{)140} \\ 105 \quad\quad 7 \\ \hline 35\overline{)105} \\ 105 \\ \hline \times \end{array}$$

Now we find the HCF of 5 and 448

$$\begin{array}{r} 12 \\ 35\overline{)448} \\ 420 \quad\quad 1 \\ \hline 28\overline{)35} \\ 28 \quad\quad 4 \\ \hline 7\overline{)28} \\ 28 \\ \hline \times \end{array}$$

HCF of 448, 285 and 245 is 7Ans.

**d) 212, 380, 180**

Sol. First we find the HCF of 180 and 380

$$\begin{array}{r} 2 \\ 180\overline{)380} \\ 360 \quad\quad 9 \\ \hline 20\overline{)180} \\ 180 \\ \hline \times \end{array}$$

Now we find the HCF of 20 and 212

$$\begin{array}{r} 10 \\ 20\overline{)212} \\ 200 \quad\quad 1 \\ \hline 12\overline{)20} \\ 12 \quad\quad 1 \\ \hline 8\overline{)12} \\ 8 \quad\quad 2 \\ \hline 4\overline{)8} \\ 8 \\ \hline \times \end{array}$$

HCF of 212, 180 and 380 is 4 Ans.

**Q9. Find the LCM of the following numbers using prime factorization method.**

**a) 600, 345, 476**

Sol. Prime factorization of 600, 345 and 476

| 3 | 345 |
|---|---|
| 5 | 115 |
| 23 | 23 |
| | 1 |

| 2 | 600 |
|---|---|
| 2 | 300 |
| 2 | 150 |
| 3 | 75 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

| 2 | 476 |
|---|---|
| 2 | 238 |
| | 119 |

$345 = 3 \times 5 \times 23$

$600 = 2 \times 2 \times 2 \times 3 \times 5 \times 5$

$476 = 2 \times 2 \times 119$

LCM = Common factors × Non common factors

LCM = $2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 23 \times 119$

LCM = 1,642,200 Ans.

**b) 620, 434, 545**

Sol.Prime factorization of 620, 434 and 545

| 2 | 434 |
|---|---|
| 7 | 217 |
| 31 | 31 |
| | 1 |

| 2 | 620 |
|---|---|
| 2 | 310 |
| 5 | 155 |
| 31 | 31 |
| | 1 |

| 5 | 545 |
|---|---|
| 109 | 109 |
| | 1 |

$434 = 2 \times 7 \times 31$

$620 = 2 \times 2 \times 5 \times 31$

$545 = 5 \times 109$

LCM = Common factors × Non common factors

LCM = $2 \times 2 \times 5 \times 7 \times 31 \times 109$

LCM = 473,060 Ans.

**c) 156, 135, 215**

Sol.Prime factorization of 156, 135 and 215

| 2 | 156 |
|---|---|
| 2 | 78 |
| 3 | 39 |
| | 13 |

| 3 | 135 |
|---|---|
| 3 | 45 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

| 5 | 215 |
|---|---|
| 43 | 43 |
| | 1 |

$345 = 2 \times 2 \times 3 \times 13$

$135 = 3 \times 3 \times 3 \times 5$

$215 = 5 \times 43$

LCM = Common factors × Non common factors

LCM = $2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 13 \times 43$

LCM = 301,860 Ans.

**d) 165, 425, 725**

Sol.Prime factorization of 165, 425 and 725

| 3 | 165 |
|---|---|
| 5 | 55 |
| 11 | 11 |
| | 1 |

| 5 | 725 |
|---|---|
| 5 | 145 |
| 29 | 29 |
| | 1 |

| 5 | 425 |
|---|---|
| 5 | 85 |
| | 17 |

$165 = 3 \times 5 \times 11$

$725 = 5 \times 5 \times 29$

$425 = 5 \times 5 \times 17$

LCM = Common factors × Non common factors

LCM = $5 \times 5 \times 3 \times 11 \times 29 \times 17$

LCM = 406,725 Ans.

**Q10. Find the LCM of the following numbers by using division method.**

**a) 212, 404, 68**

Sol. LCM of 212, 404 and 68 by division method

| 2 | 212 | 404 | 68 |
|---|---|---|---|
| 2 | 106 | 202 | 34 |
| | 53 | 101 | 17 |

$LCM = 2 \times 2 \times 17 \times 53 \times 101$

$LCM = 364,004\ Ans.$

**b) 306, 428, 845**

Sol. LCM of 306, 428 and 845 by division method

| | | | |
|---|---|---|---|
| 2 | 306 | 428 | 845 |
| 2 | 153 | 214 | 845 |
| 3 | 153 | 107 | 845 |
| 3 | 51 | 107 | 845 |
| 5 | 17 | 107 | 845 |
| 13 | 17 | 107 | 169 |
| | 17 | 107 | 13 |

$LCM = 2 \times 2 \times 3 \times 3 \times 5 \times 13 \times 13 \times 17 \times 107$

$LCM = 55,333,980\ Ans.$

**c) 340, 146, 456**

Sol. LCM of 340, 146 and 456 by division method

| | | | |
|---|---|---|---|
| 2 | 340 | 146 | 456 |
| 2 | 170 | 73 | 228 |
| 2 | 85 | 73 | 114 |
| 3 | 85 | 73 | 57 |
| 5 | 85 | 73 | 19 |
| | 17 | 73 | 19 |

$LCM = 2 \times 2 \times 2 \times 3 \times 5 \times 17 \times 73 \times 19$

$LCM = 2,829,480\ Ans.$

**d) 560, 956, 890**

Sol. LCM of 560, 956 and 890 by division method

| | | | |
|---|---|---|---|
| 2 | 560 | 956 | 890 |
| 2 | 280 | 478 | 445 |
| 2 | 140 | 239 | 445 |
| 2 | 70 | 239 | 445 |
| 5 | 35 | 239 | 445 |
| | 7 | 239 | 89 |

$LCM = 2 \times 2 \times 2 \times 2 \times 5 \times 7 \times 89 \times 239$

$LCM = 11,911,760\ Ans.$

**Q11. Find square of the following numbers.**

**a) 16**

Sol. 16

Taking square

$(16)^2 = 16 \times 16$

$(16)^2 = 256$

**b) 12**

Sol. 12

Taking square

$(12)^2 = 12 \times 12$

$(12)^2 = 144$

**c) 44**

Sol. 44

Taking square

$(44)^2 = 44 \times 44$

$(44)^2 = 1,936$

**d) 62**

Sol. 62

Taking square

$(62)^2 = 62 \times 62$

$(62)^2 = 3,844$

**Q12. The length, breadth and height of a room is 680cm, 510cm and 340cm respectively. Find the longest tape which can measure the dimensions of the room exactly?**

Sol. To find the longest tape for measuring these lengths, we will find the HCF.

| | | | | | |
|---|---|---|---|---|---|
| 2 | 680 | 2 | 510 | 2 | 340 |
| 2 | 340 | 5 | 255 | 2 | 170 |
| 2 | 170 | 5 | 85 | 5 | 85 |
| 5 | 85 | | 17 | | 17 |
| | 17 | | | | |

$680 = 2\times2\times5\times17\times2$

$510 = 2\times5\times5\times17$

$340 = 2\times2\times5\times17$

Common factors = $2\times5\times17$ HCF = 170 Ans.

**Q13. A light flashes every 12 seconds, another every 18 seconds and a third every single minute. At 2:45 a.m, the three flashed simultaneously. What time the three lights will again flash simultaneously?**

Sol. First we will find the HCF of these numbers

Factors of 12 = 1, 2, 3, 4, 6, 12

Factors of 18 = 1, 2, 3, 6, 9, 18

Common factors = 1, 2, 3, 6

HCF = 6

Now add 6 minutes to 2:45 a.m we get 2:51 min.

So three lights will flash at 2:51 a.m

**Q14. Find the greatest number which exactly divides 145, 360 and 578.**

Sol. The greatest number will be their HCF

| 2 | 360 |
|---|---|
| 2 | 180 |
| 2 | 90 |
| 5 | 45 |
| 5 | 15 |
| | 5 |

| 5 | 145 |
|---|---|
| | 29 |

| 2 | 578 |
|---|---|
| 17 | 289 |
| | 17 |

$680 = 2\times2\times2\times5\times5\times5$

$145 = 5\times29$

$578 = 2\times17\times17$

No factor in common so HCF is 1.

**Q15. Find the smallest number which exactly divisible by 200, 400 and 800.**

Sol. The required smallest number will be their LCM

| 2 | 200 | 400 | 800 |
|---|---|---|---|
| 2 | 100 | 200 | 400 |
| 2 | 50 | 100 | 200 |
| 2 | 25 | 50 | 100 |
| 2 | 25 | 25 | 50 |
| 5 | 25 | 25 | 25 |
| 5 | 5 | 5 | 5 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times2\times2\times5\times5$

$LCM = 800\ Ans.$

**Q16. Find the minimum length of ribbon that can be exactly cut into pieces of length 450cm, 750cm and 800cm.**

Sol. The required minimum length of ribbon will be their LCM.

| 2 | 450 | 750 | 800 |
|---|---|---|---|
| 2 | 225 | 375 | 400 |
| 2 | 225 | 375 | 200 |
| 2 | 225 | 375 | 100 |
| 2 | 225 | 375 | 50 |
| 3 | 225 | 375 | 25 |
| 3 | 75 | 125 | 25 |
| 5 | 25 | 125 | 25 |
| 5 | 5 | 25 | 5 |
| 5 | 1 | 5 | 1 |
| | 1 | 1 | 1 |

$LCM = 2\times2\times2\times2\times2\times3\times3\times5\times5\times5$

$LCM = 36000\ Ans.$

**Q17. If LCM of two numbers if 678 and product of two numbers is 4986. Find HCF of the numbers?**

Sol. LCM = 678

Product of two numbers = 4986

HCF = ?

Using formula

HCF × LCM = Product of two polynomials

$$HCF \times 678 = 4986$$

Divide both sides by 678

$$\frac{HCF \times \cancel{678}}{\cancel{678}} = \frac{4986}{678}$$

HCF = 7.35 Ans.

**Q18. If HCF of two numbers is 64 and LCM is 1024. Find the product of two numbers?**

Sol. HCF = 64
LCM = 1024
Product of two numbers = ?
Using formula
Product of two polynomials = HCF × LCM
Product of two polynomials = 64 × 1024
Product of two polynomials = 65,536 Ans.

**Q19. The HCF of two numbers is 20 and LCM is 5604. If one number is 467 then find the other number?**

Sol. HCF = 20
LCM = 5604
One number = 467
Other number = ?
Using formula

$$a \times b = HCF \times LCM$$

$$a \times 467 = 20 \times 5604$$

Divide both sides by 467

$$\frac{a \times \cancel{467}}{\cancel{467}} = \frac{20 \times \cancel{5604}^{12}}{\cancel{467}^{1}}$$

$$a = 12 \times 20$$

$$a = 240\ Ans.$$

## Unit # 2
## Integers
### Exercise 2.1

**Q1. Circle the positive integers from the following.**

+2, +10, −9, +11, −3, −5,
+8, +9, −3, −23, 7, 10

Sol. We will circle the positive integers

(+2) (+10), −9, (+11), −3, −5,
(+8) (+9), −3, −23, (7) (10)

**Q2. Write the opposite integers of each of the following.**

a. −5

Sol. Opposite integer of − 5 is +5

b. +11

Sol. Opposite integer of +11 is − 11

c. 0

Sol. Opposite integer of is 0

d. −9

Sol. Opposite integer of − 9 is +9

e. +14

Sol. Opposite integer of +14 is − 14

f. −23

Sol. Opposite integer of − 23 is +23

g. −19

Sol. Opposite integer of − 19 is +19

h. −8

Sol. Opposite integer of − 8 is +8

**Q3. Enlist all the integers which come between the following.**

a. $-4\ and\ +6$

Sol. Integers between $-4\ and\ +6$ are:

$-3, -2, -1, 0, +1, +2, +3, +4, +5$

b. $-7\ and\ -1$

Sol. Integers between $-7\ and\ -1$ are:

$-6, -5, -4, -3, -2$

c. $-14\ and\ +11$

Sol. Integers between $-14\ and\ +11$ are:

$-13, -12, -11, -10, -9, -8,$
$-7, -6, -5, -4, -3, -2, -1, 0,$
$+1, +2, +3, +4, +5, +6, +7,$
$+8, +9, +10$

d. $-8\ and\ -18$

Sol. Integers between $-8$ *and* $-18$ are:

$-17,-16,-15,-14,-13,-12,$

$-11,-10,-9$

e. $-5$ *and* $+5$

Sol. Integers between $-5$ *and* $+5$ are:

$-4,-3,-2,-1,0,+1,+2,+3,+4$

f. $+6$ *and* $+8$

Sol. Integers between $+6$ *and* $+8$ are:

$+7$

g. $-11$ *and* $+17$

Sol. Integers between $-11$ *and* $+17$ are:

$-10,-9,-8,-7,-6,-5,-4,$

$-3,-2,-1,0,+1,+2,+3,+4,$

$+5,+6,+7,+8,+9,+10,+11,$

$+12,+13,+14,+15,+16$

h. $-19$ *and* $+20$

Sol. Integers between $-19$ *and* $+20$ are:

$-18,-17,-16,-15,-14,-13,$

$-12,-11,-10,-9,-8,-7,-6,$

$-5,-4,-3,-2,-1,0,+1,+2,+3,$

$+4,+5,+6,+7,+8,+9,+10,+11,$

$+12,+13,+14,+15,+16,+17,+18,+19$

**Q4. Write the six integers which are:**

a. $< +5$

Sol. Six integers which are $< +5$ are:

$-2,-1,0,+1,+2,+3,+4$

b. $> -6$

Sol. Six integers which are $> -6$ are:

$-5,-4,-3,-2,-1,0$

c. $< -12$

Sol. Six integers which are $< -12$ are:

$-13,-14,-15,-16,-17,-18$

d. $> -16$

Sol. Six integers which are $> -16$ are:

$-15,-14,-13,-12,-11,-10$

e. $\geq 10$

Sol. Six integers which are $\geq 10$ are:

$+10,+11,+12,+13,+14,+15$

f. $\leq 50$

Sol. Six integers which are $\leq 50$ are:

$+45,+46,+47,+48,+49,+50$

**Q5. Write an integer for each situation.**

a. **An earning of Rs 12,000**

Sol. In integer form:

$+12,000$

b. **A loan of Rs 700**

Sol. In integer form: $-700$

c. **$30^0$ below $0^0$**

Sol. In integer form: $-30^0$

d. **A loss of Rs 720**

Sol. In integer form: $-720$

e. **A profit of Rs 100**

Sol. In integer form: $+100$

f. **5695 meter below the sea level**

Sol. In integer form:

$-5695$ meter

g. **Two degree above zero**

Sol. In integer form: $+2$

h. **Fifteen degrees below zero**

Sol. In integer form: $-15^0$

i. **3 level below ground level**

Sol. In integer form: $-3$

j. **55 meters above sea level**

Sol. In integer form:

$+55$ meter.

**Q6. Akram bought an air conditioner for Rs 65,000 and sells it for Rs 62,000. Express his loss or profit as an integer.**

Sol. Cost price = 65,000

Selling price = 62,000

Loss = 65,000 − 62,000 = 3,000

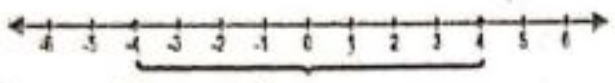
In integer form = $-3,000$

**Exercise 2.2**

**Q1. Represent the following sets of integers on a number line.**

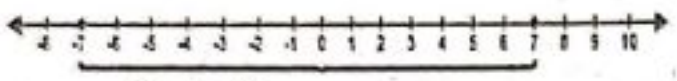
a. $-4$ *to* $+4$

**Sol. Number line:**



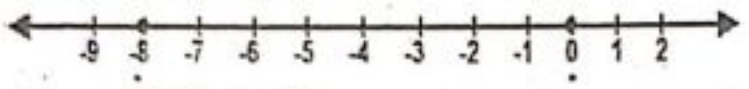
b. $-7$ *to* $+9$

**Sol. Number line:**



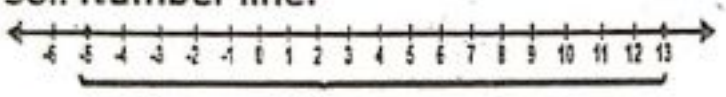
c. $-8$ *to* $0$

**Sol. Number line:**



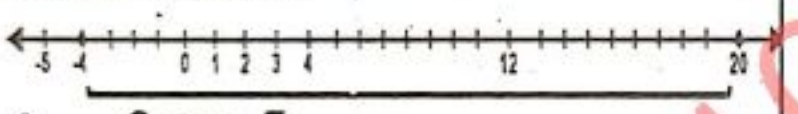
d. $-5$ *to* $+13$

**Sol. Number line:**



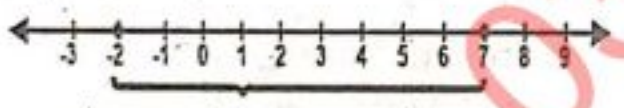
e. $-4$ *to* $+20$

**Sol. Number line:**



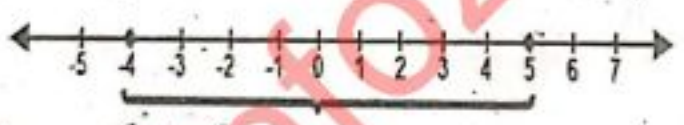
f. $-2$ *to* $+7$

**Sol. Number line:**



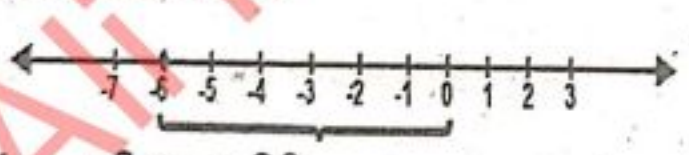
g. $-4$ *to* $+5$

**Sol. Number line:**



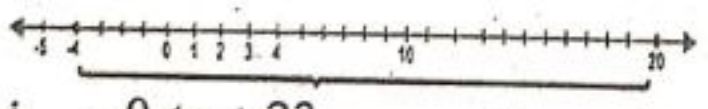
h. $-6$ *to* $0$

**Sol. Number line:**



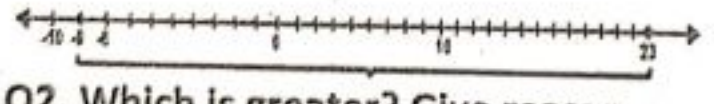
i. $-3$ *to* $+20$

**Sol. Number line:**



j. $-9$ *to* $+23$

**Sol. Number line:**



**Q2. Which is greater? Give reason.**

a. $-666$ *or* $-6666$

Sol. $-666$ is greater

**Reason:** a greater integer with a negative sign is always smaller than every smaller integer with a negative sign.

b. $-2340$ *or* $-234$

Sol. $-234$ is greater

**Reason:** a greater integer with a negative sign is always smaller than every smaller integer with a negative sign.

c. $-10000$ *or* $-1000$

Sol. $-1000$ is greater

**Reason:** a greater integer with a negative sign is always smaller than every smaller integer with a negative sign.

d. $-555$ *or* $-55$

Sol. $-55$ is greater

Reason: a greater integer with a negative sign is always smaller than every smaller integer with a negative sign.

**Q3. Arrange the following integers in ascending order.**

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

**Sol. Ascending order:**

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

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

**Sol. Ascending order:**

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

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

**Sol. Ascending order:**

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

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

**Sol. Ascending order:**

$-50, -12, -8, +6, +11, +17$

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

**Sol. Ascending order:**

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

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

Sol. Ascending order:

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

**Q4. Arrange the following integers in descending order.**

a. $-5, -1, 0, 7, 9, -3, -2$

Sol. Descending order:

$9, 7, 0, -1, -2, -3, -5$

b. $-11, -13, -8, +9, +12, +23$

Sol. Descending order:

$+23, +12, +9, -8, -11, -13$

c. $+24, +45, 0, -17, +10, -12, -20$

Sol. Descending order:

$+45, +24, +10, 0, -12, -17, -20$

d. $-9, -7, 0, +16, +8, -8$

Sol. Descending order:

$+16, +8, 0, -7, -8, -9$

e. $-8, -1, +4, +1, +10, -10, -9$

Sol. Descending order:

$+10, +4, +1, -1, -8, -9, -10$

f. $-34, -78, 0, +56, +78, +90, -45, -11$

Sol. Descending order:

$+90, +78, +56, 0, -11, -34, -45, -78$

## Exercise 2.3

**Q1. Write the absolute value of the following.**

a. +5

Sol. Absolute value

$|+5| = 5$

b. +67

Sol. Absolute value

$|+67| = 67$

c. −99

Sol. Absolute value

$|-99| = 99$

d. +90

Sol. Absolute value $|+90| = 90$

e. −80

Sol. Absolute value $|-80| = 80$

f. −40

Sol. Absolute value

$|-40| = 40$

**Q2. Arrange the absolute or numerical values of the following integers in ascending order and descending order.**

a. $+22, +33, 0, +50, +7, +23$

Sol. Absolute values in ascending order:

0, 7, 22, 23, 33, 50

Absolute values in descending order:

50, 33, 23, 22, 7, 0

b. $+6, +11, -3, +5, 0, +77$

Sol. Absolute values in ascending order:

0, 3, 5, 6, 11, 77

Absolute values in descending order:

77, 11, 6, 5, 3, 0

c. $-14, 0, -11, -7, -8, +9$

Sol. Absolute values in ascending order:

0, 7, 8, 9, 11, 14

Absolute values in descending order:

14, 11, 9, 8, 7, 0

d. $-11, -3, +5, +18, +13, -7$

Sol. Absolute values in ascending order:

3, 5, 7, 11, 13, 18

Absolute values in descending order:

18, 13, 11, 7, 5, 3

e. $-16, +4, -7, -9, +2, +10$

Sol. Absolute values in ascending order:

2, 4, 7, 9, 10, 16

Absolute values in descending order:

16, 10, 9, 7, 4, 2

f. $-6, +7, -8, -22, +25, -31, -56$

Sol. Absolute values in ascending order:

6, 7, 8, 22, 25, 31, 56

Absolute values in descending order:

56, 31, 25, 22, 8, 7, 6

g. $+23, +12, +11, -14, -6, +8, -9$

Sol. **Absolute values in ascending order:**

6, 8, 9, 11, 12, 14, 23

**Absolute values in descending order:**

23, 14, 12, 11, 9, 8, 6

h. $+23, +13, -15, +6, -5, +7, +9, +3, -10, -8$

Sol. **Absolute values in ascending order:**

3, 5, 6, 7, 8, 9, 10, 13, 15, 23

**Absolute values in descending order:**

23, 15, 13, 10, 9, 8, 7, 6, 5, 3

**Q3. Aliya and Harris start at same point. Aliya takes 11 steps upstairs and Harris comes 5 steps down the stairs. Write the integers for the two situations. Also write the absolute value of the integers.**

Sol. For Aliya +11

For Harris – 5

Absolute values are 11 and 5

## Review Exercise – 2

**Q1. Choose the correct option.**

a. The smallest positive integers is _____.

i. 0
ii. +1
iii. – 1
iv. Not determined

b. The greatest negative integers is _____.

i. 0
ii. + 1
iii. – 1
iv. Not determined

c. The absolute value of – 16 is _____.

i. – 16
ii. +16
iii. – 60
iv. +60

**Q2. Circle the negative integers from the following.**

Sol. $+5, +15, -78, +100, -67, -12, +90$

**Q3. Write the opposite integers for each of the following.**

a. **– 7**

Sol. Opposite integer of – 7 is + 7

b. **+ 101**

Sol. Opposite integer of +101 is – 101

c. **– 987**

Sol. Opposite integer of – 987 is +987

d. **– 50**

Sol. Opposite integer of – 50 is +50

e. **+13**

Sol. Opposite integer of +30 is – 30

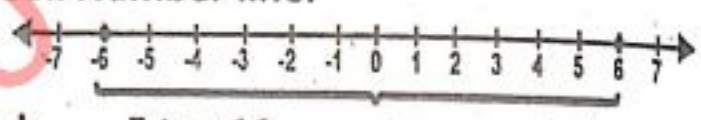
f. **– 56**

Sol. Opposite integer of – 56 is +56

**Q4. Represent the following sets of integers on a number line.**

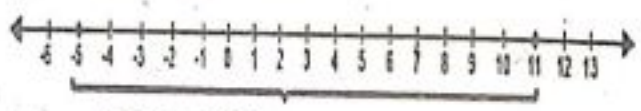
a. **– 6 to +6**

Sol. Number line:



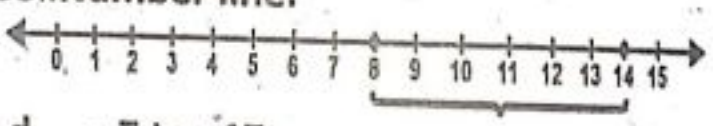
b. **– 5 to +11**

Sol. Number line:



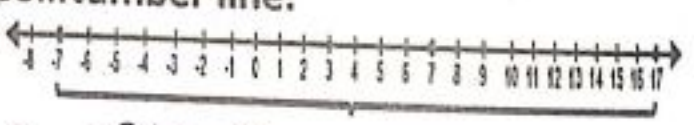
c. **+8 to +14**

Sol.Number line:



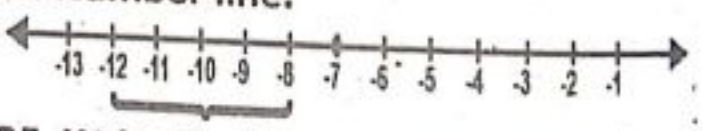
d. **– 7 to +17**

Sol.Number line:



e. **– 8 to – 12**

Sol.Number line:



**Q5. Write the integers between the following.**

a. **– 5 and + 5**

Sol. Integers between – 5 and + 5 are:

$-4, -3, -2, -1, 0, +1, +2, +3, +4$

b. **– 6 and + 8**

Sol. Integers between – 6 and + 8 are:

$-5, -4, -3, -2, -1, 0, +1, +2, +3, +4, +5, +6, +7$

c. **– 11 and +17**

Sol. Integers between – 11 and +17 are:

$-10,-9,-8,-7,-6,-5,-4,-3,$

$-2,-1,0,+1,+2,+3,+4,+5,+6,$

$+7,+8,+9,+10,+11,+12,+13,$

$+14,+15,+16$

**d. – 19 and + 20**

Sol. Integers between – 19 and + 20 are:

$-18,-17,-16,-15,-14,-13,$

$-12,-11,-10,-9,-8,-7,-6,$

$-5,-4,-3,-2,-1,0,+1,+2,$

$+3,+4,+5,+6,+7,+8,+9,+10,$

$+11,+12,+13,+14,+15,+16,$

$+17,+18,+19$

**Q6. Arrange the following integers in ascending and descending order.**

**a.** $-6,-3,-1,0,5,7$

Sol. Ascending order:

$-6,-3,-1,0,5,7$

Descending order:

$7,5,0,-1,-3,-6$

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

Sol. Ascending order:

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

Descending order:

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

**c.** $-23,-56,-13,0,+14,+15,+23$

Sol. Ascending order:

$-56,-23,-13,0,+14,+15,+23$

Descending order:

$+23,+15,+14,0,-13,-23,-56$

**d.** $-12,-16,-11,+10,+25,+34$

Sol. Ascending order:

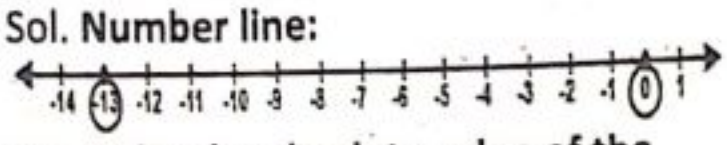
$-16,-12,-11,+10,+25,+34$

Descending order:

$+34,+25,+10,-11,-12,-16$

**Q7. Represent the integers greater than – 13 to 0 on a number line.**

Sol. **Number line:**




**Q8. Write the absolute value of the following.**

**a. – 11**

Sol. $|-11|=11$

**b. + 45**

Sol. $|+45|=45$

**c. – 99**

Sol. $|-99|=99$

**d. + 123**

Sol. $|+123|=123$

**e. – 88**

Sol. $|-88|=88$

**f. – 100**

Sol. $|-100|=100$

**Q9. Arrange the absolute or numerical value of the following integers in ascending order and descending order.**

**a.** $+16,+8,0,+2,+7,+19$

Sol. Ascending order:

0, 2, 7, 8, 16, 19

Descending order:

19, 16, 8, 7, 2, 0

$+17,+11,-3,+8,0,+23$

Sol. Ascending order:

0, 3, 8, 11, 17, 23

Descending order:

23, 17, 11, 8, 3, 0

**c.** $-17,0,-16,-4,-1,+4$

Sol. Ascending order:

0, 1, 4, 16, 17

Descending order:

17, 16, 4, 1, 0

**d.** $-18,-3,+4,+18,+19,-9$

Sol. Ascending order:

3, 4, 9, 18, 19

Descending order:

19, 18, 9, 4, 3

**e.** $-21,+5,+16,-5,-8,+5,+77$

Sol. Ascending order:

5, 8, 16, 21, 77

Descending order:

77, 21, 16, 8, 5

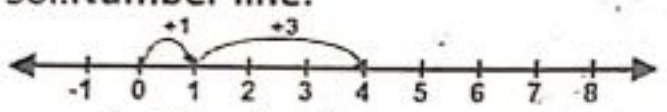
## Unit # 3
## Laws of Integers and Order of Operations

### Exercise – 3.1

**Q1. Represent the sum of the integers on a number line.**

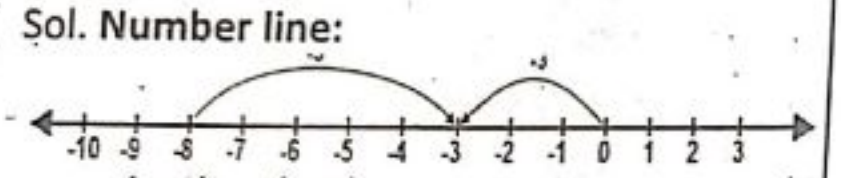
a. $(+1)+(+3)$

Sol. Number line:



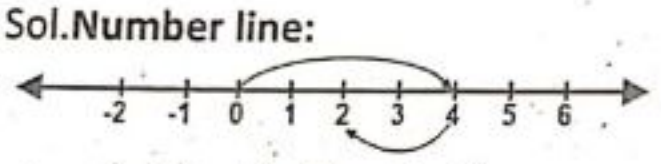

b. $(-3)+(-5)$

Sol. Number line:



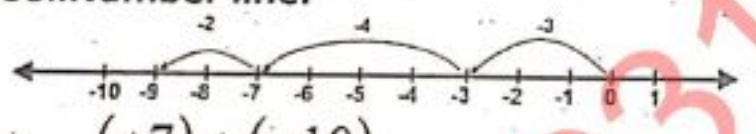

c. $(+4)-(+2)$

Sol. Number line:



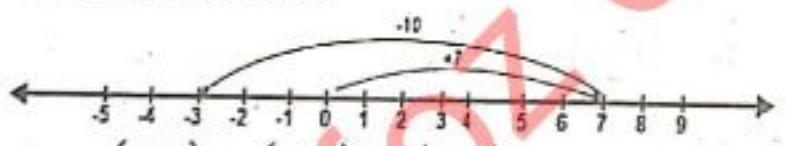

d. $(-3)+(-4)+(-2)$

Sol. Number line:



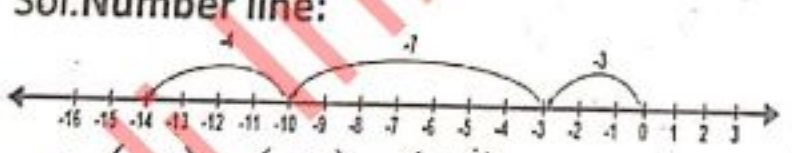

e. $(+7)+(-10)$

Sol. Number line:



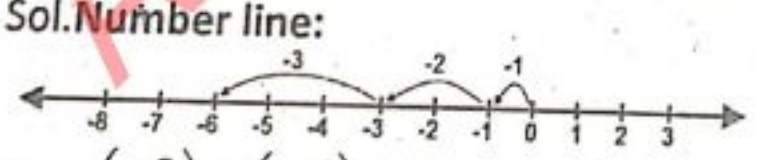

f. $(-3)+(-7)+(-4)$

Sol. Number line:



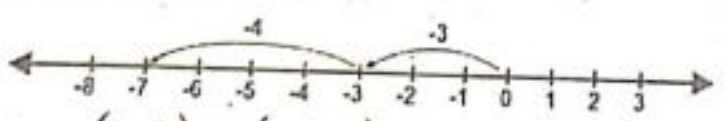

g. $(-1)+(-2)+(-3)$

Sol. Number line:



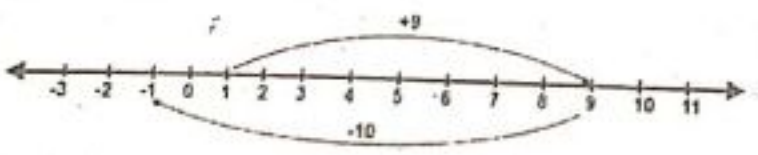

h. $(-3)+(-4)$

Sol. Number line:




i. $(+9)+(-10)$

Sol. Number line:




**Q2. Solve the following.**

a. $(+9)-(+5)$

Sol. $+9-5=+4$ *Ans.*

b. $(-4)+(-7)$

Sol. $(-4)+(-7)=-11$ *Ans.*

c. $(+4)-(+6)$

Sol. $+4-6=-2$ *Ans.*

d. $(-9)+(-8)+(-2)$

Sol. $-9-8-2=-19$ *Ans.*

e. $(+10)-(-2)$

Sol. $+10+2=+12$ *Ans*

f. $(-2)+(-5)+(+3)$

Sol. $-2-5+3=-4$ *Ans.*

g. $(-5)+(-2)+(-7)$

Sol. $-5-2-7=-14$ *Ans.*

h. $(+3)-(+2)$

Sol. $+3-2=+1$ *Ans.*

i. $(+6)-(+4)$

Sol. $+6-4=+2$ *Ans.*

j. $(-4)+(-6)+(-8)$

Sol. $-4-6-8=-18$ *Ans.*

k. $(+23)+(-2)+(-34)$

Sol. $+23-2-34=-13$ *Ans.*

l. $(-7)+(+6)$

Sol. $-7+6=-1$ *Ans.*

**Q3. Write the missing integers in the given.**

a. $(+11)+(+3)=\_\_$

Sol. $(+11)+(+3)=+14$

b. $(-4)+\_\_=(-7)$

Sol. $(-4)+(-3)=(-7)$

c. $\_\_\_\_-(+4)=(-7)$

Sol. $(-3)-(+4)=(-7)$

d. $(-9)+\_\_+(-2)=-16$

Sol. $(-9)+(-5)+(-2)=-16$

e. $\_\_\_\_-(-3)=+5$

Sol. $(+2)-(-3)=+5$

f. $(-1)+(-3)+(-7)=\_$

Sol. $(-1)+(-3)+(-7)=-11$

g. $(-5)+(-7)+(+2)=\_\_\_$

Sol. $(-5)+(-7)+(+2)=(-10)$

h. $(-5)+\_\_\_\_+(-9)=-16$

Sol. $(-5)+(-2)+(-9)=-16$

**Q4. The difference of two integers is +34. If minuend is – 23. Find the subtrahend.**

Sol. Difference = + 34

Minuend = – 23

Subtrahend =?

As minuend – subtrahend = difference

So, $(-23)-\_\_\_\_=+34$

$\Rightarrow(-23)-(-57)=+34$

**Q5. An elevator goes down 5 floors from the ground floor. Then it goes up 2 floors. What floor is the elevator on now?**

Sol. Elevator goes down = – 5

Elevator goes up = +2

Now $(-5)+2=-3$

Elevator is now 3 floors below the ground floor.

**Q6. The temperature in the night was $-10^0$ C. if the temperature rises $4^0$ C in the morning. What is the new temperature?**

Sol. Temperature in night = $-10^0 C$

Temperature in morning = $+4^0 C$

New temperature =

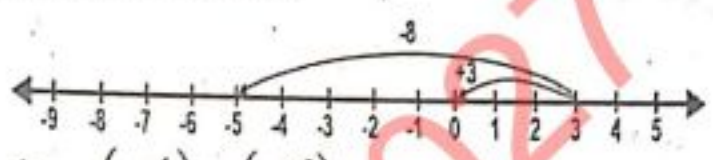
$-10^0 C+4^0 C=-6^0 C$ Ans.

**Exercise – 3.2**

**Q1. Represent the difference of the digits on number line.**

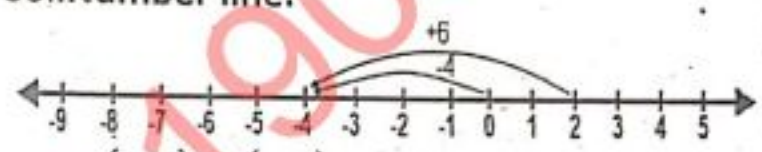
a. $(+3)-(+8)$

Sol. Number line:



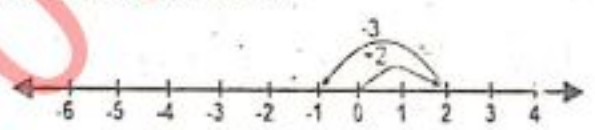

b. $(-4)-(-6)$

Sol. Number line:



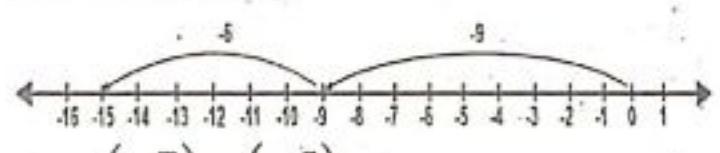

c. $(+2)-(+3)$

Sol. Number line:



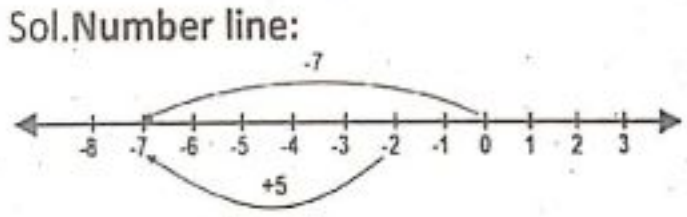

d. $(-9)-(+6)$

Sol. Number line:



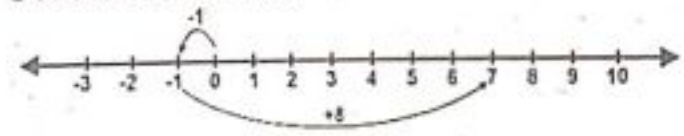

e. $(-7)-(-5)$

Sol. Number line:



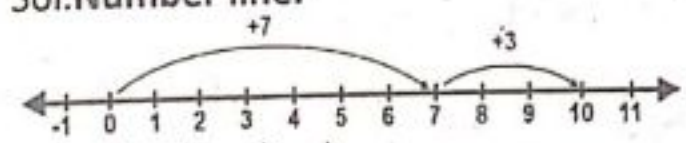

f. $(-1)-(-8)$

Sol. Number line:



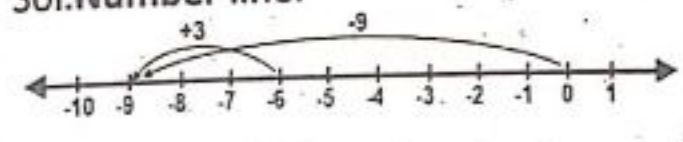

g. $(+7)-(-3)$

Sol. Number line:



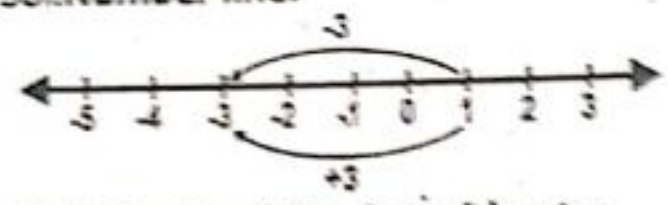

h. $(-9)-(-3)$

Sol. Number line:



i. $(-3)-(-3)$

Sol. Number line:




**Q2. Solve the following without a number line.**

a. $(+4)-(+18)$

Sol. $(+4)-(+18)$

$=+4-18=-14$ Ans.

b. $(-8)-(-3)$

Sol. $(-8)-(-3)=-8+3=-5$ Ans

c. $(+5)-(+7)$

Sol. $(+5)-(+7)=+5-7=-2$ Ans.

d. $(-11)-(-5)$

Sol. $(-11)-(-5)=-11+5=-6$ Ans.

e. $(-3)-(-2)$

Sol. $(-3)-(-2)=-3+2=-1$ Ans.

f. $(-5)-(-4)$

Sol. $(-5)-(-4)=-5+4=-1$ Ans.

g. $(-6)-(-4)$

Sol. $(-6)-(-4)=-6+4=-2$ Ans.

h. $(-7)-(-3)$

Sol. $(-7)-(-3)=-7+3=-4$ Ans.

i. $(-4)-(+2)$

Sol. $(-4)-(+2)=-4-2=-6$ Ans.

j. $(+7)-(-8)$

Sol. $(+7)-(-8)=+7+8=+15$ Ans.

k. $(-9)-(+2)$

Sol. $(-9)-(+2)=-9-2=-11$ Ans.

l. $(+6)-(+8)$

Sol. $(+6)-(+8)=+6-8=-2$ Ans.

**Q3. Write the missing integers in the given.**

a. $(+3)-(+8)=$ _____

Sol. $(+3)-(+8)=\underline{(-5)}$

b. $(-3)-$ _____ $=(-2)$

Sol. $(-3)-\underline{(-1)}=(-2)$

c. _____ $-(+5)=(-9)$

Sol. $\underline{(-4)}-(+5)=(-9)$

d. $(-8)-$ _____ $=(-3)$

Sol. $(-8)-\underline{(-5)}=(-3)$

e. _____ $-(-8)=+7$

Sol. $\underline{(-1)}-(-8)=+7$

f. $(-9)-(-5)-(-2)=$ __

Sol. $(-9)-(-5)-(-2)=\underline{(-2)}$

**Q4. The sum of two integers is +54. One of them is – 11. Find the other.**

Sol. In mathematical form

$(-11)+$ _____ $=+54$

$(-11)+\underline{65}=+54$

**Q5. A place is 213 m above sea level and another is 114 m below sea level. What is the distance between the two places?**

Sol. Distance of place A = +213

Distance of place B = −114

Distance between them =

$(+213)-(-114)$

$=+213+114=327$ Ans.

**Q6. Two cars started from the same point. First car went towards the east and covered 44 km in an hour. The**

second car went towards the west and covered 62 km in 1 hour. Find the distance between the two cars after an hour?

Sol. Distance of 1st car = +44 km

Distance of 2nd car = $-62$ km

Distance between the two cars =

$(+44)-(-62)$

$= +44+62 = +106$ km.

## Exercise – 3.3

**Q1. Use laws of addition of integers and complete the following.**

a. $(-3)+5 = \_\_+(-3)$

Sol. $(-3)+5 = \underline{(5)}+(-3)$

b. $7+(-4) = -4+\_\_$

Sol. $7+(-4) = -4+\underline{7}$

c. $(-38)+(-17) = \_\_+(-38)$

Sol. $(-38)+(-17) = \underline{(-17)}+(-38)$

d. $\_\_+(-8) = -8+(-16)$

Sol. $\underline{(-16)}+(-8) = -8+(-16)$

e. $\{4+(-25)\}+5 = 4+(\_+5)$

Sol. $\{4+(-25)\}+5 = 4+(\underline{(-25)}+5)$

f. $(84+43)+(-9) = \_\_+\{43+(-9)\}$

Sol. $(84+43)+(-9) = \underline{84}+\{43+(-9)\}$

g. $48+(\_\_\_+25) = (48+2)+25$

Sol. $48+(\underline{2}+25) = (48+2)+25$

h. $38+(48+\_\_\_) = (38+48)+12$

Sol. $38+(48+\underline{12}) = (38+48)+12$

**Q2. Which of the following are true?**

a. $(-32)+6 = 6+(-32)$

Sol. $(-32)+6 = 6+(-32)$ **True.**

b. $18+(-4) = -4+(-18)$

Sol. $18+(-4) = -4+(-18)$ **True**

c. $(-38)+47 = 47\times(-38)$

Sol. $(-38)+47 = 47\times(-38)$ **False**

d. $86+(-8) = (-8)+86$

Sol. $86+(-8) = (-8)+86$ **True**

e. $(-7+4)+6 = 7+(4+6)$

Sol. $(-7+4)+6 = 7+(4+6)$ **False**

f. $(44+93)+(-96) = 44+\{93-(-96)\}$

Sol. $(44+93)+(-96) = 44+\{93-(-96)\}$ False

g. $38+\{98+(-86)\} = (38+98)+(-86)$

Sol. $38+\{98+(-86)\} = (38+98)+(-86)$ True

h. $79+\{(-63)+(-86)\} = (79-63)-(-86)$

Sol. $79+\{(-63)+(-86)\} = (79-63)-(-86)$ False

**Q3. Verify the Commutative law for the following.**

a. $-6, +8$

Sol. Commutative law

$(-6)+8 = 8+(-6)$

| LHS | RHS |
|---|---|
| $(-6)+8$ | $8+(-6)$ |
| +2 | +2 |

LHS=RHS

$(-6)+8 = 8+(-6)$ **Verified.**

b. $+9, +4$

Sol. Commutative law

$+9+4 = +4+9$

| LHS | RHS |
|---|---|
| $+9+4$ | $+4+9$ |
| +13 | +13 |

LHS=RHS

$+9+4 = +4+9$ **Verified.**

c. $-7, -3$

Sol. Commutative law

$(-7)+(-3) = (-3)+(-7)$

| LHS | RHS |
|---|---|

| $(-7)+(-3)$ | $(-3+(-7))$ |
|---|---|
| $-7-3$ | $-3-7$ |
| $-10$ | $-10$ |

LHS=RHS

$(-7)+(-3)=(-3)+(-7)$ **Verified.**

**d.** $-4, +16$

Sol. Commutative law

$$(-4)+(+16)=(+16)+(-4)$$

| LHS | RHS |
|---|---|
| $(-4)+(+16)$ | $+16+(-4)$ |
| $-4+16$ | $+16-4$ |
| $+12$ | $+12$ |

LHS=RHS

$(-4)+(+16)=(+16)+(-4)$

**Verified.**

**e.** $3, -43$

Sol. Commutative law

$$3+(-43)=(-43)+3$$

| LHS | RHS |
|---|---|
| $3+(-43)$ | $(-43)+3$ |
| $3-43$ | $-43+3$ |
| $-40$ | $-40$ |

LHS=RHS

$3+(-43)=(-43)+3$ **Verified.**

**f.** $-8, +9$

Sol. Commutative law

$$(-8)+9=9+(-8)$$

| LHS | RHS |
|---|---|
| $(-8)+9$ | $9+(-8)$ |
| $-8+9$ | $9-8$ |
| $+1$ | $+1$ |

LHS=RHS

$(-8)+9=9+(-8)$ **Verified.**

**Q4. Verify the Associative law for the following.**

**a.** $8, -6, -9$

Sol. Associative law

$8+[(-6)+(-9)]=[8+(-6)]+(-9)$

| LHS | RHS |
|---|---|
| $8+[(-6)+(-9)]$ | $[8+(-6)]+(-9)$ |
| $8+[-6-9]$ | $[8-6]+(-9)$ |
| $8+(-15)$ | $2+(-9)$ |
| $8-15$ | $2-9$ |
| $-7$ | $-7$ |

LHS=RHS

$8+[(-6)+(-9)]=[8+(-6)]+(-9)$

**Verified.**

**b.** $15, +5, -38$

Sol.Associative law

$15+[5+(-38)]=[15+5]+(-38)$

| LHS | RHS |
|---|---|
| $15+[5+(-38)]$ | $[15+5]+(-38)$ |
| $15+[5-38]$ | $20+(-38)$ |
| $15+(-33)$ | $20+(-38)$ |
| $15-33$ | $20-38$ |
| $-18$ | $-18$ |

LHS=RHS

$15+[5+(-38)]=[15+5]+(-38)$

Verified.

**c.** $-34, 37, -48$

Sol.Associative law

$(-34)+[37+(-48)]$

$=[(-34)+37]+(-48)$

| LHS | RHS |
|---|---|
| $(-34)+[37+(-48)]$ | $[(-34)+37]+(-48)$ |
| $(-34)+[37-48]$ | $[-34+37]+(-48)$ |
| $(-34)+(-11)$ | $3+(-48)$ |
| $-34-11$ | $3-48$ |
| $-45$ | $-45$ |

LHS=RHS

$(-34)+[37+(-48)]=[(-34)+37]+(-48)$

**Verified.**

**d.** $-39, 18, 50$

Sol.Associative law

$(-39)+[18+50]=[(-39)+18]+50$

| LHS | RHS |
|---|---|
| $(-39)+[18+50]$ | $[(-39)+18]+50$ |
| $(-39)+68$ | $[-39+18]+50$ |
| $-39+68$ | $(-21)+50$ |
| $+29$ | $-21+50$ |
| $+29$ | $+29$ |

LHS=RHS

$(-39)+[18+50]=[(-39)+18]+50$

**Verified.**

**e.** $-16, -21, 98$

Sol.Associative law

$(-16)+[-21+98]=$

$[(-16)+(-21)]+(98)$

| LHS | RHS |
|---|---|
| $(-16)+[-21+98]$ | $[(-15)+(-21)]+98$ |
| $(-16)+77$ | $[-16-21]+98$ |
| $+61$ | $(-37)+98$ |
| $+61$ | $+61$ |

$(-16)+[-21+98]=[(-16)+(-21)]+(98)$

**Verified.**

**f.** $-48, -96, -83$

Sol.Associative law

$(-48)+[(-96)+(-83)]=$

$[(-48)+(-96)]+(-83)$

| LHS | RHS |
|---|---|
| $(-48)+[(-96)+(-83)]$ | $[(-48)+(-96)]+(-83)$ |
| $(-48)+[-96-83]$ | $[-48-96]+(-83)$ |
| $(-48)+(-179)$ | $(-144)+(-83)$ |
| $-48-179$ | $-144-83$ |
| $-227$ | $-227$ |

LHS=RHS

$(-48)+[(-96)+(-83)]=$

$[(-48)+(-96)]+(-83)$

**Verified.**

**Q5. Verify the following.**

**a.** $(-2)+5=5+(-2)$

Sol. $(-2)+5=5+(-2)$

$-2+5=5-2$

$3=3$ **Verified.**

**b.** $11+(-3)=-3+11$

Sol. $11+(-3)=-3+11$

$11-3=-3+11$

$8=8$ **Verified**

**c.** $(-8)+(-7)=(-7)+(-8)$

Sol. $(-8)+(-7)=(-7)+(-8)$

$-8-7=-7-8$

$-15=-15$ **Verified**

**d.** $7+(-8)=(-8)+7$

Sol. $7+(-8)=(-8)+7$

$7-8=-8+7$

$-1=-1$ **Verified**

**e.** $\{4+(-7)\}+3=4+(-7+3)$

Sol. $\{4+(-7)\}+3=4+(-7+3)$

$\{4-7\}+3=4+(-4)$

$-3+3=4-4$

$0=0$ **Verified**

**f.** $\{(-14)+9\}+(-6)=-14+\{9+(-6)\}$

Sol. $\{(-14)+9\}+(-6)=-14+\{9+(-6)\}$

$\{-14+9\}-6=-14+\{9-6\}$

$-5-6=-14+3$

$-11=-11$ **Verified**

**g.** $(-18)+\{8+(-4)\}=\{(-18)+8\}+(-4)$

Sol. $(-18)+\{8+(-4)\}=\{(-18)+8\}+(-4)$

$-18+\{8-4\}=\{-18+8\}-4$

$-18+4=-10-4$

$-14=-14$ **Verified**

**h.** $50+\{(-13)+(-16)\}=\{50+(-13)\}+(-16)$

Sol. $50+\{(-13)+(-16)\}=\{50+(-13)\}+(-16)$

$$50+\{-13-16\}=\{50-13\}-16$$

$$50+(-29)=37-16$$

$$21=21 \text{ Verified.}$$

## Exercise – 3.4

**Q1. Find the product of the following without using a number line.**

a. $+2, +5$

Sol.Product of $+2, +5$:

$$\Rightarrow (+2)(+5)=+10 \text{ Ans.}$$

b. $-4, +7$

Sol.Product of $-4, +7$:

$$\Rightarrow (-4)(+7)=-28 \text{ Ans.}$$

c. $+9, -2$

Sol.Product of $+9, -2$:

$$\Rightarrow (+9)(-2)=-18 \text{ Ans.}$$

d. $+6, +5$

Sol.Product of $+6, +5$:

$$\Rightarrow (+6)(+5)=+30 \text{ Ans.}$$

e. $+13, -10$

Sol.Product of $+13, -10$:

$$\Rightarrow (+13)(-10)=-130 \text{ Ans.}$$

f. $+14, -20$

Sol.Product of $+14, -20$:

$$\Rightarrow (+14)(-20)=-280 \text{ Ans.}$$

g. $-3, +22$

Sol.Product of $-3, +22$:

$$\Rightarrow (-3)(+22)=-66 \text{ Ans.}$$

h. $-70, +21$

Sol.Product of $-70, +21$:

$$\Rightarrow (-70)(+21)=-1470 \text{ Ans.}$$

i. $-11, -22$

Sol.Product of $-11, -22$:

$$\Rightarrow (-11)(-22)=+242 \text{ Ans.}$$

j. $+40, -29$

Sol.Product of $+40, -29$:

$$\Rightarrow (+40)(-29)=-1160 \text{ Ans.}$$

k. $-4, +5$

Sol.Product of $-4, +5$:

$$\Rightarrow (-4)(+5)=-20 \text{ Ans.}$$

l. $-10, +10$

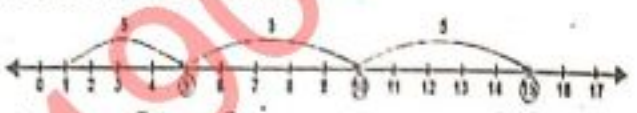
Sol.Product of $-10, +10$:

$$\Rightarrow (-10)(+10)=-100 \text{ Ans.}$$

**Q2. Find the product of the following using a number line.**

a. $+5, +3$

Sol.Number line:



b. $-3, -3$

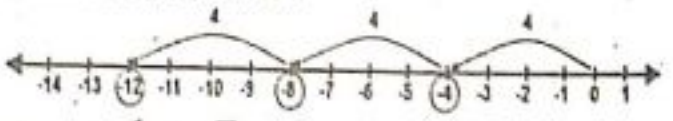
Sol.The number line of the product of two negative number cannot be drawn.

c. $+2, -5$

Sol.Number line:

d. $-4, +3$

Sol.Number line:

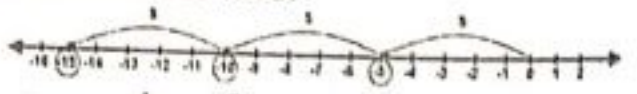


e. $-1, -7$

Sol.The number line of the product of two negative number cannot be drawn.

f. $+3, -5$

Sol.Number line:

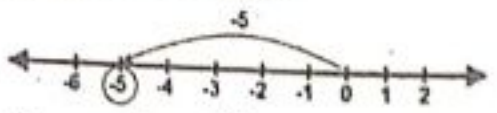


g. $-4, -2$

Sol.The number line of the product of two negative number cannot be drawn.

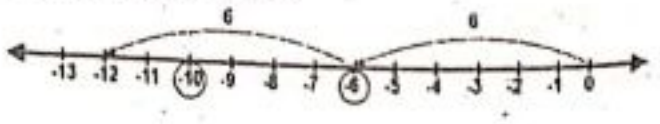
h. $+1, -5$

Sol.Number line:



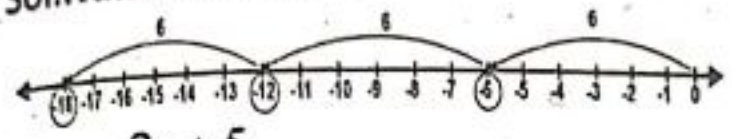
i. $-2, +6$

Sol.Number line:



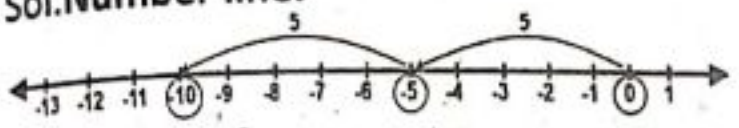
j. $-3, +6$

Sol. Number line:



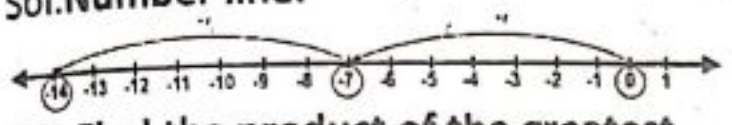
k. $-2, +5$

Sol. Number line:



l. $-7, +2$

Sol. Number line:



**Q3. Find the product of the greatest negative integer and the smallest positive integer.**

Sol. Greatest negative integer = $-1$

Smallest positive integer = + 1

Their product = $(-1)\times(+1)$

$$-1\times 1=-1 Ans.$$

**Q4. Find the product of – 100 and + 100.**

Sol. Product of – 100 and + 100

$$(-100)\times(+100)=-(100\times 100)$$

$$=-10,000 Ans.$$

## Exercise – 3 .5

**Q1. Verify the Commutative Law under multiplication for the following.**

a. $-2, +6$

Sol. Commutative law

$$(-2)\times 6=6\times(-2)$$

| LHS | RHS |
|---|---|
| $(-2)\times 6$ | $6\times(-2)$ |
| $-12$ | $-12$ |

LHS=RHS

$(-2)\times 6=6\times(-2)$ **Verified.**

b. $8, -4$

Sol. Commutative law

$$(-4)\times 8=8\times(-4)$$

| LHS | RHS |
|---|---|
| $(-4)\times 8$ | $8\times(-4)$ |
| $-32$ | $-32$ |

LHS=RHS

$(-4)\times 8=8\times(-4)$ **Verified.**

c. $-6, 3$

Sol. Commutative law

$$(-6)\times 3=3\times(-6)$$

| LHS | RHS |
|---|---|
| $(-6)\times 3$ | $3\times(-6)$ |
| $-18$ | $-18$ |

LHS=RHS

$(-6)\times 3=3\times(-6)$ **Verified.**

d. $-38, -94$

Sol. Commutative law

$$(-94)\times(-38)=(-38)\times(-94)$$

| LHS | RHS |
|---|---|
| $(-94)\times(-38)$ | $(-38)\times(-94)$ |
| $+3572$ | $+3572$ |

LHS=RHS

$(-94)\times(-38)=(-38)\times(-94)$ **Verified.**

e. $-95, 34$

Sol. Commutative law

$$(-95)\times 34=34\times(-95)$$

| LHS | RHS |
|---|---|
| $(-95)\times 34$ | $34\times(-95)$ |
| $-3230$ | $-3230$ |

LHS=RHS

$(-95)\times 34=34\times(-95)$ **Verified.**

f. $48, -82$

Sol. Commutative law

$$(-82)\times 48=48\times(-82)$$

| LHS | RHS |
|---|---|
| $(-82)\times 48$ | $48\times(-82)$ |
| $-3936$ | $-3936$ |

LHS=RHS

$(-82)\times 48=48\times(-82)$ **Verified.**

**Q2. Verify the Associative Law under multiplication for the following.**

**a.** $-4, +7, -8$

Sol. Associative law

$(-4)\times[7\times(-8)]=[(-4)\times 7]\times(-8)$

| LHS | RHS |
|---|---|
| $(-4)\times[7\times(-8)]$ | $[(-4)\times 7]\times(-8)$ |
| $(-4)\times(-56)$ | $(-28)\times(-8)$ |
| $+224$ | $+224$ |

LHS=RHS

$(-4)\times[7\times(-8)]=[(-4)\times 7]\times(-8)$

**Verified.**

**b.** $-3, -2, 7$

Sol.Associative law

$(-3)\times[(-2)\times 7]=[(-3)\times(-2)]\times 7$

| LHS | RHS |
|---|---|
| $(-3)\times[(-2)\times 7]$ | $[(-3)\times(-2)]\times 7$ |
| $(-3)\times(-14)$ | $(+6)\times 7$ |
| $+42$ | $+42$ |

LHS=RHS

$(-3)\times[(-2)\times 7]=[(-3)\times(-2)]\times 7$

**Verified.**

**c.** $-13, 52, -68$

Sol.Associative law

$(-13)\times[52\times(-68)]=$

$[(-13)\times 52]\times(-68)$

| LHS | RHS |
|---|---|
| $(-13)\times[52\times(-68)]$ | $[(-13)\times 52]\times(-68)$ |
| $(-13)\times(-3536)$ | $(-676)\times(-68)$ |
| $+45968$ | $+45968$ |

LHS=RHS

$(-13)\times[52\times(-68)]=[(-13)\times 52]\times(-68)$

Verified.

**d.** $-85, -44, 76$

Sol.Associative law

$(-85)\times[(-44)\times 76]=[(-85)\times(-44)]\times 76$

| LHS | RHS |
|---|---|
| $(-85)\times[(-44)\times 76]$ | $[(-85)\times(-44)]\times 76$ |
| $(-85)\times(-3344)$ | $(+3740)\times 76$ |
| $+284,240$ | $+284,240$ |

LHS=RHS

$(-85)\times[(-44)\times 76]=[(-85)\times(-44)]\times 76$

**Verified.**

**e.** $-63, -93, -81$

Sol.Associative law

$(-63)\times[(-93)\times(-81)]=[(-63)\times(-93)]\times(-81)$

| LHS | RHS |
|---|---|
| $(-63)\times[(-93)\times(-81)]$ | $[(-63)\times(-93)]\times(-81)$ |
| $(-63)\times(+7533)$ | $(+5859)\times(-81)$ |
| $-474,579$ | $-474,579$ |

LHS=RHS

$(-63)\times[(-93)\times(-81)]=[(-63)\times(-93)]\times(-81)$

**Verified.**

**f.** $15, -38, -39$

Sol.Associative law

$15\times[(-38)\times(-39)]=[15\times(-38)]\times(-39)$

| LHS | RHS |
|---|---|
| $15\times[(-38)\times(-39)]$ | $[15\times(-38)]\times(-39)$ |
| $15\times(+1482)$ | $(-570)\times(-39)$ |
| $+22230$ | $+22230$ |

LHS=RHS

$15\times[(-38)\times(-39)]=[15\times(-38)]\times(-39)$

**Verified.**

**Q3. Write the multiplicative inverse of each of the following.**

**a.** $-3$

Sol. Multiplicative inverse of $-3$ is $-\frac{1}{3}$

**b.** $-2$

Sol.Multiplicative inverse of $-2$ is $-\frac{1}{2}$

**c.** $+7$

Sol.Multiplicative inverse of $+7$ is $+\frac{1}{7}$

**d.** $+100$

Sol.Multiplicative inverse of $+100$ is $+\frac{1}{100}$

**e.** $-77$

Sol.Multiplicative inverse of $-77$ is

$$-\frac{1}{77}$$

f. **$-243$**

Sol.Multiplicative inverse of $-243$ is

$$-\frac{1}{243}$$

g. **$-48$**

Sol.Multiplicative inverse of $-48$ is

$$-\frac{1}{48}$$

h. **$-55$**

Sol.Multiplicative inverse of $-55$ is

$$-\frac{1}{55}$$

i. **$+60$**

Sol.Multiplicative inverse of $+60$ is

$$+\frac{1}{60}$$

j. $\dfrac{1}{-2}$

Sol.Multiplicative inverse of $\dfrac{1}{-2}$ is $-2$

k. $\dfrac{3}{2}$

Sol.Multiplicative inverse of $\dfrac{3}{2}$ is $\dfrac{2}{3}$

l. $\dfrac{-2}{7}$

Sol.Multiplicative inverse of $\dfrac{-2}{7}$ is $\dfrac{7}{-2}$

**Q4. Verify the Distributive Law.**

a. $-4\times[1+(-3)]=(-4\times1)+[-4\times(-3)]$

Sol. Taking LHS = $-4\times[1+(-3)]$

$$\Rightarrow -4\times[1-3]$$
$$\Rightarrow -4\times(-2)$$
$$\Rightarrow +8$$

Taking RHS = $(-4\times1)+[-4\times(-3)]$

$$\Rightarrow -4+(+12)$$
$$\Rightarrow -4+12=+8$$

LHS = RHS

Thus Distributive law is verified.

b. $-4\times[(-5)+1]=[(-4)\times(-5)]+[(-4)\times1]$

Sol. Taking LHS = $-4\times[(-5)+1]$

$$\Rightarrow -4\times[-5+1]$$
$$\Rightarrow -4\times(-4)=+16$$

Taking RHS = $[(-4)\times(-5)]+[(-4)\times1]$

$$\Rightarrow (+20)+(-4)$$
$$\Rightarrow +20-4=+16$$

LHS = RHS

Thus Distributive law is verified.

c. $[(-5)-2]\times(-2)=[(-5)\times(-2)]-[2\times(-2)]$

Sol. Taking LHS = $[(-5)-2]\times(-2)$

$$\Rightarrow (-7)\times(-2)$$
$$\Rightarrow +14$$

Taking RHS = $[(-5)\times(-2)]-[2\times(-2)]$

$$(+10)-(-4)$$
$$\Rightarrow +10+4=+14$$

LHS = RHS

Thus Distributive law is verified.

d. $-8\times[1+(-3)]=(-8\times1)+[-8\times(-3)]$

Sol. Taking LHS = $-8\times[1+(-3)]$

$$\Rightarrow -8\times[1-3]$$
$$\Rightarrow -8\times(-2)=+16$$

Taking RHS = $(-8\times1)+[-8\times(-3)]$

$$\Rightarrow (-8)+(+24)$$
$$\Rightarrow -8+24=+16$$

LHS = RHS

Thus Distributive law is verified.

e. $[(-6)+(-1)]\times(-4) =$

$[(-6)\times(-4)]+[(-1)\times(-4)]$

Sol. Taking LHS =

$[(-6)+(-1)]\times(-4)$

$\Rightarrow (-7)\times(-4)$

$\Rightarrow +28$

Taking RHS =

$[(-6)\times(-4)]+[(-1)\times(-4)]$

$\Rightarrow (+24)+(+4)$

$\Rightarrow +28$

LHS = RHS

Thus Distributive law is verified.

f. $-2\times[1+(-3)]=(-2\times1)+[-2\times(-3)]$

Sol. Taking LHS = $-2\times[1+(-3)]$

$\Rightarrow -2\times[1-3]$

$\Rightarrow -2\times(-2)$

$\Rightarrow +4$

Taking RHS = $(-2\times1)+[-2\times(-3)]$

$\Rightarrow (-2)+(+6)$

$\Rightarrow -2+6=+4$

LHS = RHS

Thus Distributive law is verified.

g. $[(-7)-1]\times(-3) =$

$[(-7)\times(-3)]-[1\times(-3)]$

Sol. Taking LHS = $[(-7)-1]\times(-3)$

$\Rightarrow (-8)\times(-3)$

$\Rightarrow +24$

Taking RHS =

$[(-7)\times(-3)]-[1\times(-3)]$

$\Rightarrow (+21)-(-3)$

$\Rightarrow +21+3=+24$

LHS = RHS

Thus Distributive law is verified.

h. $-4\times[7+(-8)]=(-4\times7)+[-4\times(-8)]$

Sol. Taking LHS = $-4\times[7+(-8)]$

$\Rightarrow -4\times[7-8]$

$\Rightarrow -4\times(-1)=+4$

Taking RHS = $(-4\times7)+[-4\times(-8)]$

$\Rightarrow (-28)+(+32)$

$\Rightarrow -28+32=+4$

LHS = RHS

Thus Distributive law is verified.

## Exercise – 3 .6

**Q1. Solve the following.**

a. $(+45)\div(+5)$

Sol.Take absolute value and divide

$(+45)\div(+5)=|+45|\div|+5|$

$=45\div5=9$

As both numbers are positive so the answer will be positive.

$(+45)\div(+5)=+9\,Ans.$

b. $(-63)\div(-9)$

Sol.Take absolute value and divide

$(-63)\div(-9)=|-63|\div|-9|$

$=63\div9=7$

As both numbers are negative so the answer will be positive.

$(-63)\div(-9)=+7\,Ans.$

c. $(-80)\div(+4)$

Sol.Take absolute value and divide

$(-80)\div(+4)=|-80|\div|+4|$

$=80\div4=20$ As both numbers have different signs so the answer will be negative.

$(-80)\div(+4)=-20\,Ans.$

d. $(+44)\div(-11)$

Sol.Take absolute value and divide

$$(+44)\div(-11)=|+44|\div|-11|$$

$$=44\div11=4$$ As

both numbers have different signs so the answer will be negative.

$$(+44)\div(-11)=-4\,Ans.$$

e. $(-60)\div(+10)$

Sol.Take absolute value and divide

$$(-60)\div(+10)=|-60|\div|+10|$$

$$=60\div10=6$$ As

both numbers have different signs so the answer will be negative.

$$(-60)\div(+10)=-6\,Ans.$$

f. $(-144)\div(+12)$

Sol.Take absolute value and divide

$$(-144)\div(+12)=|-144|\div|+12|$$

$$=144\div12=12$$ As

both numbers have different signs so the answer will be negative.

$$(-144)\div(+12)=-12\,Ans.$$

g. $(+168)\div(-8)$

Sol.Take absolute value and divide

$$(+168)\div(-8)=|+168|\div|-8|$$

$$=168\div8=21$$ As

both numbers have different signs so the answer will be negative.

$$(+168)\div(-8)=-21\,Ans.$$

h. $(+390)\div(-39)$

Sol.Take absolute value and divide

$$(+390)\div(-39)=|+390|\div|-39|$$

$$=390\div39=10$$

As both numbers have different signs so the answer will be negative.

$$(+390)\div(-39)=-10\,Ans.$$

i. $(-600)\div(-25)$

Sol.Take absolute value and divide

$$(-600)\div(-25)=|-600|\div|-25|$$

$$=600\div25=24$$

As both numbers are negative so the answer will be positive.

$$(-600)\div(-25)=+24\,Ans.$$

j. $(-85)\div(+17)$

Sol.Take absolute value and divide

$$(-85)\div(+17)=|-85|\div|+17|$$

$$=85\div17=5$$ As

both numbers have different signs so the answer will be negative.

$$(-85)\div(+17)=-5\,Ans.$$

**Q2. Solve the following.**

a. $0\div4=$ _____

Sol. $0\div4=\underline{0}$

b. $0\div10=$ _____

Sol. $0\div10=\underline{0}$

c. $0\div(-90)=$ _____

Sol. $0\div(-90)=\underline{0}$

d. $0\div(-5)=$ _____

Sol. $0\div(-5)=\underline{0}$

e. $0\div(-130)=$ _____

Sol. $0\div(-130)=\underline{0}$

f. $0\div(+300)=$ _____

Sol. $0\div(+300)=\underline{0}$

## Exercise – 3.7

**Q1. Simplify the following.**

a. $1.6+3\times7-5$

Sol. $1.6+3\times7-5$

$\Rightarrow 1.6+21-5$

$\Rightarrow 22.6-5=17.6\ Ans.$

b. $42\div2+45-22$

Sol. $42 \div 2 + 45 - 22$

$\Rightarrow 21 + 45 - 22$

$\Rightarrow 66 - 22 = 44$ *Ans.*

c. $\frac{7}{9} \times 1\frac{1}{5} \div \frac{8}{15}$

Sol. $\frac{7}{9} \times 1\frac{1}{5} \div \frac{8}{15}$

$\Rightarrow \frac{7}{9} \times \frac{6}{5} \div \frac{8}{15} \Rightarrow \frac{7}{9} \times \frac{6}{5} \times \frac{15}{8}$

$\Rightarrow \frac{7}{\cancel{9}_3} \times \frac{\cancel{6}^2}{\cancel{5}_1} \times \frac{\cancel{15}^3}{8} = \frac{7 \times \cancel{2}^1 \times \cancel{3}}{\cancel{3} \times 1 \times \cancel{8}^4}$

$\Rightarrow \frac{7}{4}$ *or* $1\frac{3}{4}$ *Ans.*

d. $\frac{15}{21} \times \frac{45}{3} - \frac{1}{15} \div \frac{3}{7}$

Sol. $\frac{15}{21} \times \frac{45}{3} - \frac{1}{15} \div \frac{3}{7}$

$\Rightarrow \frac{15}{21} \times \frac{45}{3} - \frac{1}{15} \times \frac{7}{3}$

$\Rightarrow \frac{\cancel{15}^5}{\cancel{21}_7} \times \frac{\cancel{45}^{15}}{\cancel{3}_1} - \frac{1}{15} \times \frac{7}{3}$

$\Rightarrow \frac{75}{7} - \frac{7}{45} = \frac{75 \times 45}{7 \times 45} - \frac{7 \times 7}{45 \times 7}$

$\Rightarrow \frac{3375}{315} - \frac{49}{315} = \frac{3375 - 49}{315}$

$\Rightarrow \frac{3326}{315} = 10\frac{176}{315}$ *Ans.*

e. $725 - \left[20 \times \left\{10 + 7 + \left(7 \times \overline{5-3}\right)\right\}\right]$

Sol. $725 - \left[20 \times \left\{10 + 7 + \left(7 \times \overline{5-3}\right)\right\}\right]$

$\Rightarrow 725 - \left[20 \times \left\{10 + 7 + (7 \times 2)\right\}\right]$

$\Rightarrow 725 - \left[20 \times \left\{10 + 7 + 14\right\}\right]$

$\Rightarrow 725 - [20 \times 31]$

$\Rightarrow 725 - 620 = 105$ *Ans.*

f. $7 + \left\{\frac{1}{3} + \frac{2}{12}\left(\frac{7}{4} - \frac{5}{12}\right)\right\}$

Sol. $7 + \left\{\frac{1}{3} + \frac{2}{12}\left(\frac{7}{4} - \frac{5}{12}\right)\right\}$

$\Rightarrow 7 + \left\{\frac{1}{3} + \frac{2}{12}\left(\frac{7 \times 3}{4 \times 3} - \frac{5}{12}\right)\right\}$

$\Rightarrow 7 + \left\{\frac{1}{3} + \frac{2}{12}\left(\frac{21}{12} - \frac{5}{12}\right)\right\}$

$\Rightarrow 7 + \left\{\frac{1}{3} + \frac{\cancel{2}^1}{\cancel{12}_6} \times \frac{21-5}{12}\right\}$

$\Rightarrow 7 + \left\{\frac{1}{3} + \frac{1}{\cancel{6}_3} \times \frac{\cancel{16}^{A_2}}{\cancel{12}_3}\right\}$

$\Rightarrow 7 + \left\{\frac{1}{3} + \frac{1}{3} \times \frac{2}{3}\right\} = 7 + \left\{\frac{1}{3} + \frac{2}{9}\right\}$

$\Rightarrow 7 + \left\{\frac{3}{9} + \frac{2}{9}\right\} \Rightarrow \frac{7}{1} + \frac{3+2}{9}$

$\Rightarrow \frac{7}{1} + \frac{5}{9} = \frac{63+5}{9}$

$\Rightarrow \frac{68}{9} = 7\frac{5}{9}$ **Ans.**

g. $\left\{\overline{\left(10\frac{1}{3} - \frac{2}{9}\right)} \div \frac{5}{16} \times \frac{5}{20} + \frac{1}{4}\right\}$

Sol. $\left\{\overline{\left(10\frac{1}{3} - \frac{2}{9}\right)} \div \frac{5}{16} \times \frac{5}{20} + \frac{1}{4}\right\}$

$\Rightarrow \left\{\overline{\left(\frac{31}{3} - \frac{2}{9}\right)} \times \frac{16}{5} \times \frac{5}{20} + \frac{1}{4}\right\}$

$\Rightarrow \left\{\frac{93-2}{9} \times \frac{16}{5} \times \frac{5}{20} + \frac{1}{4}\right\}$

$\Rightarrow \left\{\frac{91}{9} \times \frac{\cancel{16}^4}{\cancel{8}} \times \frac{\cancel{8}}{\cancel{20}_5} + \frac{1}{4}\right\}$

$$\Rightarrow\left\{\frac{91\times4}{9\times5}+\frac{1}{4}\right\}\Rightarrow\left\{\frac{364}{45}+\frac{1}{4}\right\}$$

$$\Rightarrow\left\{\frac{364\times4}{45\times4}+\frac{1\times45}{4\times45}\right\}$$

$$\Rightarrow\left\{\frac{1456}{180}+\frac{45}{180}\right\}\Rightarrow\frac{1456+45}{180}$$

$$\Rightarrow\frac{1501}{180}\ or\ 8\frac{61}{180}\ \textbf{Ans.}$$

h. $\frac{1}{3}-\left\{\frac{17}{4}\div\left(5\frac{1}{4}\times2\frac{1}{2}\right)\right\}$

Sol. $\frac{1}{3}-\left\{\frac{17}{4}\div\left(5\frac{1}{4}\times2\frac{1}{2}\right)\right\}$

$$\Rightarrow\frac{1}{3}-\left\{\frac{17}{4}\div\left(\frac{21}{4}\times\frac{5}{2}\right)\right\}$$

$$\Rightarrow\frac{1}{3}-\left\{\frac{17}{4}\div\frac{105}{8}\right\}$$

$$\Rightarrow\frac{1}{3}-\left\{\frac{17\times2}{4\times2}\div\frac{105}{8}\right\}$$

$$\Rightarrow\frac{1}{3}-\left\{\frac{34-105}{8}\right\}$$

$$\Rightarrow\frac{1}{3}\div\left(\frac{-71}{8}\right)$$

$$\Rightarrow\frac{1}{3}+\frac{71}{8}\Rightarrow\frac{8+213}{24}$$

$$\Rightarrow\frac{221}{24}\ or\ 9\frac{5}{24}\ Ans.$$

i. $\frac{71}{3}-\frac{21}{4}\left(\frac{1}{5}\times\frac{3}{4}\right)$

Sol. $\frac{71}{3}-\frac{21}{4}\left(\frac{1}{5}\times\frac{3}{4}\right)$

$$\Rightarrow\frac{71}{3}-\frac{21}{4}\times\frac{1}{5}\times\frac{3}{4}$$

$$\Rightarrow\frac{71}{3}-\frac{21\times1\times3}{4\times5\times4}=\frac{71}{3}-\frac{63}{80}$$

$$\Rightarrow\frac{5680-189}{240}$$

$$\Rightarrow\frac{5491}{240}\ or\ 22\frac{211}{240}\ Ans.$$

j. $\left(\frac{6}{17}\times\frac{34}{15}\right)-\frac{6}{35}\times\frac{2}{3}$

Sol. $\Rightarrow\left(\frac{\cancel{6}^{2}}{\cancel{17}_{1}}\times\frac{\cancel{34}^{2}}{\cancel{15}_{5}}\right)-\frac{\cancel{6}^{2}}{35}\times\frac{2}{\cancel{3}_{1}}$

$$\Rightarrow\frac{2\times2}{1\times5}-\frac{2\times2}{35\times1}=\frac{4}{5}-\frac{4}{35}$$

$$\Rightarrow\frac{4\times7}{5\times7}-\frac{4}{35}=\frac{28}{35}-\frac{4}{35}$$

$$\Rightarrow\frac{28-4}{35}=\frac{24}{35}\ Ans.$$

k. $\left\{\left(6\frac{1}{3}\div\frac{3}{5}\right)\times\frac{18}{9}-\frac{6}{3}\right\}$

Sol. $\left\{\left(6\frac{1}{3}\div\frac{3}{5}\right)\times\frac{18}{9}-\frac{6}{3}\right\}$

$$\Rightarrow\left\{\left(\frac{19}{3}\times\frac{5}{3}\right)\times\frac{18}{9}-\frac{6}{3}\right\}$$

$$\Rightarrow\left\{\frac{19}{3}\times\frac{5}{\cancel{3}_{1}}\times\frac{\cancel{18}^{6}}{9}-\frac{6}{3}\right\}=\frac{19\times5\times6}{3\times1\times9}-\frac{6}{3}$$

$$\Rightarrow\frac{570}{27}-\frac{6\times9}{3\times9}=\frac{570}{27}-\frac{54}{27}$$

$$\Rightarrow\frac{570-54}{27}=\frac{516}{27}$$

$$\Rightarrow19\frac{3}{27}\ or\ 19\frac{1}{9}\ Ans.$$

l. $22.46\times3\div2(7.82-2.42)+9.5\times3.4$

Sol.

$$22.46\times3\div2(7.82-2.42)+9.5\times3.4$$

$$\Rightarrow22.46\times3\div2(5.4)+9.5\times3.4$$

$$\Rightarrow22.46\times3\div10.8+9.5\times3.4$$

$\Rightarrow 22.46\times 0.27+9.5\times 3.4$

$\Rightarrow 6.238+32.3=38.538$ *Ans.*

m. $12.35+\left[5.25+3(18.43-3.66\times 5.75)\right]$

Sol.

$12.35+\left[5.25+3(18.43-3.66\times 5.75)\right]$

$\Rightarrow 12.35+\left[5.25+3(18.43-21.045)\right]$

$\Rightarrow 12.35+\left[5.25+3(-2.615)\right]$

$\Rightarrow 12.35+\left[5.25-7.845\right]$

$\Rightarrow 12.35+\left[-2.595\right]=12.35-2.595$

$\Rightarrow 9.755$ *Ans.*

**Exercise – 3.8**

**Q1. Afnan's monthly income is Rs 35,000. If he spent $\frac{2}{10}$ of his income on house rent, $\frac{3}{10}$ on food and $\frac{4}{10}$ on other expenditures, find the total amount that he saved.**

Sol. Total monthly income = 35,000

House rent = $\frac{2}{10}\times 35,000=7,000$

On food = $\frac{3}{10}\times 35,000=10,500$

Other expenditures = $\frac{4}{10}\times 35,000=14,000$

Total expenses = 7,000 + 10,500 + 14,000 = 31,500

Savings = income – expenses

Savings = 35,000 – 31,500 = 3,500 Ans.

**Q2. The length of a piece of rope is 111.9 meters. If it is divided into 6 equal pieces and 10 meter of each rope is used, find the length of remaining rope.**

Sol. Total rope = 111.9m

6 equal pieces = $111.9\div 6=18.65$ m

Each piece used = 10 meter

Remaining rope = 18.65 – 10 = 8.65 meter

8.65 meter is left in all 6 pieces.

i.e. total remaining = $8.65\times 6=51.9$ meter

**Q3. Dania bought 6 boxes of cupcakes. Each box has 12 cupcakes in it. She distributed $\frac{2}{3}$ of the cupcakes among needy children and put the remaining in 8 jars equally. How many cupcakes did she put in each jar?**

Sol. Number of boxes = 6

Cupcakes in each box = 12

Total cupcakes = $12\times 6=72$

Distributed = $\frac{2}{3}$ *of* $72$

$=\frac{2}{3}\times 72=48$

Remaining cupcakes = 72 – 48 = 24

Number of jars = 8

Cupcakes in each jar = $24\div 8=3$ *Ans.*

3 cupcakes in each jar.

**Q4. Marwa ordered 3 scarves for Rs 415 each and 2 abaya's for Rs 920 each online. There was a discount of these items and she paid half price for each item. She paid additional Rs 140 as courier charges. How much did she spend in total?**

Sol. Price of one scarf = 415

Price of 3 scarves = $415\times 3=1245$

Price of one abaya = 920

Price of 2 abayas = $920\times 2=1840$

Total price = 1245 + 1840 =3085

On discount she paid half price = $3085\div 2=1542.5$

Courier charges = 140

Total amount paid = 140 + 1542.5 = 1682.5 Ans.

**Q5. Ali has number blocks in three colours. He has 8 blue blocks. There are $\frac{3}{4}$ times as many green block as blue blocks, and there are 4 fewer red blocks than green blocks. How many blocks does Ali have?**

Sol. Number of blue blocks = 8

Number of green blocks = $\frac{3}{4}$ times of blue blocks

Number of green blocks = $\frac{3}{4} \times 8 = 6$ blocks

Number of red blocks = 4 fewer than green blocks

i.e. 6 – 4 = 2 red blocks

Total blocks = blue + green + red

Total blocks = 8 + 6 + 2 = 16 blocks

**Q6. Madiha needs 7.5 kg of apples and 5.75 kg of mangoes for an Iftar party. She already has 3.25 kg of mangoes and 2.25 kg apples at home. How many more apples and mangoes should she buy?**

Sol. Apples needed = 7.5 kg

Mangoes needed = 5.75 kg

Available apples = 2.25 kg

Available mangoes = 3.25 kg

Apples to buy = 7.5 kg – 2.25 kg = 5.25 kg

Mangoes to buy = 5.75 kg – 3.25 kg = 4.5 kg

## Review Exercise – 3

**Q1. Encircle the correct option.**

a. The smallest positive integer is _____.
   i. 0
   **ii. + 1**
   iii. – 1
   iv. Not determined

b. The greatest negative integer is _____.
   i. 0
   ii. + 1
   **iii. – 1**
   iv. Not determined

c. The greatest positive integer is _____.
   i. + 10
   ii. +100
   iii. +1
   **iv. Not determined**

d. The absolute value of – 16 is _____.
   j. – 16
   **ii. +16**
   iii. – 60
   iv. +60

e. The product of two integers with opposite signs is _____.
   i. Always positive
   **ii. Always negative**
   iii. sometimes positive sometimes negative
   iv. Both positive and negative

f. What must be added to – 135 to get – 142 ?
   i. – 7
   ii. 7
   iii. 277
   iv. – 277

g. Additive inverse of 6 is _____.
   **i. – 6**
   ii. +6
   iii. $\frac{1}{6}$
   iv. $-\frac{1}{6}$

h. The value of $4 \times (-5) \times (-2)$ is _____.
   i. – 16
   ii. +20
   **iii. +40**
   iv. – 40

i. Multiplicative inverse of – 100 is _____.
   i. – 100
   ii. + 100

iii. $\frac{1}{100}$

iv. $-\frac{1}{100}$

j. _____ is a phrase that includes numbers, brackets and operations together to show the value of something in mathematical form.

i. A set
**ii. An expression**
iii. An operation
iv. A rule

k. We solve _____ bracket first in BODMAS rule.

i. [ ]
ii. { }
iii. ( )
iv. _____

l. In BODMAS rule we solve _____ operation first.

i. + ii. ×
iii. − iv. ÷

m. _____ is called Vinculum.

i. [ ] ii. { }
iii. ( ) iv. _____

n. The correct order of operations is _____.

i. +, −, ÷, ×
ii. ÷, +×, −
iii. ÷, ×, +, -
iv. ÷, ×, −, +

**Q2. Solve the following.**

a. $85+(-96)=$ ____

Sol. $85+(-96)=\underline{-11}$

b. $80+57=$ ____

Sol. $80+57=\underline{137}$

c. $86+(-38)=$ ____

Sol. $86+(-38)=\underline{48}$

d. $22+(-41)+(-8)=$ ____

Sol. $22+(-41)+(-8)=\underline{-27}$

e. $(-18)+(-45)+(-89)=$ ____

Sol. $(-18)+(-45)+(-89)=\underline{-152}$

f. $(-11)+(-5)+6=$ ____

Sol. $(-11)+(-5)+6=\underline{+10}$

g. $(-4)-(-6)=$ ____

Sol. $(-4)-(-6)=\underline{+2}$

h. $80-(-7)=$ ____

Sol. $80-(-7)=\underline{+87}$

i. $6-(-8)=$ ____

Sol. $6-(-8)=\underline{14}$

j. $(-34)-(-40)=$ ____

Sol. $(-34)-(-40)=\underline{+6}$

k. $(-18)-(-45)-(56)=$ ____

Sol. $(-18)-(-45)-(56)=\underline{-29}$

l. $(-101)-(-55)-(43)=$ ____

Sol. $(-101)-(-55)-(43)=\underline{-89}$

m. $(+6)\times(-9)=$ ____

Sol. $(+6)\times(-9)=\underline{-54}$

n. $(+8)\times(-9)=$ ____

Sol. $(+8)\times(-9)=\underline{-72}$

o. $(-2)\times(-34)=$ ____

Sol. $(-2)\times(-34)=\underline{+68}$

p. $(+134)\times(-123)=$ ____

Sol. $(+134)\times(-123)=\underline{-16,482}$

q. $(+6)\div(-2)=$ ____

Sol. $(+6)\div(-2)=\underline{-3}$

r. $(+340)\div(-34)=$ ____

Sol. $(+340)\div(-34)=\underline{-10}$

s. $(-12)\div(-4)=$ ____

Sol. $(-12)\div(-4)=\underline{+3}$

t. $(+220)\div(-22)=$ ____

Sol. $(+220)\div(-22)=\underline{-10}$

**Q3. The product of two integers is – 75. If one of them is – 15, then find the other one.**

Sol. Product = – 75
On integer = – 15
Other integer = ?

According to question

$(-15)\times$ _____ $=-75$

$\Rightarrow(-15)\times \underline{+5} =-75$

**Q4. Find an integer which divides – 90 to give – 45?**

Sol. $\Rightarrow(-90)\div$ ___ $=-45$

$\Rightarrow(-90)\times \underline{(+2)} =-45$

**Q5. Verify the following.**

a. $(-5)\times 3=3\times(-5)$

Sol. $(-5)\times 3=3\times(-5)$

| LHS | RHS |
|---|---|
| $(-5)\times 3$ | $3\times(-5)$ |
| $-15$ | $-15$ |

b. $(-27)+(-97)$

$=(-97)+(-27)$

Sol. $(-27)+(-97)$

$=(-97)+(-27)$

| LHS | RHS |
|---|---|
| $(-27)+(-97)$ | $(-97)+(-27)$ |
| $-124$ | $-124$ |

c. $17+(-9)=(-9)+17$

Sol. $17+(-9)=(-9)+17$

| LHS | RHS |
|---|---|
| $17+(-9)$ | $(-9)+17$ |
| $+8$ | $+8$ |

d. $(-101)+(-77)$

$=-77+(-101)$

Sol. $(-101)+(-77)$

$=-77+(-101)$

| LHS | RHS |
|---|---|
| $(-101)+(-77)$ | $(-77)+(-101)$ |
| $-178$ | $-178$ |

e. $(-6)+[(-3)+(-4)]$

$=[(-6)+(-3)]+(-4)$

Sol. $(-6)+[(-3)+(-4)]$

$=[(-6)+(-3)]+(-4)$

| LHS | RHS |
|---|---|
| $(-6)+[(-3)+(-4)]$ | $[(-6)+(-3)]+(-4)$ |
| $(-6)+(-7)$ | $(-9)+(-4)$ |
| $-13$ | $-13$ |

f. $(-12)\times[5\times(-4)]$

$=[(-12)\times 5]\times(-4)$

Sol. $(-12)\times[5\times(-4)]=[(-12)\times 5]\times(-4)$

| LHS | RHS |
|---|---|
| $(-12)\times[5\times(-4)]$ | $[(-12)\times 5]\times(-4)$ |
| $(-12)\times(-20)$ | $(-60)\times(-4)$ |
| $+240$ | $+240$ |

g. $[(-6)-2](-5)=[(-6)(-5)]-[(2(-5))]$

Sol. $[(-6)-2](-5)=[(-6)(-5)]-[(2(-5))]$

| LHS | RHS |
|---|---|
| $[(-6)-2](-5)$ | $[(-6)(-5)]-[(2(-5))]$ |
| $(-8)(-5)$ | $(+30)-(-10)$<br>$30+10$ |
| $+40$ | $+40$ |

h. $(-11)\times[5+(-7)]=[(-11)\times 5]+[(-11)\times(-7)]$

Sol. $(-11)\times[5+(-7)]=[(-11)\times5]+[(-11)\times(-7)]$

| LHS | RHS |
|---|---|
| $(-11)\times[5+(-7)]$ | $[(-11)\times5]+[(-11)\times(-7)]$ |
| $(-11)\times(-2)$ | $(-55)+77$ |
| $+22$ | $+22$ |

**Q6. Simplify the following expressions.**

a. $(2\times7)+(12\div4)$

Sol. $(2\times7)+(12\div4)$

$\Rightarrow 14+3$

$\Rightarrow 17$ *Ans.*

b. $3\times(7+9)-6$

Sol. $3\times(7+9)-6$

$\Rightarrow 3\times16-6$

$\Rightarrow 48-6=42$ *Ans.*

c. $(8\times5)+5-3$

Sol. $(8\times5)+5-3$

$\Rightarrow 40+5-3$

$\Rightarrow 45-3=42$ *Ans.*

d. $204-[30\times\{20+(8\times32\div4)-(9\div63)\}]$

Sol. $204-[30\times\{20+(8\times32\div4)-(9\div63)\}]$

$\Rightarrow 204-[30\times\{20+(8\times8)-0.1428\}]$

$\Rightarrow 204-[30\times\{20+64-0.1428\}]$

$\Rightarrow 204-[30\times\{84-0.1428\}]$

$\Rightarrow 204-[30\times83.8571]$

$\Rightarrow 204-2515.71$

$\Rightarrow -2311.714$ **Ans.**

e. $\left\{\left(9\times\frac{1}{3}-\frac{3}{9}\right)\div\frac{5}{16}\right\}\times\left(\frac{5}{12}+\frac{3}{4}\right)$

Sol $\left\{\left(9\times\frac{1}{3}-\frac{3}{9}\right)\div\frac{5}{16}\right\}\times\left(\frac{5}{12}+\frac{3}{4}\right)$

$\Rightarrow\left\{\left(\frac{9}{3}-\frac{3}{9}\right)\div\frac{5}{16}\right\}\times\left(\frac{5}{12}+\frac{3\times3}{4\times3}\right)$

$\Rightarrow\left\{\left(\frac{9\times3}{3\times3}-\frac{3}{9}\right)\div\frac{5}{16}\right\}\times\left(\frac{5}{12}+\frac{9}{12}\right)$

$\Rightarrow\left\{\left(\frac{27-3}{9}\right)\div\frac{5}{16}\right\}\times\left(\frac{5+9}{12}\right)$

$\Rightarrow\left\{\frac{24}{9}\div\frac{5}{16}\times\frac{14}{12}\right\}$

$\Rightarrow\left\{\frac{\cancel{24}^{2}}{9}\times\frac{16}{5}\times\frac{14}{\cancel{12}_{1}}\right\}$

$\Rightarrow\frac{448}{45}$ *or* $9\frac{43}{45}$ **Ans.**

**Q7. While travelling Rohaan paid Rs 36.45 for 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.

**Q8. A shopkeeper has $42\frac{3}{4}$ m of clothes in his stock, if he sells $6\frac{2}{6}$ m of cloth, then how much cloth he has left?**

Sol. Total cloth = $42\frac{3}{4}$ m = $\frac{171}{4}$ m

He sold = $6\frac{2}{6}$ m = $\frac{38}{6}$ m

He left with = $\Rightarrow\frac{171}{4}-\frac{38}{6}$

$\Rightarrow\frac{171\times3}{4\times3}-\frac{38\times2}{6\times2}$

$$\Rightarrow \frac{513}{12} - \frac{76}{12} \Rightarrow \frac{513-76}{12}$$

$$\Rightarrow \frac{437}{12} \text{ or } 36\frac{5}{12} m \text{ Ans.}$$

**Q9. Look at the following price list of the different fruits to answer the questions.**

Apple : Rs 150 per kg
Mango: Rs 200 per kg
Orange: Rs 100 per dozen
Banana: Rs 150 per dozen

a. If Rabia bought 3.45 kg of apples and 2.34 dozen of oranges. How much did she pay?

b. If the shopkeeper sold 34.45 kg of mangoes, 23.89 kg of apples, 7.67 dozen of oranges and 6.5 dozen of banana find his total sales?

c. Also write it in an expression.

Sol.

a. price of 1 kg apple = 150
Price of 3.45 kg apple =
$3.45 \times 150 = 517.50$
Price of 1 dozen oranges = 100
Price of 2.34 dozen oranges =
$2.34 \times 100 = 234$
Total amount she paid = 517.50 + 234 = 751.50 Ans.

b. price of 34.45 kg mangoes=
$34.45 \times 200 = 6,890$
price of 23.89 kg apples =
$23.89 \times 150 = 3,583.50$
price of 7.67 dozen oranges =
$7.67 \times 100 = 767$
price of 6.5 dozen bananas =
$6.5 \times 150 = 975$
total sale = 6,890 + 3,583.50 + 767 + 975 = 12,215.50 Ans

c. **Expression:**

$$\{3.45 \times 150\} + \{34.45 \times 200\} + \{7.67 \times 100\} + \{6.5 \times 150\} = 12,215.50$$

**Q10. The pack of large erasers has 8 pieces: the pack of medium erasers has 15 pieces 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 = $13\frac{3}{9} + 10\frac{5}{15} + 6\frac{2}{9}$

$$\Rightarrow \frac{120}{9} + \frac{155}{15} + \frac{56}{9}$$

$$\Rightarrow \frac{120 \times 5}{9 \times 5} + \frac{155 \times 3}{15 \times 3} + \frac{56 \times 5}{9 \times 5}$$

$$\Rightarrow \frac{600}{45}+\frac{465}{45}+\frac{280}{45}$$

$$\Rightarrow \frac{600+465+280}{45}=\frac{1,345}{45}$$

$$\Rightarrow 29\frac{40}{45}\ or\ 29\frac{8}{9}\ Ans.$$

**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

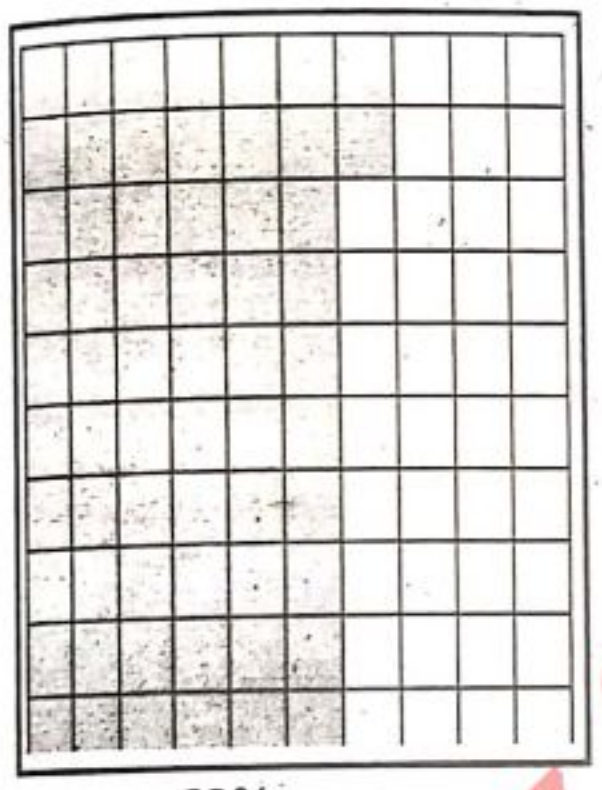
Ans

## Unit 4

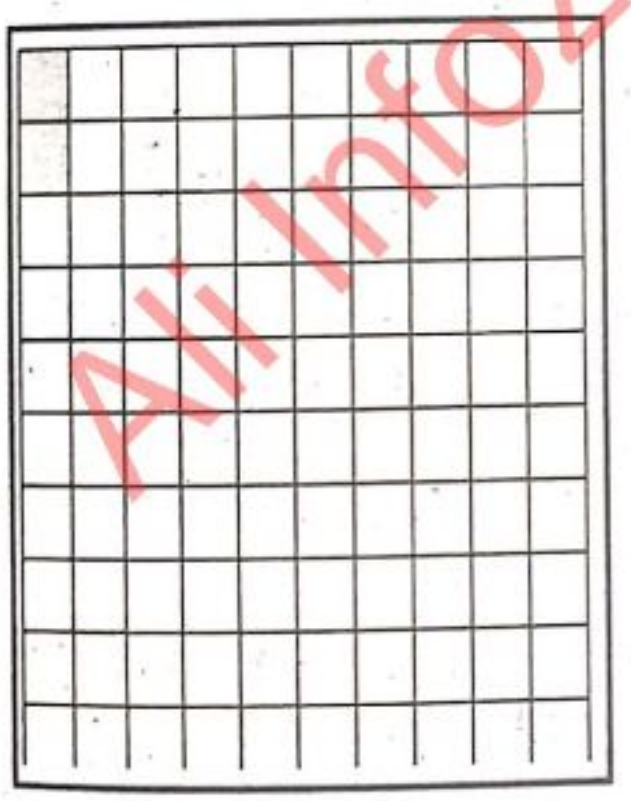
## Rate, Ratio and Percentage

### Exercise 4.1

**Q1. The following squares are divided into 100 equal parts. Express the colored parts as apercentage?**



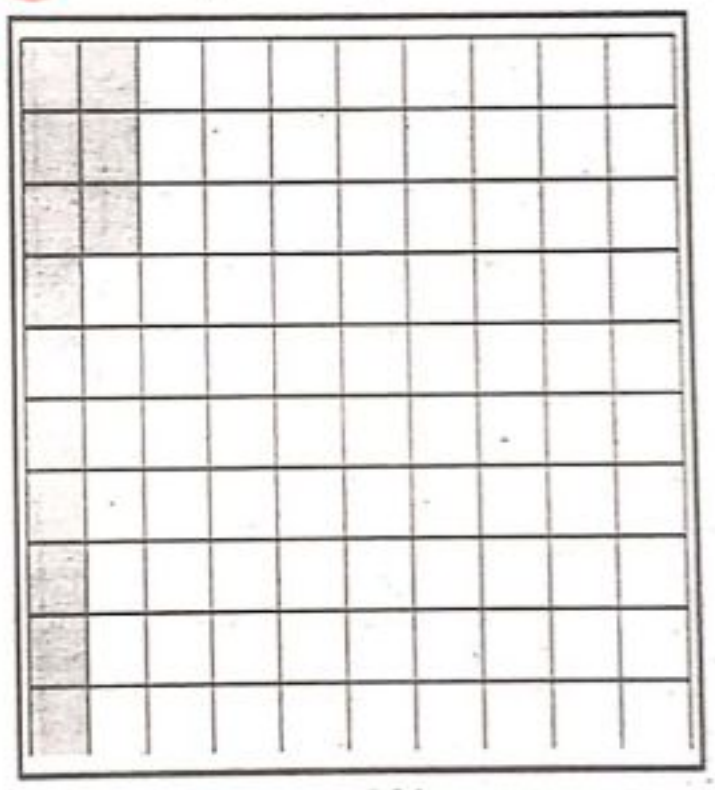
62%



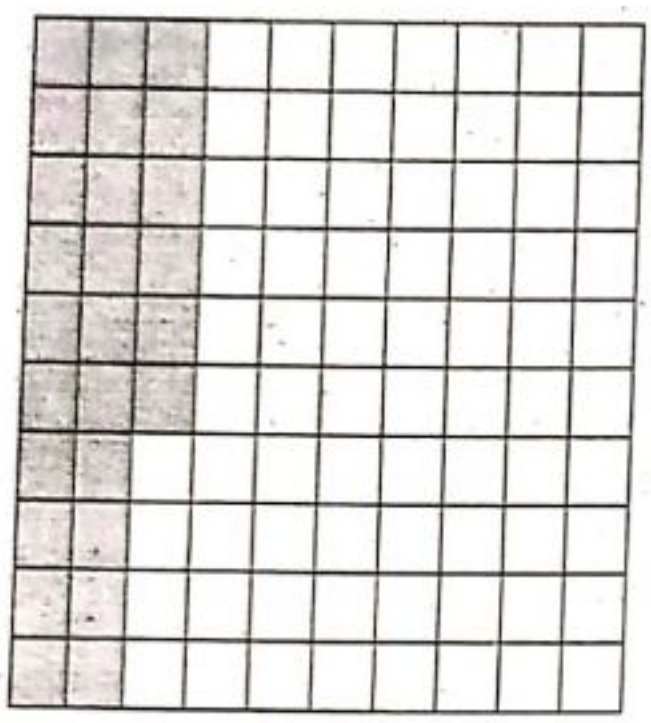
2%

**Q2. Colour the squares to show the given percentage.**

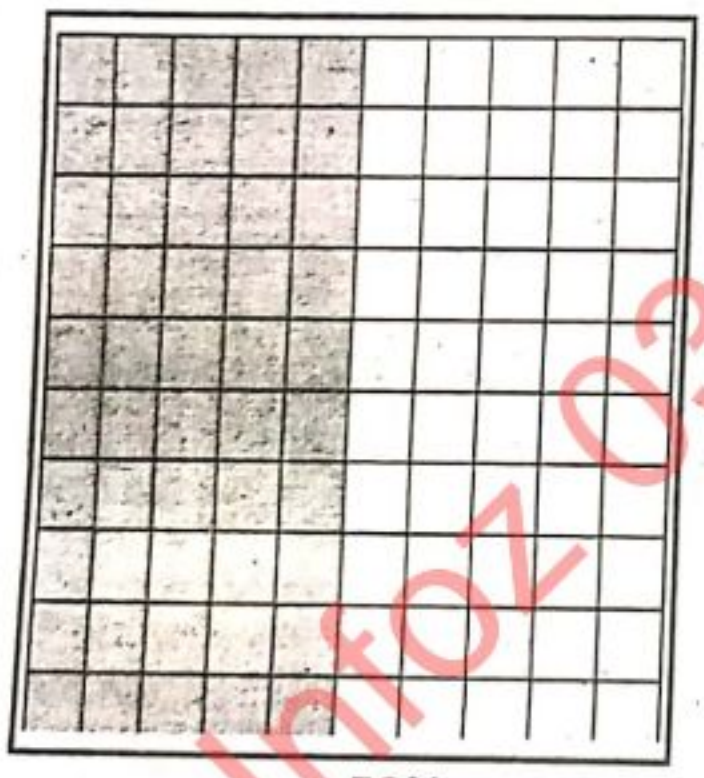
78%



13%



26%



50%

**Q3. Mahad got 92 marks out of 100 in a Mathematics test. Express the marks as a percentage.**

*Sol. Write: 92%*

Read: ninety two percentages

**Q4. Find the value of the following.**

**a. 15% of 35**

Sol. 15% of 35

$$\Rightarrow \frac{15}{100} \times 35 = \frac{525}{100} = 5.25 \; Ans.$$

**b. 90% of 1000**

Sol.90% of 1000

$$\Rightarrow \frac{90}{100} \times 1000 = \frac{90,000}{100}$$

$$= 900 \; Ans.$$

**c. 5.2% of 500**

Sol.5.2% of 500

$$\Rightarrow \frac{5.2}{100} \times 500 = \frac{2600}{100} = 26 \; Ans.$$

**d. 25% of 175**

Sol.25% of 175

$$\Rightarrow \frac{25}{100} \times 175 = \frac{4375}{100} = 43.75 \; Ans.$$

**e.** $67\frac{1}{7}\%$ **of 780**

*Sol.* $67\frac{1}{7}\%$ of 780

$$\Rightarrow 67\frac{1}{7}\% \times 780$$

$$= \frac{470}{7} \times \frac{1}{100} \times 780$$

$$\Rightarrow \frac{470}{700} \times 780 = \frac{366600}{700}$$

$$= 523.714 \ Ans.$$

**f. 87% of 2000 liters**

Sol.87% of 2000 liters

$$\Rightarrow \frac{87}{100} \times 2000 = \frac{174000}{100}$$

$$= 1740 \ Ans.$$

**g. 2.5% of 3200 grams**

Sol. 2.5% of 3200 grams

$$\Rightarrow \frac{2.5}{100} \times 3200 = \frac{8000}{100} = 80 \ Ans.$$

**h. 9.25% of 300**

Sol.9.25% of 300

$$\Rightarrow \frac{9.25}{100} \times 300 = \frac{2775}{100}$$

$$= 27.75 \ Ans.$$

**i. 45% of 75 marks**

Sol.45% of 75 marks

$$\Rightarrow \frac{45}{100} \times 75 = \frac{3375}{100}$$

$$= 33.75 \ Ans.$$

**j. 0.5% of 50mm**

Sol.0.5% of 50mm

$$\Rightarrow \frac{0.5}{100} \times 50 = \frac{25}{100} = 0.25 \ Ans.$$

**k. 4.50% of 100**

Sol.4.50% of 100

$$\Rightarrow \frac{4.50}{100} \times 100 = \frac{450}{100} = 4.5 \ Ans.$$

**Q5. Find the percentage.**

**a. 50 out of 600**

Sol.50 out of 600

$$\Rightarrow \frac{50}{600} \times 100\% = \frac{5,000}{600}\%$$

$$= 8.3\% \ Ans.$$

**b. 175 out of 900**

Sol.175 out of 900

$$\Rightarrow \frac{175}{900} \times 100\% = \frac{17,500}{900}\%$$

$$= 19.44\% \ Ans.$$

**c. 7.82 out of 40**

Sol.7.82 out of 40

$$\Rightarrow \frac{7.84}{40} \times 100\% = \frac{784}{40}\%$$

$$= 19.6\% \ Ans.$$

**d. 90 out of 100**

Sol.90 out of 100

$$\Rightarrow \frac{90}{100} \times 100\% = \frac{9,000}{100}\%$$

$$\Rightarrow 90\% \ Ans.$$

**e. 66 out of 190**

Sol.66 out of 190

$$\Rightarrow \frac{66}{190} \times 100\% = \frac{6600}{190}\%$$

$$\Rightarrow 34.73\% \ Ans.$$

**f. 89 out of 200**

Sol.89 out of 200

$$\Rightarrow \frac{89}{200} \times 100\% = \frac{8900}{200}\%$$

$$= 44.5\% \ Ans.$$

**g. 40 out of 75 marks**

Sol.40 out of 75 marks

$$\Rightarrow \frac{40}{75}\times 100\% = \frac{4,000}{75}\%$$

$$= 53.33\% \ Ans.$$

**h. 2 out of 10 children**

Sol.2 out of 10 children

$$\Rightarrow \frac{2}{10}\times 100\% = \frac{200}{10}\%$$

$$= 20\% \ Ans.$$

**i. Rs 30 out of Rs 500**

Sol.Rs 30 out of Rs 500

$$\Rightarrow \frac{30}{500}\times 100\%$$

$$= \frac{3,000}{500}\% = 6\% \ Ans.$$

**j. 78 m out of 560 m**

Sol.78 m out of 560 m

$$\Rightarrow \frac{78}{560}\times 100\% = \frac{7800}{560}\%$$

$$= 13.92\% \ Ans.$$

**k. 3 months out of 5years**

Sol.3 months out of 5 years

5 year = $5\times 12 = 60$ months

3 months out of 60 months

$$\Rightarrow \frac{3}{60}\times 100\% = \frac{300}{60}\%$$

$$= 5\% \ Ans.$$

**l. 1 day out of 1 week**

Sol.1 day out of 1 week

1 week = 7 days

1 day out of 7 days

$$\Rightarrow \frac{1}{7}\times 100\% = \frac{100}{7}\%$$

$$= 14.28\% \ Ans.$$

**Q6. 18 out of 90 boxes in a shop are blue. Express the number of blue boxes as percentage.**

Sol. Total boxes = 90

Blue boxes = 18

Percentage of blue boxes

$$\Rightarrow \frac{18}{90}\times 100\% = \frac{1800}{90}\%$$

$$= 20\% \ Ans.$$

**Q7. Huma used 12 meters of cloth to stitch four shirts. If she had 30-meter cloth altogether, find the percentage of cloth she used.**

Sol. Total cloth = 30 meter

Used cloth = 12 meter

Percentage of used cloth

$$\Rightarrow \frac{12}{30}\times 100\% = \frac{1200}{30}\%$$

$$= 40\% \ Ans.$$

**Q8. 11 students out of 25 students of a school participated in a marathon. Express this as percentage.**

Sol. Total students in Marathon = 25

Students participated = 11

Percentage = $\Rightarrow \frac{11}{25}\times 100\%$

$$= \frac{1100}{25}\% = 44\% \ Ans.$$

**Q9. Fahad saved Rs 50 out of Rs 200 from his pocket money. What percentage of money did he save?**

Sol. Total pocket money = 200

Fahad saved = 50

Percentage = $\Rightarrow \frac{50}{200}\times 100\%.$

$$= \frac{5000}{200}\% = 25\% \ Ans$$

**Q10. Out of 180 eggs 25% are broken. How many eggs are broken?**

Sol. Total eggs = 180

Broken = 25%

Number of broken eggs =

$$\frac{25}{100}\times 180 = \frac{4500}{100} = 45 \ Ans.$$

**Q11. In a match Imran scored 35% of the total 350 runs. How much runs he scored and how much runs the remaining tem scored?**

Sol. Total score = 350

Imran score = 35%

Imran score =

$$\frac{35}{100}\times 350 = \frac{12250}{100} = 122.5 \ Ans.$$

**Q12. Sara donated 12% of her salary as a donation. If her salary is Rs 45,000, find the amount she donated?**

Sol. Total salary = 45,000

Donation = 12%

Amount of donation =

$$\frac{12}{100}\times 45000 = \frac{540000}{100}$$

$$= 5400 \ Ans.$$

## Exercise – 4.2

**Q1. Compare the following and tell which is greater as percentage.**

**a. 22 out of 60 and 54 out of 60**

Sol. 22 out of 60 and 54 out of 60

Percentage of 22 out of 60 =

$$\frac{22}{60}\times 100\%$$

Percentage of 22 out of 60 = 36.66%

Now, Percentage of 54 out of 60 =

$$\frac{54}{60}\times 100\%$$

Percentage of 54 out of 60 = 90%

As 90% is greater than 46.66%, so 54 out of 60 is greater than 22 out of 60.

**b. 18 out of 20 and 16 out of 20**

Sol. Sol. 18 out of 20 and 16 out of 20

Percentage of 18 out of 20 =

$$\frac{18}{20}\times 100\%$$

Percentage of 18 out of 20 = 90%

Now, Percentage of 16 out of 20 =

$$\frac{16}{20}\times 100\%$$

Percentage of 16 out of 20 = 80%

As 90% is greater than 80%.

So 18 out of 20 is greater than 16 out of 20.

**c. 68 out of 120 and 66out of 130**

Sol. 68 out of 120 and 66 out of 130

%68 out of 120 = $\frac{68}{120}\times 100\%$

%68 out of 120 = 56.66%

%66 out of 130 = $\frac{66}{130}\times 100\%$

%66 out of 130 = 50.76%

As, 56.66% is greater than 50.76%, so 68 out 120 is greater than 66 out of 130.

**d. 440 out of 550 and 520 out of 710**

Sol. 440 out of 550 and 520 out of 710

%440 out of 550 =

$$\frac{440}{550}\times 100\%$$

%440 out of 550 = 80%

%520 out of 710 = ]

$$\frac{520}{710}\times 100\%$$

%520 out of 710 = 73.23%

As, 80% is greater than 73.23%, so 440 out of 550 is greater than 520 out of 710.

**e. 10 out of 60 and 15 out of 70**

Sol. 10 out of 60 and 15 out of 70

$$\%10 \text{ out of } 60 = \frac{10}{60} \times 100\%$$

$\%10$ out of $60 = 16.66\%$

$$\%15 \text{ out of } 70 = \frac{15}{70} \times 100\%$$

$\%15$ out of $70 = 21.42\%$

As, 21.42% is greater than 16.66%, so 15 out of 70 is greater than 10 out of 60.

**f. 200 out of 400 and 150 out of 350**

Sol. 200 out of 400 and 150 out of 350

$$\%200 \text{ out of } 400 = \frac{200}{400} \times 100\%$$

$\%200$ out of $400 = 50\%$

$$\%150 \text{ out of } 350 = \frac{150}{350} \times 100\%$$

$\%150$ out of $350 = 42.85\%$

As 50% is greater than 42.85%, so 200 out of 400 is greater than 150 out of 350.

**Q2. In a town A, 200 out 500 houses are under construction and in town B, 250 out of 600 houses are under construction. Compare and tell in which town more percentage of houses is under construction?**

Sol. In town A, 200 out of 500 houses are under construction

Percentage of town A =

$$\frac{200}{500} \times 100\%$$

Percentage of town A = 40%

In town B, 250 out of 600 houses are under construction

Percentage of town B =

$$\frac{250}{600} \times 100\%$$

Percentage of town B = 41.66%

Thus in tow B, more percentage of houses is under construction.

**Q3. In math test Anum got 40 marks out of 50, and in English test she got 35 marks out of 60. In which subject she got less percentage marks?**

Sol. In Math test 40 out 50

$$\text{In Percentage} = \frac{40}{50} \times 100\%$$

In percentage = 80%

In English test 35 out of 60

$$\text{In percentage} = \frac{35}{60} \times 100\%$$

In percentage = 58.33%

Thus in English test she got less percentage of marks.

**Q4. Mahad got 12 out of 15 marks, Hadia got 14 out of 15 marks and Samiha got 11 out of 15 marks in math weekly test. Compare their marks by finding percentage.**

Sol. Mahad got 12 out 15

Mahad percentage =

$$\frac{12}{15} \times 100\%$$

Mahad percentage = 80%

Hadia got 14 out of 15

Hadia percentage =

$$\frac{14}{15} \times 100\%$$

Hadia percentage = 93.33%

Samiha got 11 out 15

Samiha percentage =

$$\frac{11}{15} \times 100\%$$

Samiha percentage = 73.33%

Marks of samiha >

Marks of Mahad > Ans.

Marks of Samiha

**Q5. Omair's notebook has 82 empty pages out of 120 pages. Sara's notebook has 42 empty pages out of 54 pages. Compare by finding percentage to tell who has more empty pages in his/her notebook.**

Sol. Empty pages in Omair's notebook = 82 out of 120

$$\text{In percentage} = \frac{82}{120} \times 100\%$$

In percentage = 68.33%

Empty pages in Sara's notebook = 42 out of 54

$$\text{In percentage} = \frac{42}{154} \times 100\%$$

In percentage = 77.77%

As, 77.77% is more than 68.33% so Sara's notebook has more empty pages than Omair's notebook.

## Exercise – 4.3

**Q1. Find increase and decrease in quantity as given in percentage.**

**a. 500 decreased by 17%**

Sol. First we find 17% of 500

$$17\% \text{ of } 500 = \frac{17}{100} \times 500$$

17% of 500 = 85

So, 500 is decreased by 85

$\Rightarrow 500 - 85 = 415$ Ans

**b. 1400 increased by 9%**

Sol. First we find 9% of 1400

$$9\% \text{ of } 1400 = \frac{9}{100} \times 1400$$

9% of 1400 = 126

So, 1400 is increased by 126

$\Rightarrow 1400 + 126 = 1526$ **Ans.**

**c. 18% increase in 1350**

Sol. First we find 18% of 1350

$$18\% \text{ of } 1350 = \frac{18}{100} \times 1350$$

18% of 1350 = 243

So, 1350 is increased by 243

$\Rightarrow$ 1350 + 243 = 1593 Ans.

**d. 22% decrease in 760**

Sol. First we find 22% of 760

$$22\% \text{ of } 760 = \frac{22}{100} \times 760$$

22% of 760 = 167.2

So 760 is decreased by 167.2

760 – 167.2 = 592.8 **Ans.**

**e. 55% decrease in 2500**

Sol. First we find 55% of 2500

$$55\% \text{ of } 2500 = \frac{55}{100} \times 2500$$

55% of 2500 = 1375

So, 1350 is decreased by 1375

$\Rightarrow$ 2500 – 1375 = 1125 **Ans.**

**f. 2% increase in 270**

Sol. First we find 2% of 270

$$2\% \text{ of } 270 = \frac{2}{100} \times 270$$

2% of 270 = 5.4

So, 270 is increased by 5.4

$\Rightarrow$ 270 + 5.4 = 275. 4 **Ans.**

**Q2. Arham's salary is Rs 45,900. If his salary increased by 12%. How much salary increased? Find his new salary?**

Sol.Arham's salary = 45,900

Percentage increase = 12%

$$12\% \text{ of } 45{,}900 = \frac{12}{100} \times 45900$$

Increased in salary = 5,508

New salary = 45,900 + 5,508 = 51,408

**Ans.**

**Q3. On Monday 300 children visited the zoo. On Tuesday 15% less children visited the zoo. How many children visited the zoo on Tuesday?**

Sol. Children visited zoo on Monday = 300

On Tuesday 15% less children visited zoo.

$$15\% \text{ of } 300 = \frac{15}{100} \times 300 = 45$$

Children visited zoo on Tuesday = 300 − 45

= 255 Ans.

**Q4. In 2021, Ahad's weight was 27 kg. his weight is decreased by 9% in 2022. Find**

**a. How much weight did he loss?**

**b. What is his weight in 2022?**

Sol. Ahad's weight in 2021 = 27 kg

Decrease in weight = 9%

Decrease in weight = 9% of 27 =

$$\frac{9}{100} \times 27 = 2.43 \text{ kg}$$

a. Weight loss = 2.43 kg

b. His weight in 2022

= 27 kg − 2.43 kg

= 24.57 kg Ans.

**Q5. Marwa's marks in monthly test in March were 56. In April, her marks increased by 24%. What are her marks in April?**

Sol. Marwa's marks in March monthly test = 56

Percentage Increased = 24%

Increased in marks = 24% of 56 =

$$\frac{24}{100} \times 56 = 13.44$$

Her marks in April monthly test = 56 + 13.44

Her marks in April monthly test = 69.44

Ans.

## Exercise – 4.4

**Q1. Find the ratio of:**

**a. 35 to 55**

Sol. 35 to 55

35 : 55

7 : 11 (Divide by 5)

**b. 15 min to 3 hours**

Sol. 15 min to 3 hours

3 hours = 3 × 60 min = 180 min

15 min to 180 min

15 : 180

1 : 12 (Divide by 15)

**c. 8 km to 600 m**

Sol. 8 km to 600 m

8 km = 8 × 1000 m = 8000 m

8000 m to 600 m

8000 : 600

80 : 6 (Divide by 100)

40 : 3(Divide by 2)

**d. 500 gram to 4 kg**

Sol. 500 gram to 4 kg

4 kg = 4 × 1000 g = 4000 grams

500 gram to 4000 gram

500 : 4000

5 : 40 (Divide by 100)

1 : 8 (Divide by 5)

**e. Rs 240 to Rs 300**

Sol. Rs.240 to Rs.300

240 : 300

24 : 30 (Divide by 10)

4 : 5 (Divide by 6)

**f. 10 m to 100 cm**

Sol. 10m to 100 cm

10 m = $10 \times 100$ cm = 1000 cm

1000 cm to 100 cm

1000 : 100

10 : 1 (Divide by 100)

**Q2. Write each of the following ratios in fraction form.**

**a. 4:5**

Sol. 4 : 5

In fraction form: $\frac{4}{5}$ **Ans.**

**b. 12:13**

Sol. 12 : 13

In fraction form: $\frac{12}{13}$ **Ans.**

**c. 19:25**

Sol. 19 : 25

In fraction form: $\frac{19}{25}$ **Ans.**

**d. 34:63**

Sol. 34 : 63

In fraction form: $\frac{34}{63}$ **Ans.**

**e. 55:78**

Sol. 55 : 78

In fraction form: $\frac{55}{78}$ **Ans.**

**f. 3.1:6.2**

Sol. 3.1 : 6.2

$$\frac{3.1}{6.2}=\frac{3.1\div 3.1}{6.2\div 3.1}$$

In fraction form: $\frac{1}{2}$ **Ans.**

**g. 18:69**

Sol. 18 : 69

In fraction form: $\frac{18}{69}$ **Ans.**

**h. 72:81**

Sol. 72 : 81

$$\frac{72}{81}=\frac{72\div 9}{81\div 9}=\frac{8}{9}$$

In fraction form: $\frac{8}{9}$ **Ans.**

**Q3. Simplify the following ratios.**

**a. 4:8**

Sol. 4 : 8

1 : 2 (Divide by 4)

**b. 15:20**

Sol. 15 : 20

3 : 4 (Divide by 5)

**c. 30:45**

Sol. 30 : 45

2 : 4 (Divide by 15)

**d. 81:99**

Sol. 81 : 99

9 : 11 (Divide by 9)

**e. 16:39**

Sol. 16 : 39 **Ans.**

**f. 42:56**

Sol. 42 : 56

6 : 8 (Divide by 7)

3 : 4 (Divide by 2)

**g. 35:100**

Sol. 35 : 100

7 : 20 (Divide by 5)

**h. 25:75**

Sol. 25 : 75

1 : 3 (Divide by 25)

**i. 8:12**

Sol. 8 : 12

2 : 3 (Divide by 4)

**j. 56:72**

Sol. 56 : 72

7 : 9 (Divide by 8)

**k. 18:36**

Sol. 18 : 36

1 : 2 (Divide by 18)

**l. 64:90**

Sol. 64 : 90

32 : 45 (Divide by 2)

**Q4. Write each of the following quantities into ratios and reduce into the simplest form (where possible).**

**a. Rs 500 and Rs 750**

Sol. Rs.500 and Rs.750

500 : 750

50 : 75 (Divide by 10)

2 : 3 (Divide by 25)

**b. 45 m and 350 cm**

Sol. 45 m and 350 cm

45 m = 45 × 100 cm = 4500 cm

4500 : 350

450 : 35 (Divide by 10)

90 : 7 (Divide by 5)

**c. 100 days and 35weeks**

Sol. 100 days and 35 weeks

35 weeks = 35 × 7 = 245 days

100 days and 245 days

100 : 245

20 : 49 (Divide by 5)

**d. 4 kg and 12 grams**

Sol. 4 kg and 12 grams

4 kg = 4 × 1000 g = 4000 grams

4000 grams and 12 grams

4000 : 12

1000 : 3 (Divide by 4)

e. 8 weeks and 64 days

Sol. 8 weeks and 64 days

8 weeks = 8 × 7 = 56 days

56 days and 64 days

56 : 64

14 : 16 (Divide by 4)

7 : 8 (Divide by 2)

**f. 40 km and 90 km**

Sol. 40 km and 90 km

40 : 90

4 : 9 (Divide by 10)

**Q5. There are 80 bulbs in a box. If 15 were found to be defective, find the ratio of defective to non-defective bulbs.**

Sol. Total bulbs = 80

Defective bulbs = 15

Non defective bulbs = 80 – 15 = 65

Ratio of defective bulbs to non defective bulbs

15 : 65

3 : 13 (Divide by 5)

**Q6. Ahmad and Saad bought a bat for Rs. 450. Ahmad paid Rs 250 and Saad paid Rs 200. Find the ratio of the amount Ahmad paid to the amount that Saad paid.**

Sol. Ahmad paid = Rs.250

Saad paid = Rs.200

Ratio of amount of Ahmad and Saad

Ahmad : Saad

250 : 200

25 : 20 (Divide by 10)

5 : 4 (Divide by 5)

**Q7. In a school there are 800 students and 80 teachers. Find the student to teacher ratio in the school.**

Sol. Total students = 800

Total teachers = 80

Ratio of students to teacher

Student : Teacher

800 : 80

80 : 8 (Divide by 10)

10 : 1 (Divide by 8)

**Q8. The price of a pack of bread increased to Rs 50 from Rs 48. Find the ratio of the increase in price to the original price.**

Sol. Original price = Rs.48

New price = Rs.50

Increase in price = 50 – 48 = 2

Ratio of increase in price to original price

Increase in price : Original price

2 : 48

1 : 24 (Divide by 2)

**Q9. 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 of Sara and Sonia =3 : 7

Sum of ratio = 3 + 7 = 10

Share of Sara =

$$\frac{3}{10}\times 340 = 102$$

Share.of Sonia =

$$\frac{7}{10}\times 340 = 238$$

## Exercise – 4.5

**Q1. Solve the following.**

**a. If a:b =4:5 and b:c = 5:6, the find a:b:c**

Sol. If a:b =4:5 and b:c = 5:6, the find a:b:c

a : b = 4 : 5 and b : c = 5 : 6

$$\begin{array}{lll} a & :b & :c \\ 4 & :5 & \\ & 5 & :6 \\ \hline 4 & :5 & :6 \end{array}$$ *Ans.*

**b. If d:e =2:6 and e:f = 7:8, the find d:e:f**

Sol. If d:e =2:6 and e:f = 7:8, the find d:e:f

d : e = 2 : 6 and e : f = 7 : 8

$$\begin{array}{lll} d & : e & : f \\ 2 & : 6 & \\ & 7 & : 8 \\ \hline 2\times 7 & :6\times 7 & :6\times 8 \end{array}$$

14 : 42 : 48

7 : 21 : 24 Ans.

**c. If g:h =8:9 and h:i = 9:12, the find g:h:i**

Sol. If g:h =8:9 and h:i = 9:12, the find g:h:i

g : h = 8 : 9 and h : i = 9 : 12

$$\begin{array}{lll} g & : h & : i \\ 8 & : 9 & \\ & 9 & : 12 \\ \hline 8 & : 9 & : 12 \end{array}$$ **Ans.**

**d. If j:k =6:7 and k:l = 10:1, the find j:k:l**

Sol. If j:k =6:7 and k:l = 10:1, the find j:k:l

j : k = 6 : 7 and k : l = 10 : 1

$$\begin{array}{lll} j & : k & : l \\ 6 & : 7 & \\ & 10 & : 1 \\ \hline 6\times 10 & :10\times 7 & :1\times 7 \end{array}$$

60 : 70 : 7 Ans.

**e. If m:n =2:8 and n:o = 5:6, the find m:n:o**

Sol. If m:n =2:8 and n:o = 5:6, the find m:n:o

m : n = 2 : 8 and n : o = 5 : 6

$$\begin{array}{lll} m & : n & : o \\ 2 & : 8 & \\ & 5 & : 6 \\ \hline 2\times 5 & :5\times 8 & :6\times 8 \end{array}$$

10 : 40 : 48

5 : 20 : 24 Ans.

**Q2. The measurement of three angles of a triangle are in the ratio 2:2:5. Find the measurement of each angle?**

Sol. Ratio of angles of triangle = 2 : 2 : 5

Sum of angles of triangle = 180

Sum of ratio = 2 + 2 + 5 = 9

Measure of 1st angle = $\frac{2}{9}\times 180 = 40^0$

Measure of 2nd angle = $\frac{2}{9}\times 180 = 40^0$

Measure of 3rd angle = $\frac{5}{9}\times 180 = 100^0$

**Q3. The ratio of a to b is 8:9 and b to c is 4:6. Find the continued ratio a:b:c?**

Sol. a : b =8 : 9 and b : c = 4: 6

Continued ratio

| $a$ | : $b$ | : $c$ |
|---|---|---|
| 8 | : 9 | |
| | 4 | : 6 |

$8\times4 : 4\times9 : 6\times9$

32 : 36 : 54

16 : 18 : 27 Ans.

**Q4. The two ratios of three quantities a, b and c are a:b = 2:3 and b:c = 4:5. Find their continued ratio?**

Sol. a : b=2 : 3 and b : c=4 : 5

Continued ratio

| $a$ | : $b$ | : $c$ |
|---|---|---|
| 2 | : 3 | |
| | 4 | : 5 |

$2\times4 : 3\times4 : 3\times5$

8 : 12 : 15 Ans.

**Q5. The ratio of Ibrahim's marks to Ahad's marks 5:3 and the ratio of Ibrahim's marks to Marwa's marks if 4:7. Find the continued ratio among their marks.**

Sol. Ibrahim's marks : Ahad's marks = 5 : 3

Ibrahim's marks : Marwa's marks = 4 : 7

Continued ratio

| Ahad | : Ibrahim | : Marwa |
|---|---|---|
| 3 | : 5 | |
| | 4 | : 7 |

$4\times3 : 5\times4 : 5\times7$

12 : 20 : 35 Ans.

**Q6. Divide Rs.7,500 into the ratio 4:5:6.**

Sol. Total amount = Rs.7,500

Ratio = 4 : 5 :6

Sum of ratio = 4 + 5 + 6 = 15

$1^{st}$ share = $\frac{4}{15}\times7500 = 2000$

$2^{nd}$ share = $\frac{5}{15}\times7500 = 2500$

$3^{rd}$ share = $\frac{6}{15}\times7500 = 3000$

**Q7. Divide Rs 5376 between Ayesha, Sadia and Madiha in the ratio 8:7:6.**

Sol. Total amount = Rs.5376

Ayesha : Sadia : Madiha

8 : 7 : 6

Sum of ratio = 8 + 7 + 6 = 21

Share of Ayesha = $\frac{8}{21}\times5376 = 2048$

Share of Sadia = $\frac{7}{21}\times5376 = 1792$

Share of Madiha = $\frac{6}{21}\times5376 = 1536$

**Q8. Divide 3416 among three persons a, b and c, such that the ratio between their shares is:**

**a : b = 4 : 5 b : c = 8 : 10**

Sol. Total amount = Rs.3416

a : b = 4 : 5 b : c = 8 : 10

Continued ratio

| $a$ | : $b$ | : $c$ |
|---|---|---|
| 4 | : 5 | |
| | 8 | : 10 |

$8\times4 : 5\times8 : 10\times5$

32 : 40 : 50

16 : 20 : 25 (Divide by 2)

Sum of ratio =16+20+25 = 61

Share of 'a' = $\frac{16}{61}\times3416 = 896$

Share of 'b' = $\frac{20}{61}\times3416 = 1120$

Share of 'c' = $\frac{25}{61}\times3416 = 1400$

**Exercise – 4.6**

**Q1. Find the rate for each of the following.**

**a. 28 kilometers covered in 4 hours**

Sol. 28 kilometers covered in 4 hours

28 km in 4 hrs

$$\frac{28km}{4hrs} = 7km/hr$$ **Ans.**

**b. 16 meter rope for Rs. 1376**

Sol. 16 meter rope for Rs. 1376

16 meter for Rs.1376

$$\frac{Rs.1376}{16meter} = Rs.86 \text{ for 1 meter}$$ **Ans.**

**c. 108 words typed in 6 minutes.**

Sol. 108 words typed in 6 minutes.

108 words in 6 min

$$= \frac{108 \text{ word}}{6 \text{ min}}$$

$$= 18 \text{ words per min}$$ **Ans.**

**d. 8 kg of mangoes in Rs 400**

Sol. 8 kg of mangoes in Rs 400

Rs.400 for 8 kg

$$\frac{Rs.400}{8kg} = Rs.50/kg$$ **Ans.**

**e. Rs 6000 for fencing 50 meter boundary**

Sol. Rs 6000 for fencing 50 meter boundary

Rs.6000 for 50 meter boundary

$$\frac{Rs.6000}{50\text{meter}} = Rs.120/meter$$ **Ans.**

**Q2. The entry ticket for 8 person in the museum costs Rs 1760. What is the rate per ticket?**

Sol. Cost of ticket for 8 persons = Rs.1760

Rate per ticket =?

$$\frac{Rs.1760}{8\text{person}} = Rs.220/\text{ticket}$$ **Ans.**

**Q3. The cost of tiling a floor having an area of 234 meter square is Rs 205,920. What is the per square meter rate of tiling?**

Sol. Cost of tiling an area of 234 $m^2$ = Rs.205,920

Cost of tiling per $m^2$ =?

$$\frac{Rs.205,920}{234m^2} = Rs.880/m^2$$

Cost of tiling an area of 1 $m^2$ is Rs.880 **Ans.**

**Q4. Dania bought 12 kg of apples in Rs 720. Find the rate of 1 kg of apples?**

Sol. Price of 12 kg apples = Rs.720

Price of 1 kg apple =?

$$\frac{Rs.720}{12kg} = Rs.60/kg$$

Price of 1 kg apple is Rs.60 **Ans.**

**Q5. Aleem's income if Rs 3000 after working for 19 hours. What is his per hour pay?**

Sol. Aleem's pay for 19 hours = 3000

His pay per hour =?

$$\frac{Rs.3000}{19hours} = Rs.157.89/\text{hours}$$

Aleem's pay for 1 hour is Rs.157.89 **Ans.**

## Review Exercise - 4

**Q1. Encircle the correct option.**

a. When we compare two or more than two quantities of same kind then that comparison is called _____.

i. **Ratio**
ii. Percentage
iii. Rate

iv. Fraction

b. The value of one quantity in unit rate is always _____.
i. zero
ii. two
iii. Three
**iv. One**

c. There are 14 cars and 12 bikes on the road. The ratio of cars to bike is _____
i. 12 : 7
ii. 6 : 7
**iii. 7 : 6**
iv. 7 : 12

d. A _____ is a comparison of three or more quantities in a certain order.
i. Ratio
**ii. continued ratio**
iii. Rate
iv. Percentage

e. 50 out of 500 in percentage form is _____.
i. 1.2%
**ii. 10%**
iii. 15%
iv. 5%

f. The ratio 20 : 50 in simplified form is _____.
i. 1 : 2
**ii. 2 : 5**
iii. 10 : 25
iv. 4 : 10

g. The rate of one week wages of Rs 4200. The rate of one day wages:
**i. 600 : 1**
ii. 7 : 4200
iii. 1 : 4200
iv. 1: 2800

h. If the cost of 12 notebook is Rs 204, then the cost of 5 notebooks is
i. Rs 100
ii. Rs 102
**iii. Rs 85**
iv. Rs 120

i. The equivalent from of the ratio 3 : 4 is _____
i. 6 : 4
**ii. 6 : 8**
iii. 9 : 8
iv. 12 : 12

**Q2. What is meant by ratio?**
Ans. A term used to compare two or more quantities of the same king is called ratio. It is denoted by ":"

**Q3. What is rate? Give example.**
Ans. 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 an item, speed, service charges etc.

**Q4. Define percentage with examples.**
Ans. Percent means out of 100. The symbol used for percentage is "%".
For example: 40% means 40 out of 100.

**Q5. Write the following in the form of ratio and simplify if possible.**

**a. 600 days and 120 days**
Sol. 600 days and 120 days
600 : 120
60 : 12 (Divide by 10)
5 : 1(Divide by 12)

**b. 40 g and 120 g**
Sol. 40 g and 120 g
40 : 120
1 : 3 (Divide by 40)

**c. 65 ml and 13 ml**
Sol. 65 ml and 13 ml
65 : 13
5 : 1(Divide by 13)

**d. 14 men and 16 women**
Sol. 14 men and 16 women
14 : 16

7 : 8 (Divide by 2)

**Q6. Aleena covers a distance of 40 mile in 25 seconds. How much time will she take to cover the distance of:**

Sol. Distance of 40 miles in 25 seconds

Time required for 1 mile =?

$$\frac{25 \text{ seconds}}{40 \text{ mile}} = 0.625 \text{ sec/mile}$$

1 mile distance is covered in 0.625 seconds

**a. 50 miles**

Sol. Time required for 50 miles = 50 × 0.625

= 31.25 seconds.

**b. 120 miles**

Sol. Time required for 120 miles = 120 × 0.625

= 75 seconds.

**Q7. There are 800 eggs. If 120 are rotten, find:**

a. **What percentage of eggs are fresh?**
b. **What is the ratio between the number of rotten and fresh eggs?**
c. **What is the ratio between the fresh and total number of eggs?**

Sol. Total eggs = 800

Rotten eggs = 120

Fresh eggs = 800 – 120 = 680

**a. Percentage of fresh eggs = 680 out 800**

$$\frac{680}{800} \times 100\% = 85\%$$

eggs are fresh

**b. Rotten eggs = 120**

Fresh eggs = 680

Ratio of rotten eggs to fresh eggs

120 : 680

12 : 68 (Divide by 10)

3 : 17 (Divide by 4)

**c. Fresh eggs = 680**

Total eggs = 800

Ratio of fresh eggs to total eggs

680 : 800

68 : 80 (Divide by 10)

17 : 20 (Divide by 4)

**Q8. The ratio of Saad's salary to Sania's salary is 2 : 3 and the ratio of Sania's salary to Mauz's salary is 4 : 3. Find the continued ratio among their salary?**

Sol.

Ratio of Saad's salary to Sania's salary = 2 : 3

Ratio of Sania's salary to Mauz's salary = 4 : 3

Continued ratio of their salary

| Saad | : Sania | : Mauz |
|---|---|---|
| 2 | : 3 | |
| | 4 | : 3 |
| 4×2 | :3×4 | :3×3 |
| 8 | :12 | :9 Ans. |

**Q9. An author charges RS 82,500 for writing 55 pages. What is his per page rate for?**

Sol. Rate of 55 pages = Rs.82;500

Rate per page =?

Rate per page =

$$\frac{\text{Rs. } 82{,}500}{55 \text{ page}}$$

= Rs.1500/page Ans.

**Q10. Umar got 15 marks out of 20 marks in Islamic study and 22 marks out of 25 marks in Urdu. Compare and tell in which subject he got more percentage marks?**

Sol. Umar marks in Islamic study = 15 out of 20

In percentage =

$$\frac{15}{20}\times 100\% = 75\%.$$

Umar marks in Urdu = 22 out of 25

In percentage =

$$\frac{22}{25}\times 100\% = 88\%$$

As 80% is greater than 75% so, Umar got more percentage of marks in Urdu.

**Q11. Madeeha bought a table in Rs 1500. If its price decreased by 4% during sale, find the decreased price of the table?**

Sol. Original price of table = Rs.1500

Decreased in percentage = 4%

Price decreased by = 4% of 1500

$$= \frac{4}{100}\times 1500 = 60$$

Rs.60 is decreased from the original price.

New price = 1500 – 60 = Rs.1440 Ans.

## Unit – 5
## Sets
### Exercise – 5.1

**Q1. Identify well-defined sets among these.**

**a. A= the set of grades in a school.**

Sol. It is well-defined.

**b. B= the set of interesting games**

Sol. It is not well-defined.

**c. C= the set of the provincial capitals of Pakistan**

Sol. It is well-defined.

**d. D= the set of intelligent students in the class**

Sol. It is not well-defined.

**e. E= the set of easy questions in the exams**

Sol. It is not well-defined.

**f. H = the set of big animals**

Sol. It is not well-defined.

**g. J= the set of the Prime Ministers of Pakistan**

Sol. It is well-defined.

**h. Set of small birds in the sky**

Sol. It is not well-defined.

**i. Set of even numbers between 1 and 5**

Sol. It is well-defined.

**j. (+, -, +, -)**

Sol. It is well-defined.

**k. {1, 3, 5, 7}**

Sol. It is well-defined.

**l. Set of durable tables**

Sol. It is not well-defined.

**m. Set of nice people in the neighborhood**

Sol. It is not well-defined.

**n. Set of beautiful people in a town**

Sol. It is not well-defined.

**Q2. List each element of these sets in symbolic form.**

**a. A={1, 3, 5, 7, 9}**

Sol. $1 \in A, 3 \in A, 5 \in A, 7 \in A, 9 \in A$

**b. B={a, b, c, d, e}**

Sol. $a \in B, b \in B, c \in B, d \in B, e \in B$

**c. C={s, t, a, r}**

Sol. $s \in C,\ t \in C,\ a \in C,\ r \in C$

**d. D={Monday, Wednesday, Friday}**

Sol. $Monday \in D, Wednesday \in D$

$Friday \in D$

**e. E={chips, cookies, burgers, fries}**

Sol. $chips \in E,\ cookies \in E$

$burgers \in E,\ fries \in E$

**Q3. Fill in the blanks using the symbols $\in$ or $\notin$**

a. 5____{1, 4, 5} **Sol.** $\in$

b. 10___set of even numbers **Sol.** $\in$

c. {u}_____{a, e, I, o, u}

**Sol.** $\notin$

d. Tiger ___{set of birds}
Sol. $\notin$

e. January ____set of months of a yearSol. $\in$

**Q4. Write the following statements in symbolic form.**

a. 4 is an element of set W
Sol. $4 \in W$

b. 4 is an element of set P
Sol. $4 \in P$

c. 0 is not the element of natural numbers
Sol. $0 \notin N$

**Q5. If A={1, 3, 5, 7, 11} and B={2, 4, 6, 8, 10} then write true and false for the following statements.**

| | |
|---|---|
| $3 \in A$ | True |
| $5 \notin B$ | True |
| $11 \in A$ | True |
| $0 \notin B$ | True |
| $0 \notin A$ | True |
| $4 \notin B$ | False |
| $11 \in B$ | False |
| $2 \notin A$ | True |
| $12 \notin B$ | True |
| $\{7\} \in A$ | False |

**Q6. Write the cardinality of the following sets.**

a. B={1, 2, 3, 4, 5, 6, 7}
Sol. n(B) = 7

b. Q={a, e, i, o, u}
Sol. n(Q) = 5

c. N={ }
Sol. n(N) = 0

d. K={Maths, Science, Urdu, English}
Sol. n(K) = 4

e. R={2, 4, 6}
Sol. n(R) = 3

f. S={5, 10, 15, 20}
Sol. n(S) = 4

g. P={k, l, m, n, o}
Sol. n(P) = 5

h. E={10, 20, 30, 40, 50}
Sol. n(E) = 5

## Exercise – 5.2

**Q1. Write the following sets in descriptive form.**

a. A={a, b, c, d, e, f}
Sol.A is a set of first six English alphabets.

b. B={1, 3, 5}
Sol. B is the set of first three odd numbers.

c. D={4, 8, 12, 16, ..., 32}
Sol. D is a set of first eight multiples of 4.

d. E={10, 20, 30, ...}
Sol. E is a set of multiples of 10.

e. F={2, 4, 6, 8, 10, 12}
Sol. F is a set of first six multiples of 2.

f. G={ Sunday, Saturday}
Sol. G is a set of names of days of a week starting with S.

**Q2. Identify the well-defined sets and write them in tabular form.**

a. A set of months of Islamic year
Sol. A = { Muharram, Safar, Rabiul-Awwal, Rabi-us-Sani, Jamadi-ul-Awwal, Jamadi-us-Sani, Rajjab, Shaban, Ramzan, Shawal, Zil-Qadah, Zul-Hajah }

b. A set of all odd numbers
Sol. B = {1, 3, 5, 7, 9, ... }

c. A set of all provinces of Pakistan
Sol. C = { Khyber Pakhtunkhwa, Punjab, Sindh, Balochistan }

d. A set of famous Muslim countries
Sol. D = {Pakistan, Saudi Arabia, Bangladesh, Turkey, Iran,...}

e. A set of prime numbers less than 20
Sol. E = {1, 3, 5, 7, 11, 13, 17, 19}

**f. A set of the last seven English alphabets.**

Sol. F = {t, u, v, w, x, y, z}

**g. A set of even numbers between 55 and 77**

Sol. G = {56,58,60,62,64,66,68,70,72,74,76}

**h. A set of composite numbers between 110 and 119**

Sol. H = {111,112,114,115,116,117,118}

## Exercise – 5.3

**Q1. Separate the finite and infinite sets from the following.**

**a. A={10, 15, 20, 25, 30}**

Sol. Finite set

**b. B= set of number less than 20**

Sol. Finite set

**c. C = the set of all persons in Pakistan**

Sol. Infinite set

**d. W = {0, 1, 2, 3, ...}**

Sol. Infinite set

**e. The set of all animals in Lahore zoo.**

Sol. Finite set

**f. Set of all positive integers which are multiple of 6**

Sol. Infinite set

**g. N = {1, 2, 3, ...}**

Sol. Infinite set

**Q2. Identify empty and non-empty sets. Also give reason.**

**a. The set of quadrilaterals with 7 sides.**

Sol. Empty set.

Reason: No quadrilateral has 7 sides.

**b. The set of numbers between 34 and 98**

Sol. Non-empty set.

**c. The set of bicycles having 3 wheels**

Sol. Empty set

Reason: Bicycle has only 2 wheels.

**d. The set of prime numbers**

Sol. Non-empty set.

**e. The set of odd multiples of 4**

Sol. Empty set

Reason: No multiple of 4 is odd.

**f. The set of numbers divisible by 2**

Sol. Non-empty set.

**g. The set of prime numbers which have at least 5 factors**

Sol. Empty set

Reason: Primė number has only two factors.

**Q3. Identify the singleton sets.**

**a. The set of composite numbers less than 5**

Sol. {4} Singleton set.

**b. The set of prime numbers between 8and 12**

Sol. {11} Singleton set.

**c. The set of the provinces of Pakistan.**

Sol. Not a singleton set.

**d. The set of days of the week starting with the letter F.**

Sol. {Friday} Singleton set.

**e. The set of common factors of 12, 40, 55**

Sol. { } empty set

**f. The set of numbers which divide both 8 and 15**

Sol. {1} Singleton set.

**g. The set of multiples of 9 between 10 and 20**

Sol. {18} Singleton set.

**Q4. Draw a Venn diagram which shows A is a subset of B.**

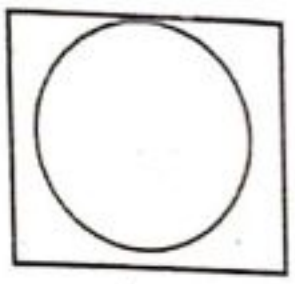
Sol. Venn Diagram of A subset of B

A

## Review exercise – 5

**Q1. Choose the correct option.**

a. A well-defined collection of similar but distinct objects is called a _____.



i. **Set**
ii. Subset
iii. Null set
iv. Infinite set

b. Empty set is denoted by _____.
i. $\{\phi\}$ *or* $\{\ \}$
ii. $\{\ \}$ *or* $\phi$
iii. $\{\phi\}$ *or* 0
iv. {0}

c. A set that consists of a limited number of elements is called a/an _____ set.
i. Equivalent
ii. **Finite**
iii. Empty
iv. Infinite

d. The cardinality of set M = {5, 10, 15, 20, 25} is _____.
i. 2
ii. 3
iii. 4
iv. **5**

e. Elements of a set are denoted by the symbol _____.
i. $\phi$
ii. $\in$
iii. $\neq$
iv. $\supset$

**Q2. Define the following.**

**a. Set**

Sol. A well-defined collection of similar but distinct objects is called a set.

**b. Element of a set**

Sol.The objects of the set are called "elements" or "members" of the set.

**c. Tabular form of a set**

Sol. In tabular form, elements of the set are placed within a curly bracket { } separated by commas.

**d. Descriptive form of a set**

Sol. Descriptive form of a set is represented in the form of statements using well defined words.

**e. Finite set**

Sol. A set that consists of limited number of elements is called a finite set.

**f. Infinite set**

Sol. A set that consists of unlimited number of elements is called a finite set.

**g. Empty set**

Sol.A set that has no element in it is called Empty set.

**h. Singleton set**

Sol. When a set has only one element in it, it is called singleton set.

**Q3. Which of the following sets are well defined?**

**a. The set of 5 triangles with 3 sides**

Sol. Finite set.

**b. The set of even numbers**

Sol. Infinite set.

**c. The set of cars in a showroom**

Sol. Finite set.

**d. The set of prime numbers**

Sol. Infinite set.

**e. The set of grains in the sand**

Sol. Infinite set.

**f. The set of numbers which are divisible by 8**

Sol. Infinite set.

**Q4. List the elements of the following sets.**

**a. The set of 6 countries of world**

Sol. {Pakistan, Saudi Arabia, Iran, Turkey, Bangladesh, Malaysia}

**b. The set of vowels**

Sol. {a, e, i, o, u}

**c. The set of first six months of the year**

Sol. {January, February, March, April, May, June}

**d. The set of colours in a rainbow**

Sol. {Violet, Indigo, Blue, Green, Orange, Yellow, Red}

**e. The set of 5 pet animals**

Sol. {Parrot, Hen, Horse, Cat, Dog}

**Q5. Write the cardinality of the following sets.**

**a. The set of all factors of 45 which are even.**

Sol. Factor of 45 are: 1, 3, 5, 9, 15, 45
No factor is even so, cardinality = 0

**b. The set of prime numbers less than 30**

Sol. {1, 3, 5, 7, 11, 13, 17, 19, 23}
Cardinality = 9

**c. The set of odd numbers divisible by 4.**

Sol. Odd number can't be divisible by 4
Cardinality = 0

**Q6. For P = {10, 20, 30, ...} and Q = {5, 10, 15, 20, ...} which of the following are correct?**

a. $5 \in P$ False

b. $20 \in Q$ Correct

c. $30 \notin Q$ False

d. $50 \in P$ Correct

e. $60 \notin Q$ False

f. $0 \in Q$ False

**Q7. Identify the correct form of the following sets as tabular or descriptive.**

**a. A set of odd number between 5 and 15**

Sol. Tabular form: {7, 9, 11, 13}

**b. A set of prime numbers.**

Sol. Tabular form: {1, 3, 5, 7, 11, ...}

**c. A = {1, 2, 3, 4, 5, 6}**

Sol. Descriptive form: set of first six natural numbers

**d. B = {2, 4, 6, 8, 10}**

Sol. Descriptive form: set of first five multiples of 2.

**e. A set of days of a week**

Sol. Tabular form: {Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday}

**Q8. Write the following sets into tabular form.**

**a. The set of the first five natural numbers**

Sol. A = {1, 2, 3, 4, 5}

**b. The set of all vowels of the Englishalphabet**

Sol. B = {a, e, i, o, u}

**c. The set of all odd numbers less than 9**

Sol. C = {1, 3, 5, 7}

**d. The set of all numbers which divide 12**

Sol. D = {1, 2, 3, 4, 6, 12}

**e. The set of all letters in the word MATHEMATICS**

Sol. E = {m, a, t, h; e, i, c, s}

**f. The set of the last four months of the year**

Sol. F = {September, October, November, December}

**Q9. Write the following sets into descriptive form.**

**a. A = {7, 8, 9, 10}**

Sol. Set of natural numbers between 6 and 11

**b. B = {6, 12, 18, 24, 30}**

Sol. Set of first five multiples of 6

**c. C = {3, 5, 7, 11}**

Sol. Set of odd number 1 and 13

**d. D = {r, e, s, t}**

Sol. Set of letters of word "rest"

**e. E = {5, 10, 15, 20}**

Sol. Set of first four multiples of 5

**Q10. Classify the following sets as finite, infinite, empty or singleton set.**

**a. The set of stars in the sky**

Sol. Infinite set

**b. The set of the sun**

Sol. Singleton set

**c. The set of odd numbers**

Sol. Infinite set

**d. The set of your friends**

Sol. Finite set

**e. The set of all women in the world**

Sol. Infinite set

**f. The set of whole numbers between 88 and 89**

Sol.Empty set

## Unit – 6
## Pattern and Algebraic Expressions
### Exercise – 6.1

**Q1. Identify the term-to-term rules for the following patterns and write the next three terms.**

**a. 4, 9, 14, 19, ___, ___, ___.**

Sol. 4, 9, 14, 19, ___, ___, ___.

The term-to-term rule for the pattern is:

Add 5 to previous term.

The next three terms are:

24, 29, 34Ans.

**b. 8, 16, 32, 64, ___, ___, ___.**

Sol.8, 16, 32, 64, ___, ___, ___.

The term-to-term rule for the pattern is:

Multiply 2 to previous term

The next three terms are:

128, 256, 512Ans.

**c. 78125, 15625, 3125, ___, ___, ___.**

Sol. 78125, 15625, 3125, ___, ___, ___.

The term-to-term rule for the pattern is:

Previous term divide by 5

The next three terms are:

625, 125, 25Ans.

**d. 122, 111, 100, 89, ___, ___, ___.**

Sol. 122, 111, 100, 89, ___, ___, ___.

The term-to-term rule for the pattern is:

Subtract 11 form previous term

The next three terms are:

78, 67, 56Ans.

**e. 5, 10, 20, 40, ___, ___, ___.**

Sol. 5, 10, 20, 40, ___, ___, ___.

The term-to-term rule for the pattern is:

Multiply 2 to previous term

The next three terms are:

80, 160, 320Ans.

**f. 26, 42, 58, 74, ___, ___, ___.**

Sol. 26, 42, 58, 74, ___, ___, ___.

The term-to-term rule for the pattern is:

Add 16 in previous term

The next three terms are:

90, 106, 122Ans.

**Q2. Identify the position-to-term rule for the following patterns and find:**

a) $8^{th}$ term
b) $30^{th}$ term
c) $100^{th}$ term

**i. 10,11,12,13,14,15,16...**

Sol.10,11,12,13,14,15,16...

| Position | Term | Rule |
|---|---|---|
| 1 | 10 | 1 + 9 |
| 2 | 11 | 2 + 9 |
| 3 | 12 | 3 + 9 |
| 4 | 13 | 4 + 9 |
| 5 | 14 | 5 + 9 |
| 6 | 15 | 6 + 9 |
| 7 | 16 | 7 + 9 |

$8^{th}$ term: 8 + 9 = 17

30th term: 30 + 9 = 39

100th term: 100 + 9 = 109

ii. **10,20,30,40,50,60,70...**

Sol.10,20,30,40,50,60,70...

| Position | Term | Rule |
|---|---|---|
| 1 | 10 | 1×10 |
| 2 | 20 | 2×10 |
| 3 | 30 | 3×10 |
| 4 | 40 | 4×10 |
| 5 | 50 | 5×10 |
| 6 | 60 | 6×10 |
| 7 | 70 | 7×10 |

8th term: 8×10= 80

30th term: 30×10 = 300

100th term: 100×10 = 1000

iii. **28,29,30,31,32,33,34...**

Sol.28,29,30,31,32,33,34...

| Position | Term | Rule |
|---|---|---|
| 1 | 28 | 1+27 |
| 2 | 29 | 2+27 |
| 3 | 30 | 3+27 |
| 4 | 31 | 4+27 |
| 5 | 32 | 5+27 |
| 6 | 33 | 6+27 |
| 7 | 34 | 7+27 |

8th term: 8 + 27 = 35

30th term: 30 + 27 = 57

100th term: 100 + 27 = 127

iv. **5,10,15,20,25,30,35...**

Sol.5,10,15,20,25,30,35...

| Position | Term | Rule |
|---|---|---|
| 1 | 5 | 1×5 |
| 2 | 10 | 2×5 |
| 3 | 15 | 3×5 |
| 4 | 20 | 4×5 |
| 5 | 25 | 5×5 |
| 6 | 30 | 6×5 |
| 7 | 35 | 7×5 |

8th term: 8×5 = 40

30th term: 30×5 = 150

100th term: 100×5= 500

v. **15,30,45,60,75,90,105...**

Sol.15,30,45,60,75,90,105...

| Position | Term | Rule |
|---|---|---|
| 1 | 15 | 1×15 |
| 2 | 30 | 2×15 |
| 3 | 45 | 3×15 |
| 4 | 60 | 4×15 |
| 5 | 75 | 5×15 |
| 6 | 90 | 6×15 |
| 7 | 105 | 7×15 |

8th term: 8×15 = 120

30th term: 30×15 = 450

100th term: 100 ×15 = 1500

**Q3. Ahad daily read the storybook. On Monday, he read 3 pages. The next day, he read 6 pages. On Wednesday, he read 9 pages. If he keeps increasing the number of pages daily, how many pages will he read on Thursday and Friday?**

Sol. On Monday = 3 pages

On Tuesday = 6 pages

On Wednesday = 9 pages

Pattern = 3, 6, 9, 12, 15

On Thursday 12 pages. On Friday 15 pages

**Q4. Rida goes for a walk in the nearby park. On Monday, she completes 2 round of the walking track. The next day, she completes 4 rounds of the walking track. On Wednesday, she completes 6 rounds. If she keeps increasing the number of rounds daily, how many rounds does she complete over the next three days of the week?**

Sol.

On Monday = 2 rounds

On Tuesday = 4 rounds

On Wednesday = 6 rounds

Pattern = 2, 4, 6, 8, 10, 12, 14, ...

On next three days number of rounds are 8, 10 and 12.

## Exercise – 6.2

**Q1. Underline the variables in each of the following.**

a. $3 - y = 4$

Sol. $3 - \underline{y} = 4$

b. $a + 3 = 30$

Sol. $\underline{a} + 3 = 30$

c. $1 + b = 0$

Sol. $1 + \underline{b} = 0$

d. $10c - 4 = 15$

Sol. $10\underline{c} - 4 = 15$

e. $3 \times 8 = z$

Sol. $3 \times 8 = \underline{z}$

f. $4 + 5 = s$

Sol. $4 + 5 = \underline{s}$

g. $18 + x = 23$

Sol. $18 + \underline{x} = 23$

h. $m \times 6 = 18$

Sol. $\underline{m} \times 6 = 18$

**Q2. Use letters instead of symbols in each of these statements.**

a. $2 - \square = 3$

Sol. $2 - y = 3$

b. $\Delta + 5 = 20$

Sol. $y + 5 = 20$

c. $4 + \square = 6$

Sol. $4 + p = 6$

d. $\square - 7 = 14$

Sol. $- 7 = 14$

e. $3 \times \Delta = 6$

Sol. $3 \times X = 6$

f. $9 + \square = 1$

Sol. $9 + Z = 1$

## Exercise – 6.3

**Q1. Write the terms of the following algebraic expressions.**

a. $4a + 5b$

Sol. Terms: 4a, 5b

b. $4y - 3x - 4$

Sol. Terms: 4y, - 3x, - 4

c. $6x - y + 7$

Sol. Terms: 6x, -y, 7

d. $3x^2 + y^2$

Sol. Terms: $3x^2, y^2$

e. $abc - d$

Sol. Terms: abc, -d

f. $11x^3 + xyz^2 + 4$

Sol. Terms: $11x^3, xyz^2, 4$

g. $4x^3 + 5y^3 + 4$

Sol. Terms: $4x^3, 5y^3, 4$

h. $a^2 - b^2 + 3$

Sol. Terms: $a^2, b^2, 3$

**Q2. Identify variable, coefficient and constant in each algebraic expressions.**

**Sol.**

| Expressions | Variable | Coefficient | Constant |
|---|---|---|---|
| $x^2 + 3$ | x | 1 | 3 |
| $7y^3 + z - 1$ | y,z | 7 | -1 |
| $2a + 7b^2$ | a, b | 2, 7 | 0 |
| $\frac{1}{2}y^4 + 6$ | y | $\frac{1}{2}$ | 6 |
| $7a - 4b + c^2$ | a, b, c | 7, - 4, 1 | 0 |

**Q3. Write the algebraic expressions whose terms are given below.**

a. $3a, -2b$

Sol. $3a, -2b$

Expression: $3a, -2b$

b. 3y, - 4z , 1

Sol. Expression: 3y - 4z + 1

c. $9x^2, -y^2, 5$

Sol. Expression: $9x^2 - y^2 + 5$

d. $x^2, -y^2$

Sol. Expression: $x^2 - y^2$

e. $6abc, -bcd, 2de$

Sol. Expression: $6abc - bcd + 2de$

f. $13x^4, xy^2, 7$

Sol. Expression: $13x^4 + xy^2 + 7$

**Q4. List out the like terms in each of the following sets.**

a. $7a - 5a + 8b - a + \frac{a}{3}$

Sol. Like terms are: $7a,\ -5a, -a, \frac{a}{3}$

b. $2p^3q^2 + 4p^2q^3 + 7p^2q^3 - 2p^3q^2$

Sol.Like terms are:

$2p^3q^2,\ -2p^3q^2$ *and*

$4p^2q^3,\ 7p^2q^3$

c. $-xy + 3y + 5xy - x - xy - 11$

Sol.Like terms are: $-xy, 5xy, -xy$

d. $2x^2y + 3x^3y + 2xy^2 + 4yx^2 - 2x^2y - 3yx^2$

Sol.Like terms are:

$2x^2y, 4yx^2, -2x^2y, -3yx^2$

e. $a^2b^3 - 5a^3b^2 + 7a^3b^2 + 11a^3b^3 - 3b^2a^3$

Sol.Like terms are:

$-3b^2a^3 - 5a^3b^2,\ 7a^3b^2$

## Exercise - 6.4

**Q1. Substitute the given value for the variables to evaluate each expression.**

a. 3y + 2y when y = 5

Sol. 3y + 2y when y = 5

3y + 2y = 3(5) + 2(5)

3y + 2y = 15 + 10 = 25 **Ans.**

b. 2a – 3b + c when a = 3, b= –2 , and c = 4.

Sol.2a – 3b + c when a = 3, b= –2 , and c = 4.

2a – 3b + c = 2(3) – 3(-2) + 4

2a – 3b + c = 6 + 6 + 4 = 16 **Ans.**

c. $3(x^2 + 4x) - 3y$ when x = –5 , and y = 3

Sol. $3(x^2 + 4x) - 3y$ when x = –5 , and y = 3

$\Rightarrow 3(x^2 + 4x) - 3y$

$= 3((-5)^2 + 4(-5)) - 3(3)$

$\Rightarrow 3(x^2 + 4x) - 3y$

$= 3(25 - 20) - 9$

$\Rightarrow 3(x^2 + 4x) - 3y$

$= 3(5) - 9 = 15 - 9 = 6$ **Ans.**

d. $x^2y$ when x = –3 and y = –4

Sol. $x^2y$ when x = –3 and y = –4

$x^2y = (-3)^2(-4)$

$x^2y = 9(-4) = -36$ **Ans.**

e. $(b-d)^2$ when b = 9 and d = –3

Sol. $(b-d)^2$ when b = 9 and d = –3

$(b-d)^2 = (9-(-3))^2$

$(b-d)^2 = (9+3)^2 = (12)^2$

$(b-d)^2 = 144$ **Ans.**

f. $m^4+2m^3-m^2+8$ when $m=-2$

Sol. $m^4+2m^3-m^2+8$ when $m=-2$

$\Rightarrow m^4+2m^3-m^2+8$

$=(-2)^4+2(-2)^3-(-2)^2+8$

$\Rightarrow 16+2(-8)-4+8$

$\Rightarrow 16-16+4=4$ **Ans.**

g. $\frac{3x}{2}+1$ when $x=-5$

Sol. $\frac{3x}{2}+1$ when $x=-5$

$\frac{3x}{2}+1=\frac{3(-5)}{2}+1$

$\frac{3x}{2}+1=\frac{-15}{2}+\frac{1}{1}$

$\frac{3x}{2}+1=\frac{-15+2}{2}=-\frac{13}{2}$ **Ans.**

h. $5y^2-2(x^2-4x)-5y$ when x = 2 and y = $-2$

Sol. $5y^2-2(x^2-4x)-5y$ when x = 2 and y = $-2$

$\Rightarrow 5y^2-2(x^2-4x)-5y$

$\Rightarrow 5(-2)^2-2((2)^2-4(2))-5(-2)$

$\Rightarrow 5(4)-2(4-8)+10$

$\Rightarrow 20+8+10=38$ **Ans.**

**Q2. Verify the following when:**

$p=2, q=-3, s=5$

**a. p+(q+s)=(p+q)+s**

Sol. p+(q+s)=(p+q)+s

| p+(q+s) | (p+q)+s |
|---|---|
| $2+(-3+5)$ | $(2+(-3))+5$ |
| $\Rightarrow 2+(2)$ | $\Rightarrow (-1)+5$ |
| $\Rightarrow 4$ | $\Rightarrow 4$ |

**p+(q+s)=(p+q)+s Verified.**

**b. p(q+s)=pq+ps**

Sol.p(q+s)=pq+ps

| p(q+s) | pq+ps |
|---|---|
| $2(-3+5)$ | $2(-3)+2(5)$ |
| $\Rightarrow 2(2)$ | $\Rightarrow -6+10$ |
| $\Rightarrow 4$ | $\Rightarrow 4$ |

**p(q+s)=pq+ps Verified.**

**c. (p+s)q=pq+sq**

Sol.(p+s)q=pq+sq

| (p+s)q | pq+sq |
|---|---|
| $(2+5)(-3)$ | $2(-3)+5(-3)$ |
| $\Rightarrow (7)(-3)$ | $\Rightarrow -6-15$ |
| $\Rightarrow -21$ | $\Rightarrow -21$ |

**(p+s)q=pq+sq Verified.**

**d. q(p-s)=qp-qs**

Sol.q(p-s)=qp-qs

| q(p-s) | pq-qs |
|---|---|
| $-3(2-5)$ | $2(-3)-(-3)(5)$ |
| $\Rightarrow -3(-3)$ | $\Rightarrow -6+15$ |
| $\Rightarrow 9$ | $\Rightarrow 9$ |

**q(p-s)=qp-qs Verified.**

**Q3. If x = 3 and y = 2, then prove that**

$(x+y)^2=x^2+2xy+y^2$

Sol. $(x+y)^2=x^2+2xy+y^2$

| $(x+y)^2$ | $x^2+2xy+y^2$ |
|---|---|
| $\Rightarrow (2+3)^2$ | $(3)^2+2(3)(2)+(2)^2$ |
| $\Rightarrow (5)^2$ | $9+12+4$ |
| $\Rightarrow 25$ | $25$ |

$(x+y)^2=x^2+2xy+y^2$ **Proved.**

**Q4. If a = 1, b = 3 and c = 1, then evaluate** $4b^2-2ac$

Sol. $4b^2-2ac$

$4b^2-2ac=4(3)^2-2(1)(1)$

$4b^2-2ac=4(9)-2$

$4b^2-2ac=36-2=34$ **Ans.**

## Exercise – 6.5

**Q1. Add the following algebraic expressions horizontally.**

**a. ab, ab**

Sol. ab, ab

ab + ab = 2ab**Ans.**

**b.** $7x^3, 9x^3$

Sol. $7x^3, 9x^3$

$7x^3+9x^3=16x^3$ **Ans.**

**c.** $14x, 3x, -7x$

Sol. $14x, 3x, -7x$

$14x+3x-7x=10x$ **Ans.**

**d. 12y, 7y, y**

Sol. 12y, 7y, y

12y + 7y + y = 20y **Ans.**

**e.** $3yz, -4yz, yz$

Sol. $3yz, -4yz, yz$

$3yz-4yz+yz=0$ **Ans.**

**f.** $3x+2y, x+y$

Sol. $3x+2y, x+y$

$3x+2y+x+y=4x+3y$ **Ans.**

**g. 4x + 3y +3, 3x + 5y + 5**

Sol. 4x + 3y +3, 3x + 5y + 5

4x + 3y +3 + 3x + 5y + 5 = 7x+8y+8 **Ans.**

**h.** $-9x^2+5x-4, x^2+2x+1$

Sol. $-9x^2+5x-4, x^2+2x+1$

$\Rightarrow -9x^2+5x-4+x^2+2x+1$

$=-8x^2+7x-3$ **Ans.**

**i.** $6x+3y-4z, 6x+8y+9z$

Sol. $6x+3y-4z, 6x+8y+9z$

$\Rightarrow 6x+3y-4z+6x+8y+9z$

$=12x+11y+5z$ **Ans.**

**j.** $7x^2+8y, 7-2x^2, 6+4x^2$

Sol. $7x^2+8y, 7-2x^2, 6+4x^2$

$\Rightarrow 7x^2+8y+7-2x^2+6+4x^2$

$=9x^2+8y+13$ **Ans.**

**Q2. Add the following expressions vertically.**

**a.** $5x+y, x-9y$

Sol. $5x+y, x-9y$

$$\begin{array}{r} 5x+y \\ x-9y \\ \hline 6x-8y \end{array}$$ **Ans.**

**b.** $5x^3-2y^3, 7x^3-3y^3$

Sol. $5x^3-2y^3, 7x^3-3y^3$

$$\begin{array}{r} 5x^3-2y^3 \\ 7x^3-3y^3 \\ \hline 12x^3-5y^3 \end{array}$$ **Ans.**

**c.** $x+3y-2z, x-y+z$

Sol. $x+3y-2z, x-y+z$

$$\begin{array}{r} x+3y-2z \\ x-y+z \\ \hline 2x+2y-z \end{array}$$ **Ans.**

**d.** $2x+9y-7, x-y+2$

Sol. $2x+9y-7, x-y+2$

$$\begin{array}{r} 2x+9y-7 \\ x-\ y+2 \\ \hline 3x+8y-5 \end{array}$$ **Ans.**

e. $5x^2+4y^2,-7x^2-5$

Sol. $5x^2+4y^2,-7x^2-5$

$$\begin{array}{r} 5x^2+4y^2 \\ -7x^2\quad -5 \\ \hline -2x^2+4y^2-5 \end{array}$$ **Ans.**

f. $-3x^2+3,x^2+5$

Sol. $-3x^2+3,x^2+5$

$$\begin{array}{r} -3x^2+3 \\ x^2+5 \\ \hline -2x^2+8 \end{array}$$ **Ans.**

g. $a^2+b^2+c^2-3abc,$
$a^2-b^2+c^2+abc$

Sol. $a^2+b^2+c^2-3abc,a^2-b^2+c^2+abc$

$$\begin{array}{r} a^2+b^2+c^2-3abc \\ a^2-b^2+c^2+\ abc \\ \hline 2a^2\quad +2c^2-2abc \end{array}$$ **Ans.**

h. $x^2+5x+6,3x^2+4x,2x^2-x-3$

Sol. $x^2+5x+6,3x^2+4x,$ and $2x^2-x-3$

$$\begin{array}{r} x^2+5x+6 \\ 3x^2+4x \\ 2x^2-\ x-3 \\ \hline 6x^2+8x+3 \end{array}$$ **Ans.**

i. $(6a+8b-7c)+(2b+c-4a)+(a-3b-2c)$

Sol. $(6a+8b-7c)+(2b+c-4a)+(a-3b-2c)$

$$\begin{array}{r} 6a+8b-7c \\ -4a+2b+\ c \\ a-3b-2c \\ \hline 3a+7b-8c \end{array}$$ **Ans.**

j. $8x^2-5xy+3y^2,2xy-6y^2$
$-3x^2,y^2+xy-6x^2$

Sol. $8x^2-5xy+3y^2,2xy-6y^2$
$-3x^2,y^2+xy-6x^2$

$$\begin{array}{r} 8x^2-5xy+3y^2 \\ -3x^2+2xy-6y^2 \\ -6x^2+\ xy+\ y^2 \\ \hline x^2-2xy-2y^2 \end{array}$$ **Ans.**

**Q5. Subtract the following algebraic terms horizontally.**

a. $-ab$ *from* $3ab$

Sol. $-ab$ *from* $3ab$

$\Rightarrow 3ab-(-ab)=3ab+ab$

$\Rightarrow 4ab$ **Ans.**

b. $4x^3$ *from* $-9x^3$

Sol. $4x^3$ *from* $-9x^3$

$\Rightarrow -9x^3-(4x^3)=-9x^3-4x^3$

$\Rightarrow -13x^3$ **Ans.**

c. $8y$ *from* $-7y$

Sol. $8y$ *from* $-7y$

$\Rightarrow -7y-8y$

$\Rightarrow -15y$ **Ans.**

**d. – 15y from y**

Sol. – 15y from y

$\Rightarrow y-(-15y)=y+15y$

$\Rightarrow 16y$ **Ans.**

**e. 3xz from – 4xz**

Sol. 3xz from – 4xz

$\Rightarrow -4xz-3xz$

$\Rightarrow -7xz$ **Ans.**

**f. 7x+4y from – x – y**

Sol. 7x+4y from – x – y

$\Rightarrow (-x-y)-(7x+4y)$

$\Rightarrow -x-y-7x-4y$

$\Rightarrow -8x-5y$ **Ans.**

**g.** $-6x+2y^2+3$ *from* $3x-5y^2-5$

Sol. $-6x+2y^2+3$ *from* $3x-5y^2-5$

$\Rightarrow (3x-5y^2-5)-(-6x+2y^2+3)$

$\Rightarrow 3x-5y^2-5+6x-2y^2-3$

$\Rightarrow 9x-7y^2-8$ **Ans**

**h.** $-10x^2+3x-2$ *from* $x^2-5x+9$

Sol. $-10x^2+3x-2$ *from* $x^2-5x+9$

$\Rightarrow (x^2-5x+9)-(-10x^2+3x-2)$

$\Rightarrow x^2-5x+9+10x^2-3x+2$

$\Rightarrow 11x^2-8x+11$ **Ans.**

**i. 5x – 2y – z from 6x+8y – z**

Sol. 5x – 2y – z from 6x+8y – z

$\Rightarrow (6x+8y-z)-(5x-2y-z)$

$\Rightarrow 6x+8y-z-5x+2y+z$

$\Rightarrow x+10y$ **Ans.**

**j.** $8x^2-8y$ *from* $7-2x^2$

Sol. $8x^2-8y$ *from* $7-2x^2$

$\Rightarrow (7-2x^2)-(8x^2-8y)$

$\Rightarrow 7-2x^2-8x^2+8y$

$\Rightarrow -10x^2+8y+7$ **Ans.**

**Q4. Subtract the following expression vertically.**

**a. 4a + 5b – 3c from 6a – 3b + c**

Sol. 4a + 5b – 3c from 6a – 3+bc

$$\begin{array}{r} 6a-3b+c \\ \pm 4a \pm 5b \mp 3c \\ \hline 2a-8b+4c \end{array}$$ **Ans.**

**b.** $3x^2-6x-4$ *from* $5+x-2x^2$

Sol. $3x^2-6x-4$ *from* $5+x-2x^2$

$$\begin{array}{r} -2x^2+x+5 \\ \pm 3x^2 \mp 6x \mp 4 \\ \hline -5x^2+7x+9 \end{array}$$ **Ans:**

**c. 3x + y – 3z from 9x – 5y + z**

Sol. 3x + y – 3z from 9x – 5y + z

$$\begin{array}{r} 9x-5y+z \\ \pm 3x \pm y \mp 3z \\ \hline 6x-6y+4z \end{array}$$ **Ans.**

**d. 2x + 9y – 7 from x – y + 2**

Sol. 2x + 9y – 7 from x – y + 2

$$\begin{array}{r} x-y+2 \\ \pm 2x \pm 9y \mp 7 \\ \hline -x-10y+9 \end{array}$$ **Ans.**

**e.** $-7x^2-5$ *from* $4x^2-5$

Sol. $-7x^2-5$ *from* $4x^2-5$

$$\begin{array}{r} 4x^2-5 \\ \mp 7x^2 \mp 5 \\ \hline 11x^2 \end{array}$$ **Ans.**

f. $-7x^2+5y-4$ *from* $x^2-5y+2$

Sol. $-7x^2+5y-4$ *from* $x^2-5y+2$

$$x^2-5y+2$$
$$\underline{\mp 7x^2 \pm 5y \mp 4}$$
$$8x^2-10y+6 \quad \textbf{Ans.}$$

g. $9x^2-5x+6$ *from* $-3x^2-4x-3$

Sol. $9x^2-5x+6$ *from* $-3x^2-4x-3$

$$-3x^2-4x-3$$
$$\underline{\pm 9x^2 \mp 5x \pm 6}$$
$$-12x^2+x-9 \quad \textbf{Ans.}$$

h. **4a + 7b – 7c from 9b – c – 3a**

Sol. 4a + 7b – 7c from 9b – c – 3a

$$-3a+9b-c$$
$$\underline{\pm 4a \pm 7b \mp 7c}$$
$$-7a+2b+6c \quad \textbf{Ans.}$$

i. $10x^2-xy+z^2$ *from* $z^2+xy-7x^2$

Sol. $\left(z^2+xy-7x^2\right)-\left(10x^2-xy+z^2\right)$

$$-7x^2+xy+z^2$$
$$\underline{\pm 10x^2 \mp xy \pm z^2}$$
$$-17x^2+2xy \quad \textbf{Ans.}$$

j. $7a^2+5b^2-c^2-3abc$ *from* $4a^2-b^2+6c^2-7abc$

Sol. $\left(4a^2-b^2+6c^2-7abc\right)-\left(7a^2+5b^2-c^2-3abc\right)$

$$4a^2-b^2+6c^2-7abc$$
$$\underline{\pm 7a^2 \pm 5b^2 \mp c^2 \mp 3abc}$$
$$-3a^2-6b^2+7c^2-4abc \quad \textbf{Ans.}$$

**Q5. Subtract $x^2+y^2+3xy$ from $4x^2+2xy-3y^2$**

Sol. $\left(4x^2+2xy-3y^2\right)-\left(x^2+y^2+3xy\right)$

$$4x^2-3y^2+2xy$$
$$\underline{\pm x^2 \pm y^2 \pm 3xy}$$
$$3x^2-4y^2-xy \quad \textbf{Ans.}$$

**Q6. What should be subtracted from $a^3-4a^2+5a-6$ to obtain $a^2-2a+1$?**

Sol. to obtain the required result we will subtract $a^2-2a+1$ from $a^3-4a^2+5a-6$

$$a^3-4a^2+5a-6$$
$$\underline{\pm a^2 \mp 2a \pm 1}$$
$$a^3-5a^2+7a-7 \quad \textbf{Ans.}$$

**Q7. Subtract $5a^3-2a^2+a-6$ from the sum of $6a^3+a^2+1$ and $a^2-4$**

Sol. First we find the sum of $6a^3+a^2+1$ and $a^2-4$

$$\Rightarrow 6a^3+a^2+1+a^2-4$$
$$\Rightarrow 6a^3+2a^2-3$$

Now we perform subtraction

$$6a^3+2a^2 \quad -3$$
$$\underline{\pm 5a^3 \mp 2a^2 \pm a \mp 6}$$
$$a^3+4a^2-a+3 \quad \textbf{Ans.}$$

**Q8. If X = a – b + c, Y = a + b + c and Z = a – b – c then find**

**a. X + Y**

Sol. X + Y

For X = a – b + c, Y = a + b + c and Z = a – b – c

X + Y = (a – b + c) + (a + b + c)

X + Y = a – b + c + a + b + c

X + Y = **2a + 2c Ans.**

**b. X – Z**

Sol. X – Z

For X = a – b + c and Z = a – b – c

X – Z = (a – b + c) – (a – b – c)

X – Z = a – b + c – a + b + c

X – Z = **2c Ans.**

**c. Y + Z**

Sol.Y + Z

For Y = a + b + c and Z = a – b – c

Y + Z = a + b + c + a – b – c

Y + Z = **2a Ans.**

**d. Z – X**

Sol. Z – X

For X = a – b + c and Z = a – b – c

Z – X = (a – b – c) – (a – b + c)

Z – X = a – b – c – a + b – c

Z – X = **– 2c Ans.**

**e. X + Y – Z**

Sol. X + Y – Z

For X = a – b + c, Y = a + b + c and Z = a – b – c

X + Y – Z = a – b + c + a + b + c – (a – b – c)

X + Y – Z = a – b + c + a + b + c – a + b + c

X + Y – Z = a + b +3c Ans.

**f. X – Y – Z**

Sol. X – Y – Z

For X = a – b + c, Y = a + b + c and Z = a – b – c

X – Y – Z = (a – b + c) – (a + b + c) – (a – b – c)

X – Y – Z = a – b + c – a – b – c – a + b + c

X – Y – Z = – a – b + c Ans.

**g. – X – Y + Z**

Sol. – X – Y + Z

For X = a – b + c, Y = a + b + c and Z = a – b – c

– X – Y + Z = – (a – b + c) – (a + b + c) + (a – b – c)

– X – Y + Z = – a + b – c – a – b – c + a – b – c

– X – Y + Z = **– a – b – 3c Ans.**

## Exercise – 6.6

**Q1. Simplify the following.**

**a. 2 (4x + 2)**

Sol. 2 (4x + 2)

$\Rightarrow 8x+4$ **Ans.**

**b. 2 + 2x {2 (3x + 2) + 2}**

Sol.2 + 2x {2 (3x + 2) + 2}

$\Rightarrow 2+2x\{6x+4+2\}$

$\Rightarrow 2+2x\{6x+6\}$

$\Rightarrow 2+12x^2+12x$ **Ans.**

c. $\left[6x-\{3x+(2x-x)\}\right]$

Sol. $\left[6x-\{3x+(2x-x)\}\right]$

$\Rightarrow \left[6x-\{3x+2x-x\}\right]$

$\Rightarrow \left[6x-3x-2x+x\right]$

$\Rightarrow 2x$ **Ans.**

d. $\left[7l-\{4m-(4m-2m)\}\right]$

Sol. $\left[7l-\{4m-(4m-2m)\}\right]$

$\Rightarrow \left[7l-\{4m-(2m)\}\right]$

$\Rightarrow \left[7l-\{4m-2m\}\right]$

$\Rightarrow [7l - \{2m\}]$

$\Rightarrow 7l - 2m$ **Ans.**

e. $3u + \{v - (2u - \overline{t+v})\}$

Sol. $3u + \{v - (2u - \overline{t+v})\}$

$\Rightarrow 3u + \{v - (2u - t - v)\}$

$\Rightarrow 3u + \{v - 2u + t + v\}$

$\Rightarrow 3u + v - 2u + t + v$

$\Rightarrow u + 2v + t$ **Ans.**

f. $2 + 3x\{4(x+2)+2\}$

Sol. $2 + 3x\{4(x+2)+2\}$

$\Rightarrow 2 + 3x\{4x + 8 + 2\}$

$\Rightarrow 2 + 12x^2 - 24x - 6x$

$\Rightarrow 12x^2 - 30x + 2$ **Ans.**

g. $11a - \{5b - 3(2a+b)\}$

Sol. $11a - \{5b - 3(2a+b)\}$

$\Rightarrow 11a - \{5b - 6a - 3b\}$

$\Rightarrow 11a - 5b + 6a + 3b$

$\Rightarrow 17a - 2b$ **Ans.**

h. $8\{3(4a+5b) - 2(6a-5b)\}$

Sol. $8\{3(4a+5b) - 2(6a-5b)\}$

$\Rightarrow 8\{12a + 15b - 12a + 10b\}$

$\Rightarrow 8\{25b\} = 200b$ **Ans.**

i. $\left[4y + 6z\left\{7\left(2y - \overline{y+2}\right) + z\right\}\right]$

Sol. $\left[4y + 6z\left\{7\left(2y - \overline{y+2}\right) + z\right\}\right]$

$\Rightarrow \left[4y + 6z\{7(2y - y - 2) + z\}\right]$

$\Rightarrow \left[4y + 6z\{14y - 7y - 14 + z\}\right]$

$\Rightarrow \left[4y + 6z\{7y - 14 + z\}\right]$

$\Rightarrow 4y + 42yz + 6z^2 - 84z$ **Ans.**

j. $8a + 4\left[\left(6a + \overline{2b+3b}\right) - 2c\right]$

Sol. $8a + 4\left[\left(6a + \overline{2b+3b}\right) - 2c\right]$

$\Rightarrow 8a + 4\left[(6a + 2b + 3b) - 2c\right]$

$\Rightarrow 8a + 4[6a + 5b - 2c]$

$\Rightarrow 8a + 4[6a + 5b - 2c]$

$\Rightarrow 8a + 24a + 20b - 8c$

$\Rightarrow 32a + 20b - 8c$ **Ans.**

## Review exercise – 6

**Q1. Choose the correct option.**

a. In algebra, a fixed or unchanged value is called a _____.
   - **i. Constant**
   - ii. Variable
   - iii. Term
   - iv. Coefficient

b. Unlike terms are those terms whose _____ are different with different exponents.
   - i. Signs
   - **ii. Variable**
   - iii. Coefficients
   - iv. Constant

c. In $3x^2$, 2 is the _____.
   - i. Variable
   - ii. Constant
   - iii. Coefficient
   - **iv. Exponent**

d. If a = 1, b = 2, the value of the expression $a^2 + 2a - b$ is _____.
   - **i. 1**
   - ii. 0

iii. $-1$
iv. 2

e. If $x = 3, y = 2$ then $3x^2y =$ _____
i. $-54$
ii. **54**
iii. 36
iv. $-36$

**Q2. Identify the position-to-term rule for the pattern and find $20^{th}$ term.**

11, 22, 33, 44, 55, ...

Sol. 11, 22, 33, 44, 55, ...

| Position | Term | Rule |
|---|---|---|
| 1 | 11 | 1×11 |
| 2 | 22 | 2×11 |
| 3 | 33 | 3×11 |
| 4 | 44 | 4×11 |
| 5 | 55 | 5×11 |

$20^{th}$ term: 20×11=220 **Ans.**

**Q3. Identify the position-to-term rule for the pattern and find the $55^{th}$ term.**

16, 17, 18, 19, 20, 21,...

Sol. 16, 17, 18, 19, 20, 21,...

| Position | Term | Rule |
|---|---|---|
| 1 | 16 | 1+15 |
| 2 | 17 | 2+15 |
| 3 | 18 | 3+15 |
| 4 | 19 | 4+15 |
| 5 | 20 | 5+15 |
| 6 | 21 | 6+15 |

$55^{th}$ term: 55+15=65 **Ans.**

**Q4. Identify the term-to-term rules for the following patterns and write the next three terms.**

**a. 15, 21, 27, 33, ___, ___, ___.**

Sol. 15, 21, 27, 33, ___, ___, ___.

The term-to-term rule for the pattern is:

6 is added to previous terms.

The next three terms are:

39, 45, 51.

**b. 5, 10, 20, 40, 80, ___, ___, ___.**

Sol. 5, 10, 20, 40, 80, ___, ___, ___.

The term-to-term rule for the pattern is:

2 is multiplied with previous terms.

The next three terms are:

160, 320, 640.

**Q5. Subtract the following.**

**a. $-3x-5y-z$ from $3x-6y-6z$**

Sol. $-3x-5y-z$ from $3x-6y-6z$

$$\begin{array}{r} 3x-6y-6z \\ \mp 3x \mp 5y \mp z \\ \hline 6x-y-5z \end{array}$$ **Ans.**

**b. $19p-q+r$ from $8p-3q-4r$**

Sol. $19p-q+r$ from $8p-3q-4r$

$$\begin{array}{r} 8p-3q-4r \\ \pm 19p \mp q \pm r \\ \hline -11p-2q-5r \end{array}$$ **Ans.**

**Q6. Simplify**

a. $\left[9x^2-\left\{x^2-5y(5x-2y)\right\}\right]$

Sol. $\left[9x^2-\left\{x^2-5y(5x-2y)\right\}\right]$

$\Rightarrow \left[9x^2-\left\{x^2-25xy+10y^2\right\}\right]$

$\Rightarrow \left[9x^2-x^2+25xy-10y^2\right]$

$\Rightarrow 8x^2+25xy-10y^2$ **Ans.**

b. $x-\left[2y-\left\{3x-(2y+3z)\right\}\right]$

Sol. $x-\left[2y-\left\{3x-(2y+3z)\right\}\right]$

$\Rightarrow x-\left[2y-\left\{3x-2y-3z\right\}\right]$

$\Rightarrow x-\left[2y-3x+2y+3z\right]$

$\Rightarrow x-2y+3x-2y-3z$

$\Rightarrow 4x-4y-3z$ **Ans.**

**Q7. If $x=-2, y=4$ and $z=5$, then find the value of the following.**

a. $9x-5y+z$

Sol. $9x-5y+z$

For $x=-2, y=4$ *and* $z=5$

$9x-5y+z=9(-2)-5(4)+5$

$9x-5y+z=-18-20+5$

$9x-5y+z=$ **-33 Ans.**

b. $5x^2+y-z$

Sol. $5x^2+y-z$

For $x=-2, y=4$ *and* $z=5$

$5x^2+y-z=5(-2)^2+4-5$

$5x^2+y-z=5(4)-1$

$5x^2+y-z=$ **19 Ans.**

c. $-2x^2-x-5$

Sol. $-2x^2-x-5$

For $x=-2, y=4$ *and* $z=5$

$-2x^2-x-5=-2(-2)^2-(-2)-5$

$-2x^2-x-5=-2(4)+2-5$

$-2x^2-x-5=-8-3=$ **-11 Ans.**

d. $6xy-yz+z$

Sol. $6xy-yz+z$

For $x=-2, y=4$ *and* $z=5$

$6xy-yz+z=6(-2)(4)-(4)(5)+5$

$6xy-yz+z=-48-20+5$

$6xy-yz+z=$ **-63 Ans.**

## Unit – 7
## Linear Expressions and Equations

### Exercise – 7.1

**Q1. Identify the following as algebraic equations or expressions.**

**a.** $2x + 3y = 13$

Sol. Algebraic equation.

**b.** $5x = 3y$

Sol. Algebraic equation.

**c.** $n = mc^2$

Sol. Algebraic equation.

**d.** $6x - 3y$

Sol. Algebraic Expression.

**e.** $10b + 4 = 14$

Sol. Algebraic equation.

**f.** $8x + 9y$

Sol. Algebraic Expression.

**g.** $3s + 4t$

Sol. Algebraic Expression.

**h.** $x^2 + 3x = 45$

Sol. Algebraic equation.

**i.** $x^3 - 32x + 23 = 0$

Sol. Algebraic equation.

**j.** $x^3 + y^2 - 3xy = 42$

Sol. Algebraic equation.

### Exercise – 7.2

**Q1. Identify the linear equations from the following.**

**a.** $y = 2x + 1$

Sol. Linear Equation.

**b.** $5x^3 = 6 + 3y$

Sol. Not a Linear Equation.

**c.** $\frac{y}{2}=3-x$

Sol. Linear Equation.

**d.** $y^3-2=0$

Sol. Not a Linear Equation.

**e.** $\frac{x}{2}=16$

Sol. Linear Equation.

**f.** $3-y^3=6$

Sol. Not a Linear Equation.

**g.** $y = 3 + z$

Sol. Linear Equation.

**h.** $2.2x+5.7=22.5$

Sol. Linear Equation.

**Q2. Write at least 5 linear equations in one variable.**

Sol. 5 linear equations in one variable are:

1. $2.2x + 5.7 = 22.5$
2. $y = 3 + 2y$
3. $\frac{x}{2} = 16$
4. $5 = 2x + 1$
5. $3z - 4z - 5 = 9$

## Exercise – 7.3

**Q1. Write algebraic expressions for the following phrases.**

**a. 5 added to a number**

Sol. $5 + x$ Ans.

**b. A number subtracted form 8**

Sol. $8 - y$ Ans.

**c. 20 decreased by anumber**

Sol. $x - 20$ Ans.

**d. Twice a number decreased by 2**

Sol. $2y - 2$ Ans.

**e. Half of a number added to 7**

Sol. $\frac{x}{2} + 7$ Ans.

**f. 12 subtracted from the sum of 6 and a number**

Sol. $(x + 6) - 12$ Ans.

**Q2. Write algebraic equations for the following statements.**

**a. 6 added to a number is 8**

Sol. $6 + x = 8$ Ans.

**b. 4 subtracted from a number is 13**

Sol. $x - 4 = 13$ Ans.

**c. 6 times a number decreased by 3 is 5**

Sol. $6x - 3 = 5$ Ans.

**d. 3 times the sum of a number and 8 is 14**

Sol. $3(x + 8) = 14$ Ans.

**e. A number decreased by 6 is 12**

Sol. $x - 6 = 12$ Ans.

**f. Twice the number decreased by 33 is 66**

Sol. $2x - 33 = 66$ Ans.

**g. 2 times the number is 16 less than 10 times the number**

Sol. $2x - 16 = 10x$

**h. 6 subtracted from 5 times a number is 14 more than the number**

Sol. $5y - 6 = 14 + y$ Ans.

**i. The product of a number and 2 is 26**

Sol. $2x = 16$ Ans.

**Q3. Write the statements for the following algebraic equations.**

**a. $8 - x = 1$**

Sol. A number subtracted from 8 is 1.

**b. $9x + 4 = 22$**

Sol. 4 added to nine times a number is 22.

**c. $3x - 7 = 23$**

Sol. 7 subtracted from three times a number is 23.

**d. $x + 5 = 2x$**

Sol. 5 added to a number is twice the number.

**e. $(6 - x) + 2x = 8$**

Sol. sum of a number subtracted from 6 and twice the number is 8.

**f. $48 - x = 7x$**

Sol. Number subtracted from 48 is 7 times the number.

**g. $4x - 8 = 2x$**

Sol. 8 subtracted from 4 times a number is twice the number.

**h. $\frac{36}{x} = 4x$**

Sol. Number divided by 36 is four times the number.

## Exercise – 7.4

**Q1. Solve the following linear equations. Also verify the solution.**

**a. $6x + 2 = -19$**

Sol. $6x+2=-19$

Subtract 2 from both sides

$\Rightarrow 6x+2-2=-19-2$

$\Rightarrow 6x=-21$

Divide both sides by 6

$\Rightarrow \frac{6x}{6}=\frac{-21}{6}$ **Ans.**

**Verification:**

$\Rightarrow 6\left(\frac{-21}{6}\right)+2=-19$

$\Rightarrow -21+2=-19$

$\Rightarrow -19=-19$ Proved.

b. $4x-\frac{1}{4}=5$

Sol. $4x-\frac{1}{4}=5$

Adding $\frac{1}{4}$ on both sides

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

$\Rightarrow 4x=\frac{5}{1}+\frac{1}{4}=\frac{20+1}{4}$

$\Rightarrow 4x=\frac{21}{4}$

Dividing 4 on both sides

$\Rightarrow x=\frac{21}{4}\div 4 \Rightarrow x=\frac{21}{4}\times\frac{1}{4}$

$\Rightarrow x=\frac{21}{16}$ **Ans.**

**Verification:**

$4\left(\frac{21}{16}\right)-\frac{1}{4}=5$

$\frac{21}{4}-\frac{1}{4}=5 \quad \Rightarrow \frac{21-1}{4}=5$

$\frac{20}{4}=5 \quad \Rightarrow 5=5$ **Proved**

c. **$7x-4=23$**

Sol. $7x-4=23$

Adding 4 on both sides

$\Rightarrow 7x-4+4=23+4$

$\Rightarrow 7x=27$

Dividing both sides by 7

$\Rightarrow x=\frac{27}{7}$ **Ans.**

**Verification:** $7x-4=23$

$\Rightarrow 7\left(\frac{27}{7}\right)-4=23$

$\Rightarrow 27-4=23$

$\Rightarrow 23=23$ **Proved**

d. $-6x=21$

Sol. $-6x=21$

Dividing both sides by $-6$

$\Rightarrow \frac{-6x}{-6}=\frac{21}{-6}$

$\Rightarrow x=-\frac{7}{2}$ **Ans.**

**Verification:** $-6x=21$

$\Rightarrow -6\left(-\frac{7}{2}\right)=21$

$\Rightarrow 3(7)=21$

$\Rightarrow 21=21$ **Proved.**

e. $18-7x=-3$

Sol. $18-7x=-3$

Subtract 18 from both sides

$\Rightarrow 18-7x-18=-3-18$

$\Rightarrow -7x=-21$

Dividing both sides by $-7$

$\Rightarrow \frac{-7x}{-7}-\frac{-21}{-7}$

$\Rightarrow x=3$ **Ans.**

**Verification:** $18-7x=-3$

$\Rightarrow 18-7(3)=-3$

$\Rightarrow 18-21=-3$

$\Rightarrow -3=-3$ **Proved**

**f.** $5(x+4)=25$

Sol. $5(x+4)=25$

Divide both sides by 5

$\Rightarrow \frac{5(x+4)}{5}=\frac{25}{5}$

$\Rightarrow x+4=5$

$\Rightarrow x+4-4=5-4$

$\Rightarrow x=1$ **Ans.**

**Verification:** $5(x+4)=25$

$\Rightarrow 5(1+4)=25$

$\Rightarrow 5(5)=25$

$\Rightarrow 25=25$ **Proved**

**g.** $\frac{4x}{6}-\frac{3x}{5}=12$

Sol. $\frac{4x}{6}-\frac{3x}{5}=12$

Taking LCM

$\Rightarrow \frac{20x-18x}{30}=12$

$\Rightarrow \frac{2x}{30}=12 \quad \Rightarrow \frac{x}{15}=12$

Multiplying by 15

$\Rightarrow x=15\times 12 \quad \Rightarrow x=180$ **Ans.**

**Verification:** $\frac{4x}{6}-\frac{3x}{5}=12$

$\Rightarrow \frac{4(180)}{6}-\frac{3(180)}{5}=12$

$\Rightarrow 4(30)-3(36)=12$

$\Rightarrow 120-108=12$

$\Rightarrow 12=12$ **Proved**

**h.** $3x-5=5x-4$

Sol. $3x-5=5x-4$

Adding 5 on both sides

$\Rightarrow 3x-5+5=5x-4+5$

$\Rightarrow 3x-5x=5x+1-5x$

Subtract $-5x$ from both sides

$\Rightarrow -2x=1 \Rightarrow x=-\frac{1}{2}$ **Ans.**

**Verification:** $3x-5=5x-4$

$\Rightarrow 3\left(-\frac{1}{2}\right)-5=5\left(-\frac{1}{2}\right)-4$

$\Rightarrow -\frac{3}{2}-5=-\frac{5}{2}-4$

$\Rightarrow \frac{-3-10}{2}=\frac{-5-8}{2}$

$\Rightarrow -\frac{13}{2}=-\frac{13}{2}$ **Proved**

**i.** $4(x-3)=4(3x+1)$

Sol. $4(x-3)=4(3x+1)$

$\Rightarrow 4(x-3)=4(3x+1)$

$\Rightarrow 4x-12=12x+4$

Subtracting $4x$ from both sides

$\Rightarrow 4x-12-4x=12x+4-4x$

$\Rightarrow -12=8x+4$

Subtract 4 from both sides

$\Rightarrow -12-4=8x+4-4$

$\Rightarrow -16=8x$

Divide both sides by 8

$\Rightarrow \frac{-16}{8}=\frac{8x}{8} \Rightarrow x=-2$ **Ans.**

**Verification:** $4(x-3)=4(3x+1)$

$\Rightarrow 4((-2)-3)=4(3(-2)+1)$

$\Rightarrow 4(-5)=4(-6+1)$

$\Rightarrow -20=4(-5)$

$\Rightarrow -20=-20$ **Proved**

j. $\frac{3x}{12}-10=\frac{1}{2}$

Sol. $\frac{3x}{12}-10=\frac{1}{2}$

Adding 10 on both sides

$\Rightarrow \frac{3x}{12}-10+10=\frac{1}{2}+10$

$\Rightarrow \frac{3x}{12}=\frac{1+20}{2} \Rightarrow \frac{x}{4}=\frac{21}{2}$

Multiply 4 on both sides

$\Rightarrow \frac{x}{4}\times 4=\frac{21}{2}\times 4$

$\Rightarrow x=42$ **Ans.**

**Verification:** $\frac{3x}{12}-10=\frac{1}{2}$

$\Rightarrow \frac{3(42)}{12}-10=\frac{1}{2}$

$\Rightarrow \frac{42}{4}-\frac{10}{1}=\frac{1}{2}$

$\Rightarrow \frac{42-40}{4}=\frac{1}{2} \Rightarrow \frac{2}{4}=\frac{1}{2}$

$\Rightarrow \frac{1}{2}=\frac{1}{2}$ **Proved.**

k. $\frac{x}{2}-\frac{x}{3}=8$

Sol. $\frac{x}{2}-\frac{x}{3}=8$

Taking LCM

$\Rightarrow \frac{3x-2x}{6}=8$

Multiplying 6 on both sides

$\Rightarrow \frac{x}{6}\times 6=8\times 6$

$\Rightarrow x=48$ **Ans**

**Verification:** $\frac{x}{2}-\frac{x}{3}=8$

$\Rightarrow \frac{48}{2}-\frac{48}{3}=8$

$\Rightarrow 24-16=8$

$\Rightarrow 8=8$ Proved.

l. $6x-9-2(1-x)=x+9$

Sol. $6x-9-2(1-x)=x+9$

$\Rightarrow 6x-9-2+2x=x+9$

$\Rightarrow 8x-11=x+9$

Re-arranging the terms

$\Rightarrow 8x-x=9+11$

$\Rightarrow 7x=20$

$\Rightarrow \frac{7x}{7}=\frac{20}{7}$

$\Rightarrow x=\frac{20}{7}$ **Ans.**

**Verification:**

$$6x-9-2(1-x)=x+9$$

$$\Rightarrow 6\left(\frac{20}{7}\right)-9-2\left(1-\left(\frac{20}{7}\right)\right)$$

$$=\frac{20}{7}+9$$

$$\Rightarrow \frac{120}{7}-\frac{9}{1}-2\left(\frac{1}{1}-\frac{20}{7}\right)$$

$$=\frac{20}{7}+\frac{9}{1}$$

$$\Rightarrow \frac{120-63}{7}-2\left(\frac{7-20}{7}\right)$$

$$=\frac{20+63}{7}$$

$$\Rightarrow \frac{57}{7}-2\left(\frac{-13}{7}\right)=\frac{83}{7}$$

$$\Rightarrow \frac{57}{7}+\frac{26}{7}=\frac{83}{7}$$

$$\Rightarrow \frac{57+26}{7}=\frac{83}{7}$$

$$\Rightarrow \frac{83}{7}=\frac{83}{7}$$ **Proved.**

m. $0.4x+2.4=6.5$

Sol. $0.4x+2.4=6.5$

Subtracting 2.4 from both sides

$$\Rightarrow 0.4x+2.4-2.4=6.5-2.4$$

$$\Rightarrow 0.4x=4.1 \quad \Rightarrow \frac{0.4x}{0.4}=\frac{4.1}{0.4}$$

$$\Rightarrow x=\frac{41}{4}$$ **Ans.**

**Verification:** $0.4x+2.4=6.5$

$$\Rightarrow 0.4\left(\frac{41}{4}\right)+2.4=6.5$$

$$\Rightarrow 0.1(41)+2.4=6.5$$

$$\Rightarrow 4.1+2.4=6.5$$

$$\Rightarrow 6.5=6.5$$ **Proved**

n. $0.8x-4=12$

Sol. $0.8x-4=12$

Adding 4 on both sides

$$\Rightarrow 0.8x-4+4=12+4$$

$$\Rightarrow 0.8x=16 \quad \Rightarrow \frac{0.8x}{0.8}=\frac{16}{0.8}$$

$$\Rightarrow x=20$$ **Ans.**

**Verification:** $0.8x-4=12$

$$\Rightarrow 0.8(20)-4=12$$

$$\Rightarrow 16-4=12$$

$$\Rightarrow 12=12$$ **Proved**

o. $0.3x+6.9=12$

Sol. $0.3x+6.9=12$

Subtract 6.9 from both sides

$$\Rightarrow 0.3x+6.9-6.9=12-6.9$$

$$\Rightarrow 0.3x=5.1 \quad \Rightarrow \frac{0.3x}{0.3}=\frac{5.1}{0.3}$$

$$\Rightarrow x=17$$ **Ans.**

**Verification:** $0.3x+6.9=12$

$$\Rightarrow 0.3(17)+6.9=12$$

$$\Rightarrow 5.1+6.9=12$$

$$\Rightarrow 12=12$$ **Proved**

p. $\frac{0.3x}{3.1}=3$

Sol. $\frac{0.3x}{3.1}=3$

Multiply 3.1 on both sides

$$\Rightarrow \frac{0.3x}{3.1}\times 3.1 = 3\times 3.1$$

$$\Rightarrow 0.3x = 9.3 \quad \Rightarrow \frac{0.3x}{0.3} = \frac{9.3}{0.3}$$

$$\Rightarrow x = 31 \text{ Ans.}$$

Verification: $\frac{0.3x}{3.1} = 3$

$$\Rightarrow \frac{0.3(31)}{3.1} = 3 \quad \Rightarrow \frac{3(31)}{31} = 3$$

$$\Rightarrow 3 = 3 \text{ Proved}$$

q. $0.5x + 1.1 = 2.3$

Sol. $0.5x + 1.1 = 2.3$

Subtract 1.1 from both sides

$$\Rightarrow 0.5x + 1.1 - 1.1 = 2.3 - 1.1$$

$$\Rightarrow 0.5x = 1.2 \quad \Rightarrow \frac{0.5x}{0.5} = \frac{1.2}{0.5}$$

$$\Rightarrow x = \frac{12}{5} \quad \Rightarrow x = 2.4 \text{ Ans.}$$

Verification: $0.5x + 1.1 = 2.3$

$$\Rightarrow 0.5(2.4) + 1.1 = 2.3$$

$$\Rightarrow 1.2 + 1.1 = 2.3$$

$$\Rightarrow 2.3 = 2.3 \text{ Proved}$$

r. $2(x-2) - 5(x-5) = 4(x-8) - 2(x-2)$

Sol. $2(x-2) - 5(x-5) = 4(x-8) - 2(x-2)$

$$\Rightarrow 2x - 4 - 5x + 25 = 4x - 32 - 2x + 4$$

$$\Rightarrow -3x + 21 = 2x - 28$$

$$\Rightarrow -3x - 2x = -28 - 21$$

Dividing both sides by $-5$

$$\Rightarrow -5x = -49 \quad \Rightarrow \frac{-5x}{-5} = \frac{-49}{-5}$$

$$\Rightarrow x = \frac{49}{5} \text{ Ans.}$$

Verification:

$$2(x-2) - 5(x-5) = 4(x-8) - 2(x-2)$$

$$\Rightarrow 2\left(\frac{49}{5} - \frac{2}{1}\right) - 5\left(\frac{49}{5} - \frac{5}{1}\right) = 4\left(\frac{49}{5} - \frac{8}{1}\right) - 2\left(\frac{49}{5} - \frac{2}{1}\right)$$

$$\Rightarrow 2\left(\frac{49-10}{5}\right) - 5\left(\frac{49-25}{5}\right) = 4\left(\frac{49-40}{5}\right) - 2\left(\frac{49-10}{5}\right)$$

$$\Rightarrow 2\left(\frac{39}{5}\right) - 5\left(\frac{24}{5}\right) = 4\left(\frac{9}{5}\right) - 2\left(\frac{39}{5}\right)$$

$$\Rightarrow \frac{78}{5} - \frac{120}{5} = \frac{36}{5} - \frac{78}{5}$$

$$\Rightarrow \frac{78-120}{5} = \frac{36-78}{5}$$

$$\Rightarrow -\frac{42}{5} = -\frac{42}{5} \text{ Proved}$$

Q2. Dania is 6 years older than her younger sister. After 10 years, the sum of their ages will be 48 years. Find their present ages.

Sol. Let age of Dania's younger sister = x

Age of Dania = x + 6

After 10 years:

Her sister age = x + 10
Dania age = x + 6 + 10
According to question
x + 10 +x + 6 + 10 = 48
2x + 26 = 48
Subtract 26 form both sides
2x + 26 – 26 = 48 – 26
2x = 22
Divide both sides by 2

$$\frac{2x}{2} = \frac{22}{2} \qquad \Rightarrow x = 11$$

Present ages: Dania's age = 11 + 6 = 17 years
Dania's sister age = 11 years

**Q3. The price of a shirt has decreased after a sale by Rs 215. Find the original price if the new price is Rs 345.**

Sol. New price of shirt = 345
Decrease in price = 215
Original price of shirt = 345 + 215 = 560 **Ans.**

**Q4. The total price of a paintbrush and a pen is Rs. 156. Find the price of both the items if the price of the paintbrush is half the price of the pen.**

Sol. Let the price of pen be '2x'
Then the price of paintbrush be 'x'
According to question:
2x + x =156
3x = 156
Divide both sides by 3

$$\frac{3x}{3} = \frac{156}{3} \qquad \Rightarrow x = 52$$

Price of paintbrush = 52 Rupees
Price of pen = 2(52) = 104 Rupees Ans.

**Q5. Ali's weight is 13 kg less than Umar's weight. Find the weight of Umar if the sum of their weights is 59 kg.**

Sol. Let Umar's age be 'x'
Ali's age be 'x – 13'
According to question:
x + x – 13 = 59
2x – 13 +13 = 59 + 13
2x =72
Divide both sides by 2

$$\frac{2x}{2} = \frac{72}{2} \qquad \Rightarrow x = 36$$

Umar's age = 36 years
Ali's age = 36 – 13 = 23 years. **Ans.**

**Q6. The difference between 45 and 5 times a number is 15. Find the number.**

Sol. Let the number be 'x'
According to question:
5x – 45 = 15
Adding 45 on both sides
5x – 45 + 45 = 15 + 45
5x = 60
Divide both sides by 5

$$\frac{5x}{5} = \frac{60}{5} \qquad \Rightarrow x = 12$$

The required number = 12 **Ans.**

**Q7. Madiha thinks of a number. She multiplied it by 6.2 and added 8 to the product, she got the answer 39. Find the number.**

Sol. Let the number be 'x'
According to question:
6.2x + 8 = 39
Subtracting 8 from both sides
6.2x + 8 – 8 = 39 – 8
6.2x = 31
Divide both sides by 6.2

$$\frac{6.2x}{6.2} = \frac{31}{6.2} \qquad \Rightarrow x = 5$$

The required number = 5 **Ans.**

**Q8. Ayesha was asked to divide a number by 3 but by mistake she multiplied it by 3. If the correct number is 72 less than the wrong number, find the number?**

Sol. Let the required number be 'x'

Wrong number = 3x

Correct number = $\frac{x}{3}$

According to question:

Correct number = wrong number + 72

$\frac{x}{3} = 3x + 72$

multiply both sides by 3

$\frac{x}{3} \times 3 = (3x + 72) \times 3$

$x = 9x + 216$

Subtract 9x from both sides

$x - 9x = 9x + 216 - 9x$

$-8x = 216$

Divide both sides by $-8$

$\frac{-8x}{-8} = \frac{216}{-8} \Rightarrow x = -27$ **Ans.**

## Review Exercise – 7

**Q1. Encircle the correct option.**

a. A mathematical sentence which has equal sides separated by an equal sign is called ___.
   - **i. Equation**
   - ii. Number
   - iii. Variable
   - iv. Power

b. An algebraic equation is an open mathematical statement that shows the equality of two or more _____.
   - i. Numbers
   - **ii. Expressions**
   - iii. Variable
   - iv. Powers

c. The equals sign between two expressions means that both sides of the equation are
   - i. Greater
   - ii. Smaller
   - **iii. Equal**
   - iv. Nothing

d. A linear equation is an algebraic equation where the highest power of the variables involved is _____.
   - i. 0
   - **ii. 1**
   - iii. 3
   - iv. 4

e. The solution of $2x - 3 = 1$ is _____.
   - i. 5
   - ii. 4
   - iii. 3
   - **iv. 2**

f. If $\frac{2x}{5} = 3$, $x =$ _____.
   - i. $\frac{15}{2}$
   - ii. $\frac{11}{2}$
   - iii. $\frac{13}{5}$
   - iv. $\frac{16}{3}$

g. $2x + 0.06 = 0.4 + 1.22$ then $x =$ _____.
   - i. 1
   - **ii. 0.78**
   - iii. 2.3
   - iv. 0

h. The solution of $5x - 20 = 3x + 2$ is _____.
   - i. 15
   - ii. 3
   - iii. 10
   - **iv. 11**

i. 12 added to half of a number means:

i. $\frac{x}{2}+12$

ii. $12+\frac{1}{2x}$

iii. $12x+\frac{1}{2}$

iv. $12x+\frac{1}{2x}$

j. "5 decreased by a number is 10" means:

i. $5-10=x$

ii. $10x-5=x$

iii. $5-x=10$

iv. $X-5=10$

**Q2. Answer the following questions.**

**a. What is an algebraic equation?**

Ans:An algebraic equation is an open mathematical statement that shows the equality of two or more expressions with at least one variable.

**b. What is the difference betweenan equation and an expression?**

Ans: An equation has an equal sign while an expression does not have an equal sign.

An equation has left and right sides while an expression has only one side.

Equations are true for some value of the variable while expressions are true for all values of the variable.

**c. Define linear equation and linear equation in one variable?**

Ans:**Linear Equation:** A linear equation is an algebraic equation where the highest power of the variable involved is one.

**Linear Equation in one Variable:** A linear equation that has only one variable is said to be a linear equation in one variable.

**d. What is meant by solving an equation?**

Ans: Solving linear equation is the process to find the value of the involved variable.

**Q3. Identify the following as expressions or equations.**

**a. ab + 4**

Sol. Algebraic Expression

**b. 3x + 3y = 45**

Sol. Algebraic Equation

**c. pq = 6**

Sol. Algebraic Equation

**d. x – 5**

Sol.Algebraic Expression

**e. 3x = 9**

Sol.Algebraic Equation

**f. x + 5**

Sol.Algebraic Expression

**Q4. Solve the following linear equations. Also verify the solution.**

a. $\frac{4x+3}{2x-3}=-\frac{4}{2}$

Sol. $\frac{4x+3}{2x-3}=-\frac{4}{2}$

By cross multiplication

$\Rightarrow 2(4x+3)=-4(2x-3)$

$\Rightarrow 8x+6=-8x+12$

Re-arranging the terms

$\Rightarrow 8x+8x=12-6$

$\Rightarrow 16x=6$

Divide both sides by 16

$\Rightarrow \frac{16x}{16}=\frac{6}{16} \quad \Rightarrow x=\frac{3}{8}$ **Ans.**

**Verification:**

$$\frac{4x+3}{2x-3}=-\frac{4}{2}$$

$$\Rightarrow \frac{4\left(\frac{3}{8}\right)+3}{2\left(\frac{3}{8}\right)-3}=-\frac{4}{2}$$

$$\Rightarrow \frac{\frac{3}{2}+\frac{3}{1}}{\frac{3}{4}-\frac{3}{1}}=-\frac{4}{2}$$

$$\Rightarrow \frac{\frac{3+6}{2}}{\frac{3-12}{4}}=-\frac{4}{2}$$

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

$$\Rightarrow \frac{9}{2}\div\frac{-9}{4}=-\frac{4}{2}$$

$$\Rightarrow \frac{9}{2}\times\frac{-4}{9}=-\frac{4}{2}$$

$$\Rightarrow \frac{-4}{2}=-\frac{4}{2}$$ **Proved**

**b.** $\frac{x-9}{3}=-\frac{(x-3)}{7}$

Sol. $\frac{x-9}{3}=-\frac{(x-3)}{7}$

By cross multiplication

$$\Rightarrow 7(x-9)=-3(x-3)$$

$$\Rightarrow 7x-63=-3x+9$$

Re-arranging the terms

$$\Rightarrow 7x+3x=9+63$$

$$\Rightarrow 10x=72$$

Divide both sides by 10

$$\Rightarrow \frac{10x}{10}=\frac{72}{10}$$

$$\Rightarrow x=7.2$$ **Ans.**

**Verification:**

$$\Rightarrow \frac{7.2-9}{3}=-\frac{(7.2-3)}{7}$$

$$\Rightarrow \frac{-1.8}{3}=-\frac{(4.2)}{7}$$

$$\Rightarrow -0.6=-0.6$$ **Proved.**

**c. 2.5x + 3 = 7**

Sol. 2.5x + 3 = 7

2.5x + 3 = 7

Subtracting 3 from both sides

2.5x + 3 – 3 = 7 – 3

2.5x = 4

Divide both side by 2.5

$\frac{2.5x}{2.5}=\frac{4}{2.5}$ $\Rightarrow x=1.6$ **Ans.**

**Verification:** 2.5x + 3 = 7

2.5(1.6) + 3 = 7

4 + 3 = 7

7 = 7 **Proved.**

**d.** $4x+\frac{4}{8}=3-x$

Sol. $4x+\frac{4}{8}=3-x$

Re-arranging the terms

$$4x+x=\frac{3}{1}-\frac{4}{8}\Rightarrow 5x=\frac{24-4}{8}$$

$$\Rightarrow 5x = \frac{20}{8}$$

$$\Rightarrow 5x = \frac{5}{2} = 2.5$$

Divide both sides by 5

$$\Rightarrow \frac{5x}{5} = \frac{2.5}{5} \Rightarrow x = 0.5 \text{ Ans.}$$

**Verification:**

$$4x + \frac{4}{8} = 3 - x$$

$$\Rightarrow 4(0.5) + \frac{4}{8} = 3 - (0.5)$$

$$\Rightarrow 2 + \frac{4}{8} = 2.5 \Rightarrow \frac{2}{1} + \frac{4}{8} = 2.5$$

$$\Rightarrow \frac{16+4}{8} = 2.5 \Rightarrow \frac{20}{8} = 2.5$$

$$\Rightarrow 2.5 = 2.5 \text{ Proved.}$$

e. $6x = \frac{3}{9}$

Sol. $6x = \frac{3}{9}$

Divide both sides by 6

$$\Rightarrow \frac{6x}{6} = \frac{3}{9} \div 6 \Rightarrow x = \frac{3}{9} \times \frac{1}{6}$$

$$\Rightarrow x = \frac{1}{18} \text{ Ans.}$$

**Verification:**

$$\Rightarrow 6\left(\frac{1}{18}\right) = \frac{3}{9} \Rightarrow \frac{1}{3} = \frac{1}{3} \text{ Proved}$$

f. $5(a-6) - 3(4a+4) = 7(a+6)$

Sol. $5(a-6) - 3(4a+4) = 7(a+6)$

$$\Rightarrow 5a - 30 - 12a - 12 = 7a + 42$$

$$\Rightarrow -7a - 42 = 7a + 42$$

Re-arranging the terms

$$\Rightarrow -7a - 7a = 42 + 42$$

$$\Rightarrow -14a = 84$$

Divide both sides by 14

$$\Rightarrow \frac{-14a}{-14} = \frac{84}{-14}$$

$$\Rightarrow x = -6 \text{ Ans.}$$

**Verification:**

$$\Rightarrow 5(-6-6) - 3(4(-6)+4) = 7(-6+6)$$

$$\Rightarrow 5(-12) - 3(-24+4) = 7(0)$$

$$\Rightarrow -60 - 3(-20) = 0$$

$$\Rightarrow -60 + 60 = 0$$

$$\Rightarrow 0 = 0 \text{ Proved}$$

g. $3(y-2) + 4(y-3) = 5y + 14 - 4(y-8)$

Sol. $3(y-2) + 4(y-3)$

$$= 5y + 14 - 4(y-8)$$

$$\Rightarrow 3y - 6 + 4y - 12$$

$$= 5y + 14 - 4y + 32$$

$$\Rightarrow 7y - 18 = y + 46$$

Re-arranging the terms

$$\Rightarrow 7y - y = 46 + 18 \Rightarrow 6y = 64$$

Divide both sides by 6

$$\Rightarrow \frac{6y}{6} = \frac{64}{6} \Rightarrow y = \frac{32}{3} \text{ Ans}$$

**Verification :**

$$3(y-2) + 4(y-3)$$

$$= 5y + 14 - 4(y-8)$$

$$\Rightarrow 3\left(\frac{32}{3}-2\right)+4\left(\frac{32}{3}-3\right)$$

$$=5\times\frac{32}{3}+14-4\left(\frac{32}{3}-8\right)$$

$$\Rightarrow 3\left(\frac{32}{3}-\frac{2}{1}\right)+4\left(\frac{32}{3}-\frac{3}{1}\right)$$

$$=\frac{160}{3}+\frac{14}{1}-4\left(\frac{32}{3}-\frac{8}{1}\right)$$

$$\Rightarrow 3\left(\frac{32-6}{3}\right)+4\left(\frac{32-9}{3}\right)$$

$$=\frac{160+42}{3}-4\left(\frac{32-24}{3}\right)$$

$$\Rightarrow 3\left(\frac{26}{3}\right)+4\left(\frac{23}{3}\right)$$

$$=\frac{202}{3}-4\left(\frac{8}{3}\right)$$

$$\Rightarrow \frac{78}{3}+\frac{92}{3}=\frac{202}{3}-\frac{32}{3}$$

$$\Rightarrow \frac{78+92}{3}=\frac{202-32}{3}$$

$$\Rightarrow \frac{170}{3}=\frac{170}{3}$$ **Proved.**

h. $\dfrac{3(2x-4)}{15(x-2)}=4$

Sol. $\dfrac{3(2x-4)}{15(x-2)}=4$

$$\frac{6x-12}{15x-30}=\frac{4}{1}$$

By cross multiplication

$$\Rightarrow 4(15x-30)=1(6x-12)$$

$$\Rightarrow 60x-120=6x-12$$

Re-arranging the terms

$$\Rightarrow 60x-6x=-12+120$$

$$\Rightarrow 54x=108$$

Divide both sides by 54

$$\Rightarrow \frac{54x}{54}=\frac{108}{54}\Rightarrow x=2$$ **Ans**

**Verification:**

$$\Rightarrow 4(15x-30)=1(6x-12)$$

$$\Rightarrow 4(15(2)-30)=1(6(2)-12)$$

$$\Rightarrow 4(30-30)=1(12-12)$$

$$\Rightarrow 4(0)=1(0)\Rightarrow 0=0$$ **Proved**

i. $\dfrac{3}{5}(4a+5)=\dfrac{2}{7}(3a+5)$

Sol. $\dfrac{3}{5}(4a+5)=\dfrac{2}{7}(3a+5)$

$$\Rightarrow \frac{12a}{5}+\frac{15}{5}=\frac{6a}{7}+\frac{10}{7}$$

$$\Rightarrow \frac{12a+15}{5}=\frac{6a+10}{7}$$

By cross multiplication

$$\Rightarrow 7(12a+15)=5(6a+10)$$

$$\Rightarrow 84a+105=30a+50$$

Re-arranging the term

$$\Rightarrow 84a-30a=50-105$$

$$\Rightarrow 54a=-55$$

Dividing both sides by 54

$$\Rightarrow \frac{54a}{54}=\frac{-55}{54}$$

$$\Rightarrow x=-\frac{55}{54}$$ **Ans**

**Verification:**

$$\Rightarrow \frac{3}{5}\left(4\left(\frac{-55}{54}\right)+5\right)$$

$$=\frac{2}{7}\left(3\left(\frac{-55}{54}\right)+5\right)$$

$$\frac{3}{5}\left(\frac{-220}{54}+\frac{5}{1}\right)=\frac{2}{7}\left(\frac{-55}{18}+\frac{5}{1}\right)$$

$$\Rightarrow \frac{3}{5}\left(\frac{-220+270}{54}\right)$$

$$=\frac{2}{7}\left(\frac{-55+90}{18}\right)$$

$$\frac{3}{5}\times\frac{50}{54}=\frac{2}{7}\times\frac{35}{18}\Rightarrow\frac{150}{270}=\frac{70}{126}$$

$$\Rightarrow \frac{5}{9}=\frac{5}{9}$$ **Proved.**

j. $0.4x + 2.4 = 2.0x + 0.12$

Sol. $0.4x + 2.4 = 2.0x + 0.12$

Re-arranging the term

$0.4x - 2.0x = 0.12 - 2.4$

$-1.6x = -2.28$

Divide both sides by $-1.6$

$$\frac{-1.6x}{-1.6}=\frac{-2.28}{-1.6}$$

$\Rightarrow x = 1.425$ **Ans**

**Verification:**

$0.4x + 2.4 = 2.0x + 0.12$

$0.4(1.425) + 2.4 = 2.0(1.425) + 0.12$

$0.57 + 2.4 = 2.85 + 0.12$

$2.97 = 2.97$ **Proved**

k. $0.5(0.2p + 3.2) = 0.5p - 1$

Sol. $0.5(0.2p + 3.2) = 0.5p - 1$

$1.0p + 16.0 = 0.5p - 1$

Re-arranging the terms

$1p - 0.5p = -1 - 16$

$0.5p = -17$

Divide both sides by 0.5

$$\frac{0.5p}{0.5}=\frac{-17}{0.5}\Rightarrow p=-34$$ **Ans**

**Verification:**

$0.5(0.2p + 3.2) = 0.5p - 1$

$0.5(0.2(-34)+3.2)=0.5(-34) - 1$

$0.5(-6.8 + 3.2) = -17 - 1$

$0.5(-3.6) = -18$

$-18 = -18$ **Proved**

**Q5. Mr Ali purchased a fridge and air conditioner for Rs 95,230. If thecost of the air conditioner is Rs 23,000 more than the fridge, find the cost of both items.**

Sol. Price of fridge and air conditioner = 95,230

Cost of air conditioner 23,000 more than the price of fridge.

Let price of fridge be 'x' and price of air conditioner be 'y'

Then $x + y = 95,230$--------(i)

$y = x + 23,000$-------(ii)

put equation (ii) in equation (i)

$x + x + 23,000 = 95,230$

$2x = 95,230 - 23,000$

$2x = 72,230$

Divide both sides by 2

$$\frac{2x}{2}=\frac{72,230}{2}\Rightarrow x=36,115$$

Thus price of fridge = 36,115

Price of air conditioner = 36,115 + 23,000

Price of air conditioner = 59,115 **Ans.**

**Q6. After sixteen years, Asma will be 28 years old. Find her present age.**

Sol. Let Asma's present age be 'x'

After sixteen year her age = x + 16

According to question

$x + 16 = 28$

$x = 28 - 16$

$x = 12$ years **Ans.**

**Q7. When five times a number is added to three times itself, the sum obtained is 48. Find the number.**

Sol. Let the required number be "x"

According to question

$5x + 3x = 48$

$8x = 48$

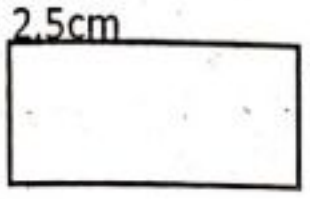
Divide both sides by 8

$$\frac{8x}{8} = \frac{48}{8} \Rightarrow x = 6 \text{ Ans.}$$

## Unit – 8
## Surface Area and Volume
### Exercise – 8.1

**Q1. Find the perimeter of the following figures.**

a. 2.5cm




Sol.

Perimeter = 2 ( length + width )

As length = 2.5cm

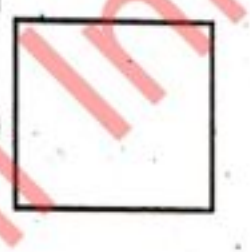
Width = 1.4cm

So Perimeter = 2(2.5 + 1.4)

Perimeter = 2(3.9)

Perimeter = 7.9 cm. **Ans**

b. 15cm




Sol. Perimeter = 2 ( length + width )

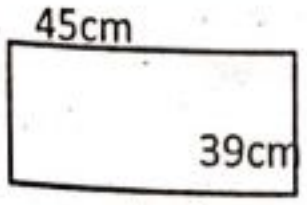
As length = width = 15cm

So Perimeter = 2(15 + 15)

Perimeter = 2(30)

Perimeter = 60 cm. **Ans**

C. 45cm




Sol. Perimeter = 2 ( length + width )

As length = 45cm

Width = 39cm

So Perimeter = 2(45 + 39)

Perimeter = 2(84)

Perimeter = 168 cm. **Ans.**

**Q2. Use the formula to find the area and perimeter of the squares whose lengths are given below:**

**a. 4cm**

Sol. Side = 4cm

**Area of Square:**

Formula: Area of square = side × side

Area of square = 4cm × 4cm

Area of square = $16cm^2$

**Perimeter of square:**

Formula: Perimeter of square = 4 × side

Perimeter of square = 4×4cm = 16cm. **Ans.**

**b. 7.2cm**

Sol. 7.2cm

**Area of Square:**

Formula: Area of square = side × side

Area of square = 7.2cm × 7.2cm

Area of square = $51.84cm^2$

**Perimeter of square:**

Formula: Perimeter of square = 4 × side

Perimeter of square = 4 × 7.2cm = 28.8cm. **Ans.**

**c. 10.5cm**

Sol. 10.5cm

**Area of Square:**

Formula: Area of square = side × side

Area of square = 10.5cm × 10.5cm

Area of square = $110.25cm^2$

**Perimeter of square:**

Formula: Perimeter of square = 4 × side

Perimeter of square = 4 × 10.5cm = 42cm. **Ans.**

**d. 6.2cm**

Sol. 6.2cm

**Area of Square:**

Formula: Area of square = side × side
Area of square = 6.2cm × 6.2cm
Area of square = $38.44cm^2$

**Perimeter of square:**

Formula: Perimeter of square = 4 × side
Perimeter of square = 4 × 6.2cm = 24.8cm. **Ans.**

**Q3. Use the formula to find the area and perimeter of the rectangles having the following lengths and widths.**

a. **Length = 4.7cm and Width = 2cm**

Sol. Length = 4.7cm and Width = 2cm

**Area of rectangle:**

Formula: Area of rectangle = Length × Width
Area of rectangle = 4.7cm × 2cm
Area of rectangle = $9.4cm^2$

**Perimeter of rectangle:**

Formula: Perimeter of rectangle = 2 (Length + Width)
Perimeter of rectangle = 2(4.7 + 2) = 2(6.7).
Perimeter of rectangle = 13.4cm **Ans.**

b. **Length = 16cm and Width = 15.5cm**

Sol. Length = 16cm and Width = 15.5cm

**Area of rectangle:**

Formula: Area of rectangle = Length × Width
Area of rectangle = 16cm × 15.5cm
Area of rectangle = $248cm^2$

**Perimeter of rectangle:**

Formula: Perimeter of rectangle = 2 (Length + Width)
Perimeter of rectangle = 2(16 + 15.5) = 2(31.5).
Perimeter of rectangle = 63cm **Ans.**

c. **Length = 23cm and Width = 4cm**

Sol. Length = 23cm and Width = 4cm

**Area of rectangle:**

Formula: Area of rectangle = Length × Width
Area of rectangle = 23cm × 4cm
Area of rectangle = $92cm^2$

**Perimeter of rectangle:**

Formula: Perimeter of rectangle = 2 (Length + Width)
Perimeter of rectangle = 2(23 + 4) = 2(27).
Perimeter of rectangle = 54cm **Ans.**

d. **Length = 20cm and Width = 12.2cm**

Sol. Length = 20cm and Width = 12.2cm

**Area of rectangle:**

Formula: Area of rectangle = Length × Width
Area of rectangle = 20cm × 12.2cm
Area of rectangle = $244cm^2$

**Perimeter of rectangle:**

Formula: Perimeter of rectangle = 2 (Length + Width)
Perimeter of rectangle = 2(20 + 12.2) = 2(32.2).
Perimeter of rectangle = 64.4cm **Ans.**

**Q4. Find the length of the rectangle if its area is $325m^2$ and width is 13m.**

Sol. Area of rectangle = $325m^2$
Width of rectangle = 13m
Length of rectangle = ?

Using formula

Area of rectangle = Length × Width
$325m^2$ = Length × 13m
Divide both sides by 13m

$$\frac{325m^2}{13m} = \frac{Length \times 13m}{13m}$$

Length = 25m Ans.

**Q5. Find the length of a square if its perimeter is 48m.**

Sol. Perimeter of square= 48m
Length of one side =?
As Perimeter = 4 × side
48 m = 4 × side
Divide both sides by 4 we get
Side = 12 m **Ans.**

**Q6. A rectangular-shaped room is 24 meters long and 20 meters wide. Find the area of the room and the cost to cement the room at the rate of Rs 200 per meter square.**

Sol. Length of room = 24 m

Width of room = 20 m

Area of room = Length × width

Area = 20 m × 24 m

Area = 48 $m^2$

Cost of cement per meter square = 200 rupees

Cost of cement for 48 meter square = 48 × 200

Cost of cement for 48 $m^2$ = 9600 rupees **Ans.**

**Q7. Find the area of a square shaped swimming pool if its length is 300m.**

Sol. Length of square = 300 m

Area of square = side × side

Area = 300 m × 300 m

Area = 90000 $m^2$ **Ans.**

**Q8. The perimeter of a rectangular flowerbed is 244 cm. find the length of the flowerbed if its width is 44 cm.**

Sol. Perimeter of rectangular flowerbed = 244 cm

Width of flowerbed = 44 cm

Length of flowerbed =?

As perimeter = 2 (Length + Width)

So, 244 cm = 2 (Length + 44)

244 cm = 2 Length + 88

Subtract 88 from both sides

244 – 88 = 2 Length + 88 – 88

156 = 2 Length

Divide both sides by 2

$$\frac{156}{2} = \frac{2\,Length}{2}$$

Length = 78 cm **Ans.**

**Q9. Find the length of a rectangular room if its area is 2048 $cm^2$ and width is 32 cm. Find the cost of flooring the room at the rate of Rs 250 per $cm^2$.**

Sol. Area of rectangular room = 2048 $cm^2$

Width of rectangular room = 32 cm

Length of rectangular room =?

As, Area = Length × Width

2048 $cm^2$ = Length × 32cm

Divide both sides by 32 we get

$$\frac{2048\,cm^2}{32} = \frac{32 \times Length}{32}$$

Length = 64 cm

Cost of flooring for 1 $cm^2$ = Rs. 250

Cost of flooring for 2048 $cm^2$ = 250 × 2048

Cost of flooring = 512,000 Rupees. **Ans.**

**Q10. The cost of fencing a square garden at the rate of Rs. 25 per meter is Rs. 5625. Find the area of the garden.**

Sol. Cost of fencing for 1 $m^2$ = Rs. 25

Cost of fencing of whole square garden = Rs. 5625

Area of square garden = ?

As, Total Cost = Area × cost per $m^2$

5625 = Area × 25

Divide both sides by 25

$$\frac{5625}{25} = \frac{25 \times Area}{25}$$

Area = 225 $m^2$ **Ans.**

## Exercise – 8.2

**Q1. A rectangle WXYZ is 50 m long and 40 m wide. A path is constructed towards the inner side of the rectangle that is 2 m wide. Find the area of the path.**

Sol. Length of outer rectangle = 50 m

Width of outer rectangle = 40 m

Area of outer rectangle = Length × Width
Area of outer rectangle = 50m × 40m
Area of outer rectangle = 2,000$m^2$.
Width of path = 2m
Now, length of inner rectangle= 50 – 2 – 2 = 46m
Width of inner rectangle = 40 – 2 – 2 = 36m
Area of inner rectangle = 46m × 36 m = 1,656$m^2$
Now, Area of strip =
= area of outer rectangle –area of inner rectangle
Area of strip = 2000 – 1656 = 344 $m^2$. Ans.

**Q2. A square is 1200 cm long. There is a 10 cm wide strip around the square. Find the area of the strip.**

Sol. One side of square = 1200 cm
Area of square = side × side
Area of inner square = 1200 × 1200 = 1,440,000 $cm^2$
Width of strip outside the square = 10cm
Now, One side of outer square = 1200 + 10 + 10 = 1220 cm
Area of outer square = 1220cm × 1220 cm
Area of outer square = 1,488,400 $cm^2$
Area of strip = area of outer square – area of inner square
Area of strip = 1,488,400 $cm^2$ – 1,440,000
Area of strip = 48,400 $cm^2$ Ans.

**Q3. A 450 cm long and 150 cm wide rectangle is enclosed by a strip outside it that is 4cm wide. Find the area of the strip.**

Sol. Length of inner rectangle = 450 cm
Width of inner rectangle = 150 cm
Area of inner rectangle = Length × Width
Area of inner rectangle = 450 cm × 150 cm = 67,500 $cm^2$
Now, Width of strip around the rectangle = 4 cm
Length of outer rectangle = 450 + 4 + 4 = 458 cm
Width of outer rectangle = 150 + 4 + 4 = 158 cm
Area of outer rectangle = 458 cm × 158 cm = 72,364 $cm^2$
Area of strip = area of outer rectangle – area of inner rectangle
Area of strip = 72,364 $cm^2$ – 67,500 $cm^2$ = 4,864 $cm^2$ Ans.

**Q4. A rectangle is 900 m long and 700 m wide. A path is constructed outside the rectangle that is 9m wide. Find the area of the path.**

Sol. Length of inner rectangle = 900 m
Width of inner rectangle = 700 m
Area of inner rectangle = Length × Width
Area of inner rectangle = 900 m × 700 cm = 630,000 $m^2$
Now, Width of strip around the rectangle = 9 m
Length of outer rectangle = 900 + 9 + 9 = 918 m
Width of outer rectangle = 700 + 9 + 9 = 718 m
Area of outer rectangle = 918 m × 718 m = 659,124 $m^2$
Area of strip
= area of outer rectangle – area of inner rectangle
Area of strip = 659,124 $m^2$ – 630,000 $m^2$ = 29,124 $m^2$ Ans.

**Q5. A garden is 75 cm long and 82cm wide. A 5 cm wide road is made all**

**around the inside of the garden. Find the area of the road.**

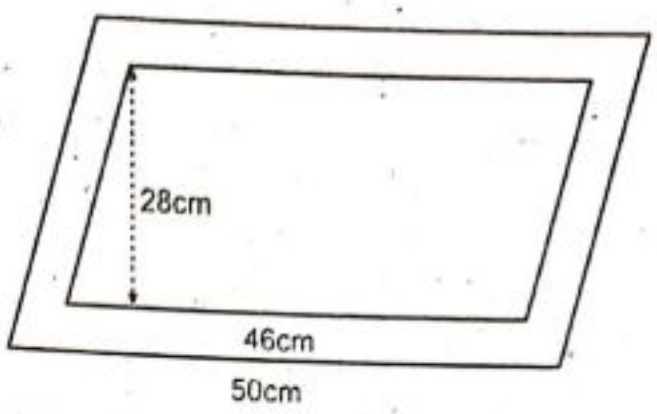
Sol. Length of garden = 82 cm
Width of garden = 75 cm
Area of garden = Length × Width
Area of garden = 82 cm × 75 cm
Area of garden = 6,150 $cm^2$.
Width of road inside = 5 cm
Now, length of inner garden = 82 – 5 – 5 = 72 cm
Width of inner garden = 75 – 5 – 5 = 65 cm
Area of inner garden = 72 cm × 65 cm = 4,680 $cm^2$
Now, Area of road inside
= area of whole garden – area of inside garden
Area of road = 6150 – 4680 = 1470 $cm^2$. **Ans.**

**Q6. A playground is 60 m long and 50 m wide. A 1.5 m wide concrete path is made all around it towards the outer side of the playground. Find the area of the concrete path.**

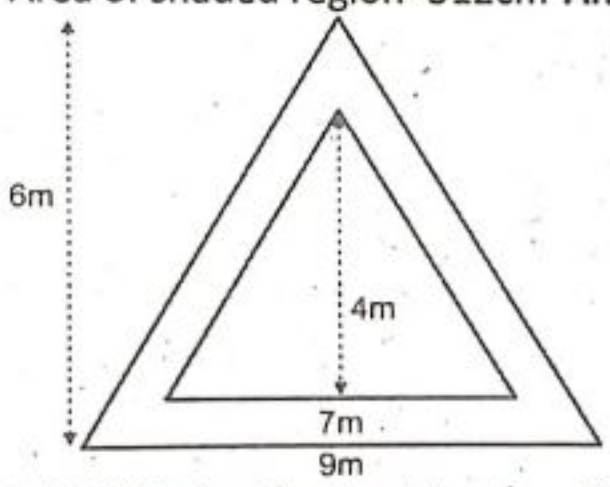
Sol. Length of playground = 60 m
Width of playground = 50 m
Area of playground = Length × Width
Area of playground = 60 m × 50 m = 3,000 $m^2$
Width of concrete path = 1.5 m
Now, length of playground = 60 + 1.5 + 1.5 = 63 m
Width of playground = 50 + 1.5 + 1.5 = 53 m
Area of outer playground = 63 m × 53 m = 3,339 $m^2$
Area of concrete road = 3,339 – 3,000 = 339 $m^2$ Ans.

## Exercise – 8.3

**Q1. Find the shaded area of the following figures.**

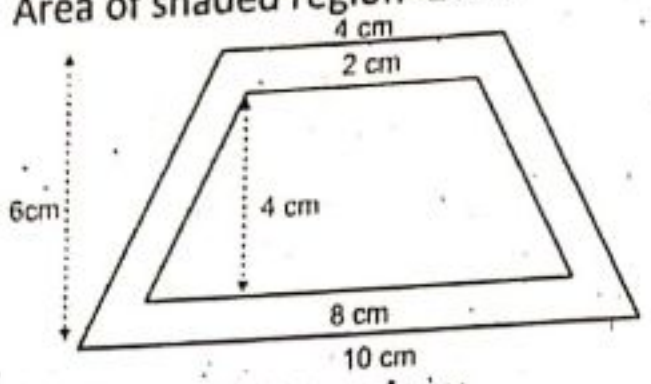



**Sol.** Altitude = $a_1$ = 32 cm
Base = $b_1$ = 50 cm
Area of outer parallelogram = $a_1 \times b_1$
= 32 cm × 50 cm
= 1600 $cm^2$
Altitude = $a_2$ = 28 cm
Base = $b_2$ = 46 cm
Area of inner parallelogram
= $a_2 \times b_2$
= 28 cm × 46 cm
= 1288 $cm^2$
Now area of the shaded region = Area of outer parallelogram – Area of inner parallelogram
Area of shaded region = 1600 $cm^2$ – 1288 $cm^2$
Area of shaded region=312$cm^2$ **Ans.**




**Sol.** Altitude of outer triangle = 6 m
Base of outer triangle = 9 m
Area of outer triangle = bh
Area = 9 m × 6 m
Area of outer triangle = 54$m^2$
Altitude of inner triangle =4m
Base of inner triangle = 7 m
Area of inner triangle = bh

Area = 4 m × 7 m
Area of inner triangle = 28 $m^2$.
Area of shaded region = Area of outer triangle – Area of inner triangle
Area of shaded region = 54$m^2$ – 28 $m^2$
Area of shaded region=26 $m^2$




**Sol. For outer trapezium:**

Length of $b_1$ = 10 cm

Length of $b_2$ = 4 cm

Altitude $a_1$ =6 cm

Area of trapezium =?

Using formula:

Trapezium area = $a_1 \times \frac{b_1 + b_2}{2}$

Trapezium area = $\cancel{6}^{3} \times \frac{4+10}{\cancel{2}}$

Trapezium area = $3 \times 14$

Area of trapezium = 42 $cm^2$

**For inner trapezium:**

Length of $b_3$ = 8 cm

Length of $b_4$ = 2 cm

Altitude $a_2$ =4 cm

Area of trapezium =?

Using formula:

Trapezium area = $a_2 \times \frac{b_3 + b_4}{2}$

Trapezium area = $\cancel{4}^{2} \times \frac{8+2}{\cancel{2}}$

Trapezium area = $2 \times 10$

Area of trapezium = 20 $cm^2$

Now we find the area of the shaded region

Area = Area of outer trapezium – Area of inner trapezium

Area = 42 $cm^2$ – 20 $cm^2$

Area of shaded region = 22$cm^2$ **Ans.**

**Q2. Find the altitude of a trapezium if the length of two bases are 5.6 cm and 2.9 cm respectively. The area of the trapezium is 42 $cm^2$.**

Sol. Area of trapezium = 42 $cm^2$

Length of first base = 5.6 cm

Length of second base = 2.9 cm

Altitude of trapezium =?

Using formula:

Area of trapezium

$$= \text{altitude} \times \left(\frac{b_1 + b_2}{2}\right)$$

$$\Rightarrow 42cm^2 = altitude \times \left(\frac{5.6+2.9}{2}\right)$$

$$\Rightarrow 42cm^2 = altitude \times \frac{8.5}{2}$$

$$\Rightarrow 42cm^2 = altitude \times 4.25$$

Divide both sides by 4.25

$$\Rightarrow \frac{42cm^2}{4.25} = \frac{altitude \times 4.25}{4.25}$$

Altitude of trapezium = 9.88 cm. **Ans.**

**Q3. Find the area of a trapezium if the lengths of two bases are 8.8 m and 12.9 m respectively. The perpendicular distance between two bases are 12 m.**

Sol. Length of base $b_1$ = 8.8 m

Length of base $b_2$ = 12.9 m

Altitude of trapezium = 12 m

Area of trapezium =?

Using formula:

Area of trapezium

$$= \text{altitude} \times \left(\frac{b_1 + b_2}{2}\right)$$

Area of trapezium =

$$12 \times \left(\frac{8.8 + 12.9}{2}\right)$$

Area of trapezium =

$$12 \times \left(\frac{21.7}{2}\right) = 12 \times (10.85)$$

Area of trapezium = 130.2 $m^2$. **Ans.**

**Q4. Find the altitude of the triangular field. If its area is 946 $cm^2$ and base is 104 cm.**

Sol. Area of triangular field = 946 $cm^2$

Base of triangular field = 104 cm

Altitude of triangular field =?

Using formula:

Area of triangle =

$$\frac{1}{2}(\text{altitude} \times \text{base})$$

$$946cm^2 = \frac{1}{2}(\text{altitude} \times 104cm)$$

Multiply 2 on B.S

946 $cm^2 \times 2$ =

$$\frac{1}{2}(\text{altitude} \times 104cm) \times 2$$

1892 $cm^2$ = altitude × 104 cm

Divide both sides by 104 cm

$$\frac{1892\ cm^2}{104\ cm} = \frac{\text{altitude} \times 104\ \text{cm}}{104\ cm}$$

Altitude of triangular field = 18.19 cm. Ans.

**Q5. Find the area of the triangle if the length of its base is 2.5 m and the length of its altitude is 1.2 m.**

Sol. Length of base of triangle = 2.5 m

Length of altitude of triangle = 1.2 m

Area of triangle =?

Using formula:

Area of triangle =

$$\frac{1}{2}(\text{altitude} \times \text{base})$$

Area of triangle =

$$\frac{1}{2}(1.2\ \text{m} \times 2.5\ \text{m})$$

Area of triangle

$$= \frac{1}{2}(3\ m^2) = 1.5\ m^2 \text{ Ans.}$$

**Q6. Find the base of the triangular piece of carpet. If its area is 1568 $cm^2$ and altitude is 9.04 m.**

Sol. Area of triangular piece of carpet = 1568 $cm^2$

Altitude of triangular piece of carpet = 9.04 cm

Base of triangular piece of carpet =?

Using formula:

Area of triangle =

$$\frac{1}{2}(\text{altitude} \times \text{base})$$

Putting values:

$$1568\ cm^2 = \frac{1}{2}(9.04\ \text{cm} \times \text{base})$$

Multiply 2:

1568 $cm^2 \times 2$ =

$$\frac{1}{2}(9.04\ \text{cm} \times \text{base}) \times 2$$

3,136 $cm^2$ = 9.04 cm × base

Divide by 9.04 cm:

$$\frac{3{,}136\ cm^2}{9.04\ cm} = \frac{9.04\ cm \times base}{9.04\ cm}$$

Base of triangular piece of carpet = 346.9 cm. **Ans.**

**Q7. The altitude of the parallelogram is 56 m and its area is 6424 $m^2$. Find the base of parallelogram.**

Sol. Altitude of parallelogram = 56 m

Area of parallelogram = 6424 $m^2$

Base of parallelogram =?

Using formula:

Area of parallelogram = base × altitude

Putting values:

6424 $m^2$ = base × 56 m

Divide by 56 m:

$$\frac{6426m^2}{56m} = \frac{base \times 56m}{56m}$$

Base = 114.71 m. **Ans.**

**Q8. The area of the parallelogram is 900 $m^2$ and base is 30 m. find the altitude of parallelogram.**

Sol. Base of parallelogram = 30 m

Area of parallelogram = 6424 $m^2$

Altitude of parallelogram = ?

Using formula:

Area of parallelogram = base × altitude

Putting values:

900 $m^2$ = 30 m × altitude

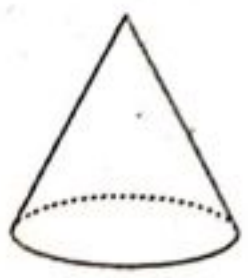
Divide by 30 m:

$$\frac{900m^2}{30m} = \frac{altitude \times 30m}{30m}$$

Base = 30 m. **Ans.**

## Exercise – 8.4

**Q1. Name the following shapes and write their number of faces, edges and vertices.**



**Cone:**

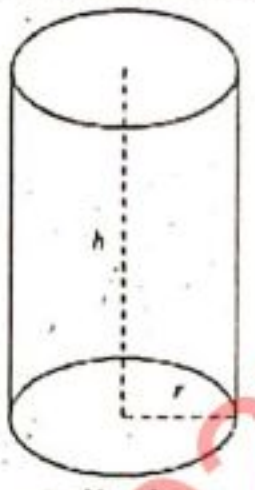
Flat faces: 1

Curved edges:1

Straight edges: 0

Vertices: 1

Curved faces: 1




**Cylinder**

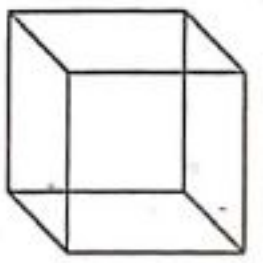
Flat faces: 2

Curved edges: 2

Straight edges: 0

Vertices: 0

Curved faces: 1



**Cube**

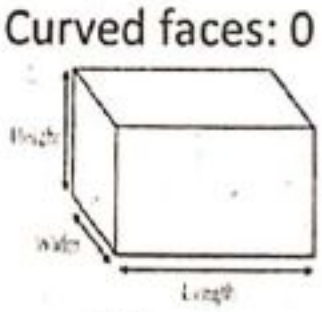
Flat faces: 6

Curved edges: 0

Straight edges: 12

Vertices: 8

Curved faces: 0




**Cuboid**

Flat faces: 6

Curved edges: 0

Straight edges: 12

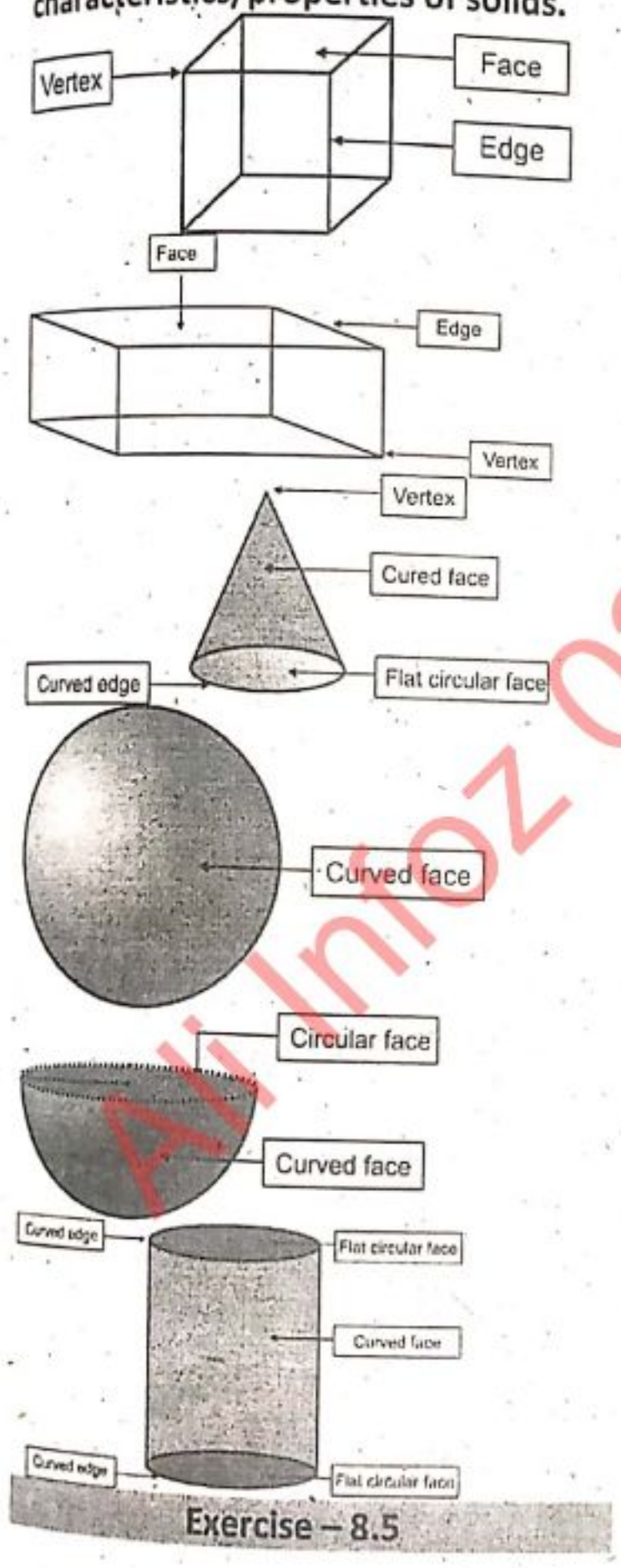
Vertices: 8

Curved faces: 0

**Circle**

Flat faces: 1
Curved edges: 1
Straight edges: 0
Vertices: 0
Curved faces: 0

**Q2. Label the following characteristics/properties of solids.**




**Exercise – 8.5**

**Q1. Calculate the volume and surface area of the following cubes whose length of the edge are given below.**

**a. 5cm**

Sol. 5 cm

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 5cm ×5cm×5cm

Volume of cube = 125 $cm^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(5cm)^2 = 6 \times 25cm^2$

Surface area of cube = 150 $cm^2$.

**b. 8cm**

Sol. 8 cm

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 8cm ×8cm×8cm

Volume of cube = 512 $cm^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(6cm)^2 = 6 \times 36cm^2$

Surface area of cube = 216 $cm^2$.

**c. 4.3cm**

Sol. 4.3 cm

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 4.3cm ×4.3cm×4.3cm

Volume of cube = 79.507 $cm^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(4.3cm)^2 = 6 \times 18.49cm^2$

Surface area of cube = 110.94 $cm^2$.

**d. 6.4m**

Sol. 6.4 m

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 6.4m ×6.4m×6.4m

Volume of cube = 262.144 $m^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(6.4m)^2 = 6 \times 40.96m^2$

Surface area of cube = 245.76 $m^2$.

e. 2m

Sol. 2 m

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 2m ×2m×2m

Volume of cube = 8 $m^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(2m)^2 = 6 \times 4m^2$

Surface area of cube = 24 $m^2$.

f. 3m

Sol. 3 m

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 3m ×3m×3m

Volume of cube = 27 $m^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(3m)^2 = 6 \times 9m^2$

Surface area of cube = 54 $m^2$.

g. 12cm

Sol. 12 cm

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 12cm ×12cm×12cm

Volume of cube = 1,728 $cm^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(12cm)^2 = 6 \times 144cm^2$

Surface area of cube = 864 $cm^2$.

h. 90cm

Sol. 90 cm

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 90cm ×90cm×90cm

Volume of cube = 729,000 $cm^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(90cm)^2 = 6 \times 8100cm^2$

Surface area of cube = 48600 $cm^2$.

i. 45.6m

Sol. 45.6 m

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 45.6m ×45.6m×45.6m

Volume of cube = 94,818.816 $m^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(45.6m)^2 = 6 \times 2079.36m^2$

Surface area of cube = 12,476.16 $m^2$.

j. 100m

Sol. 100 m

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 100m ×100m×100m

Volume of cube = 1,000,000 $m^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(100m)^2 = 6 \times 10000m^2$

Surface area of cube = 60,000 $m^2$.

k. 10cm

Sol. 10 cm

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 10cm ×10cm×10cm

Volume of cube = 1000 $cm^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6(10cm)^2 = 6 \times 100cm^2$

Surface area of cube = 600 $cm^2$.

l. 55m

Sol. 55 m

Volume of cube = $\ell \times \ell \times \ell$

Volume of cube = 55m ×55m×55m

Volume of cube = 166,375 $m^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$$6(55m)^2 = 6 \times 3025m^2$$

Surface area of cube = 18,150 $m^2$.

**Q2. Calculate the volume and surface area of each of the following cuboids.**

**a. $\ell$ =21 cm, w = 11 cm and h = 6 cm**

Sol. $\ell$ =21 cm, w = 11 cm and h = 6 cm

Volume of cuboid = $\ell \times w \times h$

Volume of cuboid = 21 cm × 11 cm × 6 cm

Volume of cuboid = 1,386 $cm^3$

Surface area of cuboid =

$$2(\ell \times w) + 2(\ell \times h) + 2(w \times h)$$

Surface area of cuboid =

$$2(21cm \times 11cm) + 2(21cm \times 6cm) + 2(11cm \times 6cm)$$

Surface area of cuboid =

$$2(231cm^2) + 2(126cm^2) + 2(66cm^2)$$

Surface area of cuboid = 462 $cm^2$ +252 $cm^2$ + 132 $cm^2$

Surface area of cuboid = 846 $cm^2$ Ans.

**b. $\ell$ =43 cm, w = 31 cm and h = 9 cm**

Sol. $\ell$ =43 cm, w = 31 cm and h = 9 cm

Volume of cuboid = $\ell \times w \times h$

Volume of cuboid = 43 cm × 31 cm × 9 cm

Volume of cuboid = 11,997 $cm^3$

Surface area of cuboid =

$$2(\ell \times w) + 2(\ell \times h) + 2(w \times h)$$

Surface area of cuboid =

$$2(43cm \times 31cm) + 2(43cm \times 9cm) + 2(31cm \times 9cm)$$

Surface area of cuboid =

$$2(1333cm^2) + 2(387cm^2) + 2(279cm^2)$$

Surface area of cuboid = 2666 $cm^2$ +774 $cm^2$ + 558 $cm^2$

Surface area of cuboid = 3,998 $cm^2$ Ans.

**c. $\ell$ = 34.5 m, w = 15.1 m and h = 800 m**

Sol. $\ell$ = 34.5 m, w = 15.1 m and h = 800 m

Volume of cuboid = $\ell \times w \times h$

Volume of cuboid = 34.5 m × 15.1 m × 800 m

Volume of cuboid = 416,760 $m^3$

Surface area of cuboid =

$$2(\ell \times w) + 2(\ell \times h) + 2(w \times h)$$

Surface area of cuboid =

$$2(34.5m \times 15.1m) + 2(34.5m \times 800m) + 2(15.1m \times 800m)$$

Surface area of cuboid =

$$2(520.95m^2) + 2(27600m^2) + 2(12080m^2)$$

Surface area of cuboid = 1,041.9 $m^2$ +55200 $m^2$ + 24160 $m^2$

Surface area of cuboid = 80,401.9 $m^2$ Ans.

**d. $\ell$ = 19 cm, w = 20 cm and h = 21 cm**

Sol. $\ell$ = 19 cm, w = 20 cm and h = 21 cm

Volume of cuboid = $\ell \times w \times h$

Volume of cuboid = 19 cm × 20 cm × 21 cm

Volume of cuboid = 7,980 $cm^3$

Surface area of cuboid =

$$2(\ell \times w) + 2(\ell \times h) + 2(w \times h)$$

Surface area of cuboid =
$2+(19cm+20cm)+2(19cm\times 21cm)$
$+2(20cm\times 21cm)$
Surface area of cuboid =
$2(380cm^2)+2(399cm^2)$
$+2(420cm^2)$
Surface area of cuboid = 760 $cm^2$ + 798 $cm^2$ + 840 $cm^2$
Surface area of cuboid = 2,398 $cm^2$ **Ans.**

**Q3. Look at the following measurements of a cuboid and fill the missing values.**

| Length (cm) | Width (cm) | Height (cm) | Volume ($cm^3$) | Surface area ($cm^2$) |
|---|---|---|---|---|
| 23 | | 4 | | 452 |
| 21 | 14 | 7 | | |
| | 5 | 9 | 321 | |
| 45 | 3 | | 453 | |

Sol. Using formulas:
For volume of cuboid = $\ell\times w\times h$
Surface area of cuboid =
$2(\ell\times w)+2(\ell\times h)+2(w\times h)$

| Length (cm) | Width (cm) | Height (cm) | Volume ($cm^3$) | Surface area ($cm^2$) |
|---|---|---|---|---|
| 23 | 4.96 | 4 | 456.32 | 452 |
| 21 | 14 | 7 | 2058 | 1,078 |
| 7.13 | 5 | 9 | 321 | 289.64 |
| 45 | 3 | 3.35 | 453 | 591.6 |

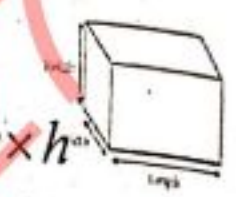
**Q4. Find the surface area and volume of the given cubes and cuboids.**

**a. Cube of side = 5cm**

Volume of cube = $\ell^3$

Volume of cube = $(5cm)^3$
Volume of cube = 125 $cm^3$
Surface area of cube = $6\times\ell^2$
Surface area of cube =
$6\times(5cm)^2=6\times 25cm^2$
Surface area of cube = 150$cm^2$.

**b. Length of cuboid = 7 cm**
Width of cuboid = 3 cm
Height of cuboid = 5 cm



Volume of cuboid = $\ell\times w\times h$
Volume of cuboid = 7cm × 3cm × 5cm
Volume of cuboid = 105 $cm^3$
Surface area of cuboid =
$2(\ell\times w)+2(\ell\times h)+2(w\times h)$
Surface area of cuboid =
$2(7\times 3)+2(7\times 5)+2(3\times 5)$
Surface area of cuboid = 2(21) + 2(35) + 2(15) = 42 + 70 + 30
Surface area of cuboid = 142$cm^2$.

**c. Length of cuboid = 4 m**
Width of cuboid = 2 m
Height of cuboid = 3 m

Volume of cuboid = $\ell\times w\times h$
Volume of cuboid = 4 m × 2 m × 3 m
Volume of cuboid = 24 $m^3$
Surface area of cuboid =
$2(\ell\times w)+2(\ell\times h)+2(w\times h)$
Surface area of cuboid =
$2(4\times 2)+2(4\times 3)+2(2\times 3)$
Surface area of cuboid = 2(8) + 2(12) + 2(6) = 16 + 24 + 12
Surface area of cuboid = 52 $m^2$.

**d. Cube of side = 7m**
Volume of cube = $\ell^3$
Volume of cube = $(7m)^3$

Volume of cube = 343 $m^3$

Surface area of cube = $6 \times \ell^2$

Surface area of cube =

$6 \times (7m)^2 = 6 \times 49m^2$

Surface area of cube = 294$m^2$.

**Exercise – 8.6**

**Q1. A cuboid glass box has dimensions 3m × 2 m × 1 m. find the volume of water that it can hold.**

Sol. Length of cuboid glass = 3m

Width of cuboid glass = 2m

Height of cuboid glass = 1m

Volume of cuboid glass = $\ell \times w \times h$

Volume of cuboid glass = 3m × 2m × 1m

Volume of cuboid glass = 6$m^3$

Thus, volume of water contained in the glass = 6$m^3$ **Ans.**

**Q2. A box of cereal is 22 cm high, 12 cm long and 6 cm wide. What is the capacity of the cereal box?**

Sol. Length of box = 22 cm

Width of box = 12 cm

Height of box = 6 cm

Volume of box = $\ell \times w \times h$

Volume of box = 21cm × 12cm × 6cm

Volume of box = 1,512 $cm^3$

Thus, capacity of cereal in the box = 1,512$cm^3$ **Ans.**

**Q3. A cube shaped container has a length of 72 cm. If it is filled with blocks up to a height of 42 cm, find the remaining capacity of the container.**

Sol. Length of cube shape container = 72 cm

Volume of cube shape container = $\ell \times \ell \times \ell$

Volume of cube shape container = 72 cm × 72 cm × 72 cm

Volume of cube shape container = 373,248 $cm^3$

Filled with block up to height of 42 cm.

Volume of blocks = h × h × h

Volume of blocks = 42 cm × 42 cm × 42 cm

Volume of blocks = 74,088 $cm^3$

Remaining capacity of container = volume of container – volume of blocks

Remaining capacity of container = 373,248 – 74,088

Remaining capacity of container = 299,160 $cm^3$. **Ans**

**Q4. A Masjid is 22 m long, 12 m wide and 18 m high. Find the cost of painting its walls at the rate of Rs 450 per square meter.**

Sol. Length = 22 m

Width = 12 m

Height = 18 m

Surface area = $2(\ell \times w) + 2(\ell \times h) + 2(w \times h)$

Surface area = $2(22 \times 12) + 2(22 \times 18) + 2(12 \times 18)$

Surface area = $2(264) + 2(396) + 2(216)$

Surface area = 528 + 792 + 432

Surface area = 1752 $m^2$

Cost of painting per square meter = 450

Cost of painting of whole surface = 450 × 1752 = 788,400 rupees.

**Q5. Find the cost of painting a cuboid container of length 4 m, width 3.5 m and height of 6 m at the rate of Rs 43.78 per square meter.**

Sol. Length = 4 m

Width = 3.5 m

Height = 6 m

Surface area = $2(\ell \times w) + 2(\ell \times h) + 2(w \times h)$

Surface area = $2(4 \times 3.5) + 2(4 \times 6) + 2(3.5 \times 6)$

Surface area =

$$2(14)+2(24)+2(21)$$

Surface area = 28 + 48 + 42

Surface area = 118 $m^2$

Cost of painting per square meter = 43.78

Cost of painting of whole surface = 43.78 × 118

= 5,166.04 Rupees.

**Q6. A cube shaped gift box has a length of 3 cm. Find whether the surface area of this box is greater or smaller than that of a cuboid box of dimension 5cm × 6cm × 3cm.**

Sol. Length of cube shape gift box = 3 cm

Surface area of cube = $6\times\ell^2$

Surface area of cube =

$$6\times(3cm)^2 = 6\times 9cm^2 = 54cm^2$$

Now, Dimension of cuboid = 5cm × 6cm × 3cm

Surface area of cuboid =

$$2(\ell\times w)+2(\ell\times h)+2(w\times h)$$

Surface area =

$$2(5\times 6)+2(5\times 3)+2(6\times 3)$$

Surface area =

$$2(30)+2(15)+2(18)$$

Surface area of cuboid = 60 + 30 + 36 = 126 $cm^2$

**Result:** Surface area of the cube gift box is smaller than the cuboid. Ans.

**Q7. The total surface area of a cuboid shoebox is 1296 $cm^2$. If its length and width is 18 cm and 9 cm respectively, find the height of the shoebox.**

Sol. Surface area of Cuboid shoebox = 1296 $cm^2$

Length of cuboid shoebox = 18 cm

Width of cuboid shoebox = 9 cm

Height of cuboid shoebox = ?

To find height of the cuboid shoebox we will use formula;

Surface area =

$$2(\ell\times w)+2(\ell\times h)+2(w\times h)$$

1296 $cm^2$ =

$$2(18\times 9)+2(18\times h)+2(9\times h)$$

1296 $cm^2$ =

$$2(162)+36h+18h$$

1296 $cm^2$ = 324 + 54h

Subtract 324 from both sides.

1296 – 324 = 324 + 54h – 324.

972 $cm^2$ = 54 h

Divide both sides by 54

$$\frac{972cm^2}{54}=\frac{54h}{54}$$

Height of cuboid shoebox = 18 cm. Ans.

**Q8. A wooden box has a length of 3 m, width of 2 m and height of 4 m. Find:**

**a. The volume of the box.**

**b. The cost polishing its surface if the rate of polishing is Rs 220 per square meter.**

Sol. Dimension of wooden box = 3 m × 2 m × 4 m

Volume of wooden box = $\ell\times w\times h$

Volume of wooden box = 3 m × 2 m × 4 m = 24 $m^3$

Surface area of wooden box =

$$2(\ell\times w)+2(\ell\times h)+2(w\times h)$$

Surface area of wooden box =

$$2(3\times 2)+2(3\times 4)+2(2\times 4)$$

Surface area of wooden box =

$$2(6)+2(12)+2(8)$$

Surface area of wooden box = 12 + 24 + 16 = 52 $m^2$

Cost of polishing per square meter = 220

Cost of polishing of 52 square meter = $52 \times 220$ = 11,440 Rupees. **Ans.**

**Q9. A box is 0.56 m high and 21 cm wide. Its volume is 51744 cubic centimeter. Find:**

a. **The length of the box in cm.**
b. **Total surface area of the box in $cm^2$**
c. **Cost of painting its complete outer surface at the rate of Rs 145 per square centimeters.**
**(Hint: First make the units of its dimensions the same)**

Sol. Height of the box = 0.56 m = $0.56 \times 100$ cm = 56 cm

Width of the box = 21 cm

Volume of the box = 51,744 $cm^3$

**a. Length of the box = ?**

To find length of the box we will use formula;

Volume of the box = $\ell \times w \times h$

51,744 $cm^3 = \ell \times 21cm \times 56cm$

51,744 $cm^3 = \ell \times 1176cm^2$

Divide both sides by $1176cm^2$

$$\frac{51744cm^3}{1176cm^2} = \frac{\ell \times 1176cm^2}{1176cm^2}$$

Length of the box = 44 cm. **Ans.**

**b. Surface area of the box =**

$$2(\ell \times w)+2(\ell \times h)+2(w \times h)$$

Surface area of the box =

$$2(44 \times 21)+2(44 \times 56)$$

$$+2(21 \times 56)$$

Surface area of the box =

$$2(924)+2(2464)+2(1176)$$

Surface area of the box = 1848 + 4928 + 2352

Surface area of the box = 9128 $cm^2$ **Ans.**

**c. Cost of painting per $cm^2$ = Rs.145**

Cost of painting for 9128 $cm^2$ = $9128 \times 145$ = Rs.1,323,560 **Ans.**

## Review Exercise – 8

**Q1. Choose the correct option.**

1. The _____ of any shape is the space occupied by it.
   i. Perimeter
   ii. Breadth
   iii. Width
   **iv. Area**
2. The sum of all the sides of a shape is called its _____.
   **i. Perimeter**
   ii. Space
   iii. Width
   iv. Area
3. The formula to find the area of a square is _____.
   i. 4L
   ii. L + B
   iii. 2 ( L + B )
   **iv. L × L**
4. ____ is the shortest distance between the top and bottom of a geometrical figure.
   i. Base
   **ii. Altitude**
   iii. Top
   iv. Vertex
5. The formula to find the area of a trapezium is _____.
   i. $a+\left(\frac{b_1+b_2}{2}\right)$
   ii. $a \times \left(\frac{b_1-b_2}{2}\right)$
   iii. $a-\left(\frac{b_1+b_2}{2}\right)$

iv. $a \times \left(\frac{b_1 + b_2}{2}\right)$

6. The formula for finding the area of a triangle is _____.

i. $\frac{1}{2}(b+h)$

ii. $\frac{1}{2}+(b \times h)$

iii. $\frac{1}{2}(b \times h)$

iv. $\frac{1}{2}(b-h)$

7. Surface area of cube = _____

i. **6 length$^2$**
ii. Length$^3$
iii. 4 length$^5$
iv. 8 length$^3$

8. Surface area of cuboid is _____.

i. $2[(l \times w) \times (l+h) \times (b+h)]$

ii. $4[(l \times b) \times (l \times h) \times (b \times h)]$

iii. $5[(l \times b) \times (l \times h) \times (b \times h)]$

iv. $2[(l \times w)+(l \times h)+(w \times h)]$

9. Volume of a cuboid = _____.

i. L + W +h
ii. L × W×h
iii. L – w – h
iv. $L \div W \div h$

**Q2. Define the following terms:**

a. **Perimeter of square and rectangle.**

Sol. Perimeter of a shape is measured by adding the lengths of all its sides. Its always measured in single units i.e. centimeter cm, meter m etc.
A square has all sides equal in length, so its perimeter can be measure by adding all 4 sides. If L is the length of a side of a square then, Perimeter of a square: L + L + L + L = 4L
In rectangle the length of opposite sides are equal. So its perimeter can be measured by adding all 4 sides. If L is the length and W is the width of the rectangle then the perimeter of the rectangle: L + W + L + W = 2L + 2W =2(L + W)

b. **Area of square and rectangle**

Sol. Area of a figure is the surface covered by that figure. It is always measured in squared units i.e. cm$^2$, m$^2$ etc.
Area of square can be obtained by multiplying the lengths of its two sides.
Area of square = length × length = L × L =L$^2$
The area of the rectangle is the product of their length and width.
Area of rectangle = length × width

c. **Altitude.**

Sol. The altitude of any shape is the shortest distance between the top or vertex of the shape to the opposite side or base. It is also called height.

**Q3. Find the perimeter and area of the squared shaped room whose length is 34 cm.**

Sol. Length of squared room = 34 cm
Perimeter of squared room = 4 × side
Perimeter of squared room = 4 × 34 cm = 136 cm
Area of squared room = side × side
Area of squared room = 34 cm × 34 cm = 1156 cm$^2$.

**Q4. Find the perimeter and area of the rectangular pond whose length is 98m and width is 88m.**

Sol. Length of rectangular pond = 98 m
Width of rectangular pond = 88 m
Perimeter = 2 (length + width)
Perimeter = 2 (98m + 88m) = 2 (186m) =372m
Area of rectangular pond = length × width
Area of rectangular pond = 98 m × 88 m = 8624 $m^2$

**Q5. Find the length of the squared playground if its perimeter is 1250 cm and cost to construct a boundary around the playground at the rate of Rs.90 per meter.**

Sol. Perimeter of squared playground = 1250 m
Length of squared playground =?
Perimeter = 4 × L
1250 m = 4 × L
Divide both sides by 4

$$\frac{1250m}{4} = \frac{4 \times L}{4}$$ L = 312.5m

Cost of boundary per meter = Rs.90
Cost of boundary for 1250 meter = 1250 × 90 =Rs.112,500

**Q6. Find the length of squared shaped bed sheet if its perimeter is 14 cm.**

Sol. Perimeter of squared shape bed sheet = 14 cm
Length of squared shape bed sheet =?
Perimeter = 4 × L
14 cm = 4 × L
Divide both sides by 4

$$\frac{14cm}{4} = \frac{4 \times L}{4}$$

L = 3.5 cm Ans.

**Q7. Find the length of rectangular hall if its area is 980 $m^2$ if width is 20 m. find the cost of cementing the room at the rate of Rs.420 per $cm^2$.**

Sol. Area of rectangular hall = 980 $m^2$
Width of rectangular hall = 20 m
Length of the hall =?
Area = length × width
980 $m^2$ = length × 20 m
Divide both side by 20 m

$$\frac{980m^2}{20m} = \frac{length \times 20m}{20m}$$

Length = 49 m.
Cost of cementing per $m^2$ = Rs.420
Cost of cementing for 980 $m^2$
= 980 × 420
= Rs.411,600 Ans.

**Q8. A pond is 98 cm long and 76 cm wide. A road 3.2 cm wide is made all around it outside the pond. Find the area of the road.**

Sol. Length of pond = 98 cm
Width of pond = 76 cm
Area of pond = length × width = 98 cm × 76 cm
Area of pond = 7448 $cm^2$
Width of road around the pond = 3.2 cm
Now, length of pond with road = 98 + 3.2 + 3.2 = 104.4 cm
Width of pond with road = 76 + 3.2 + 3.2 = 82.4 cm
Area of pond with road = 104.4cm × 82.4 cm = 8602.56 $cm^2$
Area of road = area of pond with road – area of pond without road
Area of road
= 8602.56 $cm^2$ – 7448 $cm^2$
=1154.56 $cm^2$

**Q9. A room is 7.8 m long and 6.5 m wide. Aliza wants to carpet 2m wide all round inside the room. Find the area of the carpeting part of the room.**

Sol. Length of room = 7.8m
Width of room = 6.5 m

Area of room = length × width = 7.8 m × 6.5 m

Area of room = 50.70 $m^2$

Width of carpet = 2 m

Length of room without carpet = 7.8 – 2 – 2 = 3.8 m

Width of room without carpet = 6.5 – 2 – 2 = 2.5 m

Area of room without carpet = 3.8 m × 2.5 m = 9.5 $m^2$

Area of carpeting part of room = area of room – area of room without carpet

Area of carpeting part of room = 50.70 $m^2$ – 9.5 $m^2$ = 41.2 $m^2$. Ans

**Q10. Find the altitude of a trapezium if the length of two bases are 34.56 cm and 32.12 cm respectively. The areaof the trapezium is 482 $cm^2$.**

Sol. Length of 1st base = 34.56 cm

Length of 2nd base = 32.12 cm

Area of trapezium = 482 $cm^2$

Altitude of trapezium =?

Using formula:

$$\text{Area of trapezium} = a \times \left(\frac{b_1 + b_2}{2}\right)$$

Putting values:

$$482cm^2 = a \times \left(\frac{34.56cm + 32.12cm}{2}\right)$$

$$482cm^2 = a \times \left(\frac{66.68}{2}\right)$$

$$482cm^2 = a \times 33.34\,\text{cm}$$

Divide both sides by 33.34cm

$$\frac{482cm^2}{33.34cm} = \frac{a \times 33.34cm}{33.34cm}$$

Altitude of trapezium = 14.457 cm. Ans.

**Q11. Find the area of a trapezium if the length of two bases are 44cm and 66cm respectively. The perpendicular distance between two bases are 52cm.**

Sol. Length of 1st base = 44 cm

Length of 2nd base = 66 cm

Altitude of trapezium = 52 cm

Area of trapezium =?

Using formula:

$$\text{Area of trapezium} = a \times \left(\frac{b_1 + b_2}{2}\right)$$

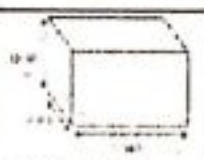
$$\text{Area of trapezium} = 52 \times \left(\frac{44 + 66}{2}\right)$$

Area of trapezium =

$$52 \times \left(\frac{110}{2}\right) = 52 \times 55$$

Area of trapezium = 2860 $cm^2$ **Ans.**

**Q12. Write the names and write the properties of each of the given shapes.**

| Shape | Circular edges | Straight edges | Vertices | Circular faces | Flat faces |
|---|---|---|---|---|---|
|  Cone | 1 | 0 | 1 | 1 | 1 |
|  Cuboid | 0 | 12 | 8 | 0 | 6 |

| | | | | | |
|---|---|---|---|---|---|
| Cube | 0 | 12 | 8 | 0 | 6 |
| Cylinder | 2 | 0 | 0 | 1 | 2 |
| Sphere | 0 | 0 | 0 | 1 | 0 |
| Semi-sphere | 1 | 0 | 0 | 1 | 1 |

**Q13. Find the altitude of the triangular field. If its area is $99cm^2$ and base is 9cm.**

Sol. Area of triangular field = 99 $cm^2$

Base of triangular field = 9 cm

Altitude of triangular field =?

Using formula:

Area of triangular field =

$$\frac{1}{2}\text{base}\times\text{altitude}$$

Putting values:

$$99cm^2=\frac{1}{2}(9cm)\times\text{altitude}$$

$$99cm^2=4.5cm\times\text{altitude}$$

Divide both sides by 4.5 cm

$$\frac{99cm^2}{4.5cm}=\frac{4.5cm\times\text{altitude}}{4.5cm}$$

Altitude of triangular field = 22 cm **Ans.**

**Q14. Find the volume and surface area of the following cube.**

a. $\ell=8cm,\ w=6cm\ and\ h=5cm$

Sol. $\ell=8cm,\ w=6cm\ and\ h=5cm$

Volume = $\ell\times w\times h$

Volume = 8cm × 6cm × 5cm

Volume = 240 $cm^3$

Surface area = $2(\ell\times w)+2(\ell\times h)+2(w\times h)$

Surface area = $2(8cm\times 6cm)+2(8cm\times 5cm)+2(6cm\times 5cm)$

Surface area =

$2(48cm^2)+2(40cm^2)$

$+2(30cm^2)$

Surface area =

$96cm^2+80cm^2+60cm^2$

Surface area = 236 $cm^2$ **Ans.**

b. $\ell = 69cm,\ w = 69cm\ and$ $h = 69cm$

Sol. $\ell = 69cm,\ w = 69cm\ and$ $h = 69cm$

Volume = $\ell \times \ell \times \ell$

Volume = 69cm × 69cm × 69cm

Volume = 328,509 $cm^3$

Surface area = $6 \times \ell^2$

Surface area = $6 \times (69cm)^2$

Surface area = $6 \times 4761cm^2$

Surface area = 28,566 $cm^2$ **Ans.**

c. $\ell = 5m,\ w = 5m\ and\ h = 5m$

Sol. $\ell = 5m,\ w = 5m\ and\ h = 5m$

Volume = $\ell \times \ell \times \ell$

Volume = 5m × 5m × 5m

Volume = 125 $m^3$

Surface area = $6 \times \ell^2$

Surface area = $6 \times (5m)^2$

Surface area = $6 \times (25m^2)$

Surface area = $150m^2$ **Ans.**

d. $\ell = 9cm,\ w = 5cm\ and$ $h = 4cm$

Sol. $\ell = 9cm,\ w = 5cm\ and\ h = 4cm$

Volume = $\ell \times w \times h$

Volume = 9cm × 5cm × 4cm

Volume = 180 $cm^3$

Surface area =

$2(\ell \times w)+2(\ell \times h)+2(w \times h)$

Surface area =

$2(9cm \times 5cm)+2(9cm \times 4cm)$

$+2(5cm \times 4cm)$

Surface area =

$2(45cm^2)+2(36cm^2)$

$+2(20cm^2)$

Surface area =

$90cm^2+72cm^2+40cm^2$

Surface area = 202 $cm^2$ **Ans.**

**Q15. Find the total surface area of the block whose length is 9 cm, width 2.3 cm and height is 3.3 cm.**

Sol. Dimension of block = 9 cm, 2.3 cm and 3.3 cm

Surface area of block =

$2(\ell \times w)+2(\ell \times h)+2(w \times h)$

Surface area of block =

$2(9cm \times 2.3cm)+2(9cm \times 3.3cm)$

$+2(2.3cm \times 3.3cm)$

Surface area of block =

$2(20.7cm^2)+2(29.7cm^2)$

$+2(7.59cm^2)$

Surface area of block = 41.4 $cm^2$ + 59.4 $cm^2$ + 15.18 $cm^2$

Surface area of block = 115.98 $cm^2$ **Ans.**

**Q16. A classroom is 4m long, 5m wide and 3m high. Find the cost of whitewash the all four walls and ceiling the room at the rate of Rs.43 per $m^2$.**

Sol. Length of classroom = 4 m

Width of classroom = 5 m

Height of classroom = 3 m

Surface area of four walls =

$$2(\ell \times h) + 2(w \times h)$$

Surface area of four walls =

$$2(4m \times 3m) + 2(5m \times 3m)$$

Surface area of four walls =

$$2(12m^2) + 2(15m^2)$$

Surface area of four walls =

$$24m^2 + 30m^2 = 54m^2$$

Surface area of ceiling = $\ell \times w$ = 4m × 5m

$= 20m^2$

Total surface area = surface area of four walls + surface area of ceiling

Total surface area

$= 54\ m^2 + 20\ m^2 = 74\ m^2$.

Cost of whitewash per $m^2$ = Rs.43

Cost of whitewash for 74 $m^2$

= 74 × 43 = Rs.3,182 Ans.

**Q17. A water tank is cuboid in shape. The length, width and height of the tank are 3.5m, 4.2m and 5.3m respectively. If we completely fill it with water, find the volume of water in the tank in liter?**

Sol. Length of water tank = 3.5m

Width of water tank = 4.2m

Height of water tank = 5.3m

Volume of water tank = $\ell \times w \times h$

Volume of water tank = 3.5m × 4.2m × 5.3m

Volume of water tank = 77.91 $m^3$

Volume of water in liters = 77.91 × 1000 liters

Volume of water in liters = 77910 liters. Ans.

**Q18. Find the capacity of a can whose length, width and height are 54cm, 35cm and 56cm respectively.**

Sol. Length of can = 54cm

Width of can = 35cm

Height of can = 56cm

Volume of can = $\ell \times w \times h$

Volume of can = 54cm × 35cm × 56cm

Volume of can = 105,840 $cm^3$. **Ans.**

**Q19. The altitude of the parallelogram is 2.4 cm and its area is 84.4 $cm^2$. Find the base of parallelogram.**

Sol. Area of parallelogram = 84.4 $cm^2$

Altitude of parallelogram = 2.4 cm

Base of parallelogram =?

Using formula:

Area of parallelogram = base × altitude

Putting values:

84.4 $cm^2$ = base × 2.4 cm

Divide by 2.4 cm:

$$\frac{84.4cm^2}{2.4cm} = \frac{\text{base} \times 2.4cm}{2.4cm}$$

Base of parallelogram = 35.16 cm. **Ans.**

**Q20. Find the area of the triangle if the length of its base is 67.2 cm and the length of its altitude is 56.2cm.**

Sol. Altitude of triangle = 56.2 cm

Base of triangle = 67.2 cm

Area of triangle =

$$\frac{1}{2} \times \text{base} \times \text{altitude}$$

Area of triangle =

$$\frac{1}{2} \times 67.2cm \times 56.2cm$$

Area of triangle =

$$\frac{1}{2} \times 3776.64cm^2$$

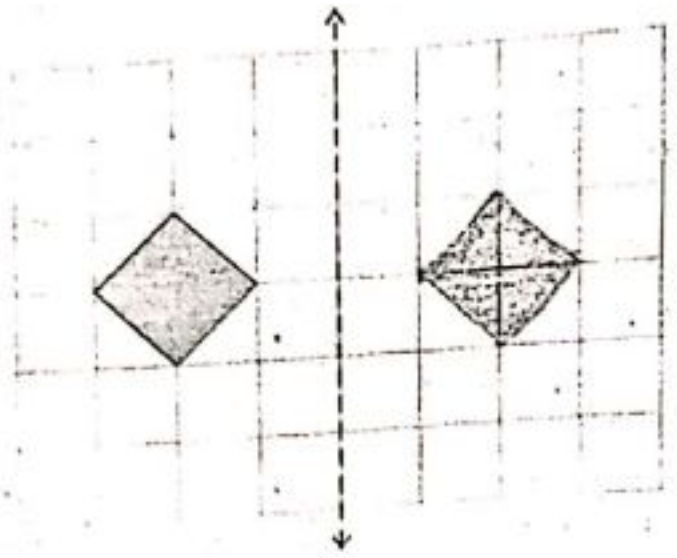
Area of triangle = 1888.32 $cm^2$ Ans.

## Unit – 9
## Lines, Angles and Symmetry
### Exercise – 9. 1

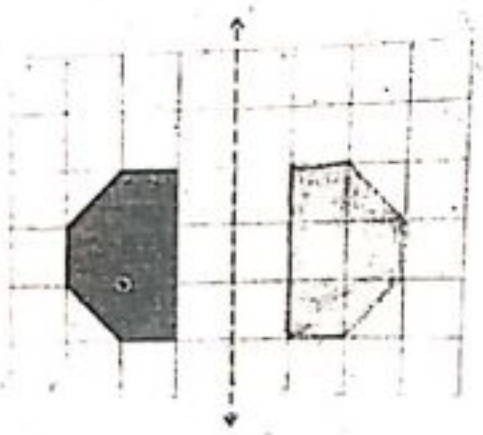
**Q1. Reflect the given images on square grid.**

Sol.

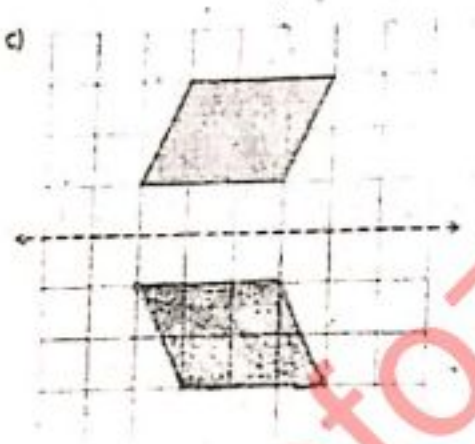
a)



b)

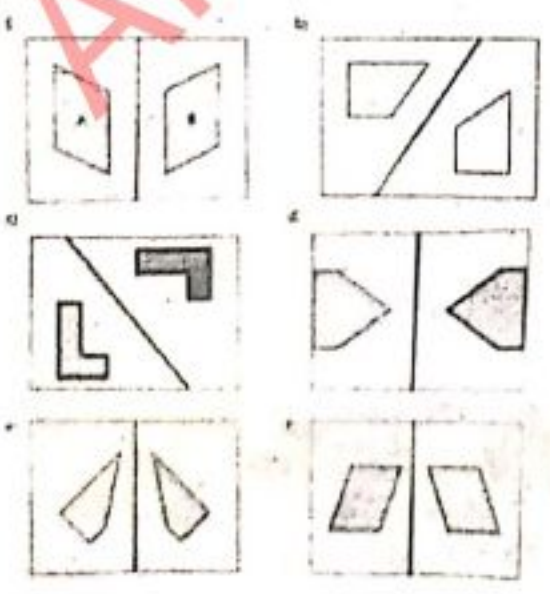


c)



**Q2. Find and draw the line of reflection for these images using compass.**

Sol.

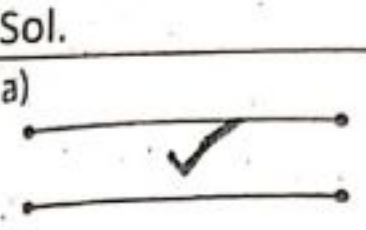


## Exercise – 9.2

**Q1. Identify and tick the parallel lines.**

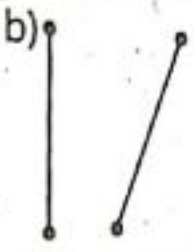
Sol.

a)



Parallel lines

b)



Not parallel lines

c)

Not parallel lines

d)

Not parallel lines

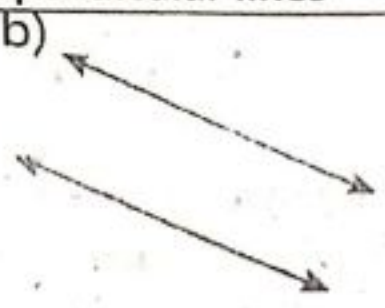
**Q2. Determine which of these pairs of lines are perpendicular.**

Sol.

a)

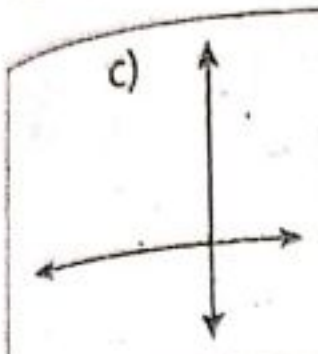
Perpendicular lines

b)



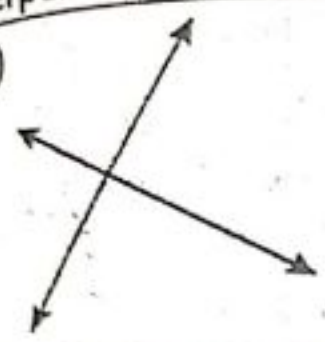
Non-perpendicular lines

c)



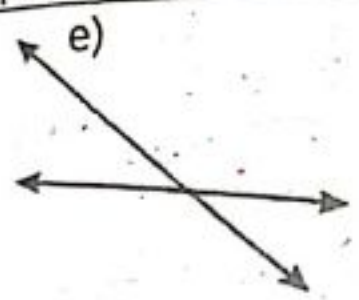
Perpendicular lines

d)



Perpendicular lines

e)

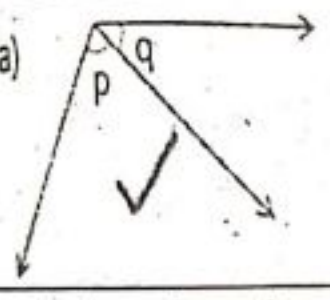


Non-perpendicular lines

**Q3. Tick the pair of adjacent angles.**

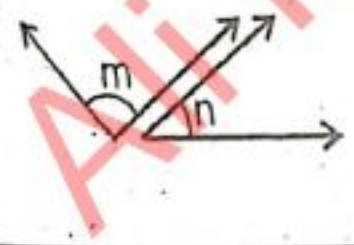
Sol.

a)



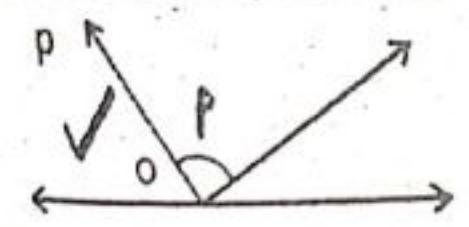

Angle P and angle q are adjacent angles

b)




These are not adjacent angles

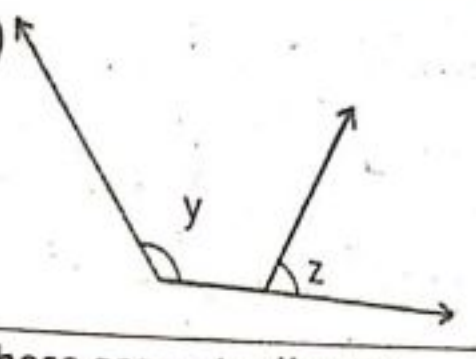
c)




Angle o and angle p are

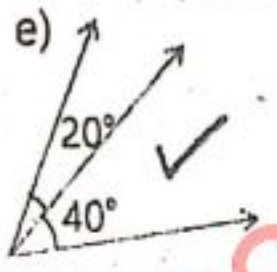
adjacent angles

d)



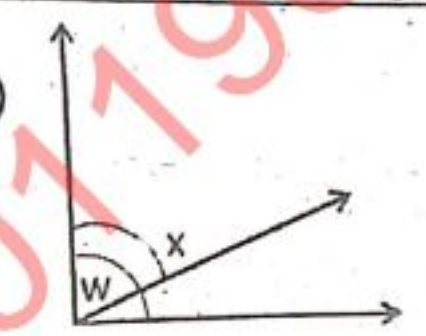

These are not adjacent angles

e)




These are adjacent angles

f)




These are not adjacent angles

## Exercise – 9.3

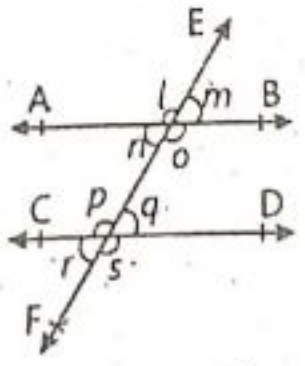
**Q1. Two parallel lines are intersected by a transversal, as shown in the given figures:Observe these figures and write answers of the following questions:**

a) Write names of parallel lines and a transversal.

b) Write names of pairs of:

- Corresponding angles
- Alternate interior angles
- Alternate exterior angles

i.



a. $\overline{AB}$ *and* $\overline{CD}$ are parallel lines while $\overline{EF}$ is the transversal.

b. Corresponding angles are:

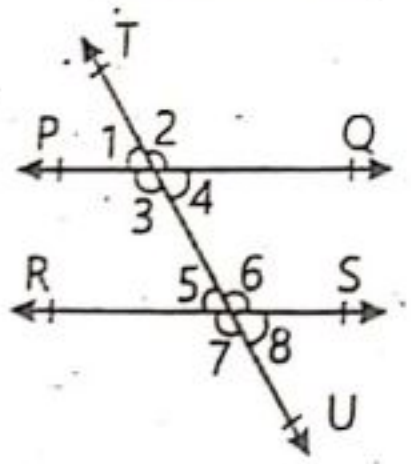
$\angle l$ and $\angle$p, $\angle$m and $\angle$q, $\angle$n and $\angle$r, $\angle$o and $\angle$s

Alternate interior angles are:

$\angle$n and $\angle q$, $\angle o$ and $\angle$p

Alternate exterior angles are:

$\angle m$ and $\angle r$, $\angle l$ and $\angle s$




a. $\overline{PQ}$ *and* $\overline{RS}$ are parallel lines while $\overline{TU}$ is the transversal.

b. Corresponding angles are:

$\angle 1$ and $\angle 5$, $\angle 2$ and $\angle 6$, $\angle 3$ and $\angle 7$, $\angle 4$ and $\angle 8$

Alternate interior angles are:

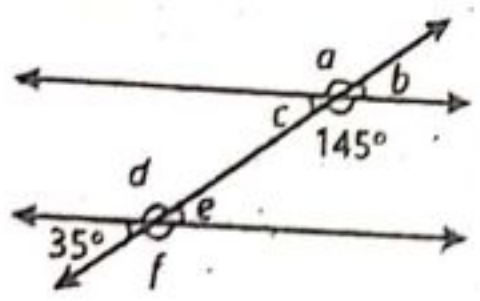
$\angle 3$ and $\angle 6$, $\angle 4$ and $\angle 5$

Alternate exterior angles are:

$\angle 1$ and $\angle 8$, $\angle 2$ and $\angle 7$

**Q2. Using properties of parallel lines and a transversal, find unknown angles of the following figures:**

a.




$\angle c = 35^0$ *and* $\angle f = 145^0$

(Corresponding angles)

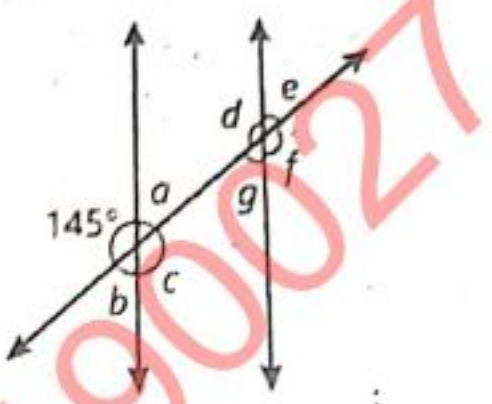
$\angle d = 145^0$ *and* $\angle e = \angle c = 35^0$

(Alternate interior angles)

$\angle b = 35^0$ *and* $\angle a = \angle f = 145^0$

(Alternate exterior angles)

b.




$\angle b + 145^0 = 180$

$\angle b = 180^0 - 145^0 \Rightarrow \angle b = 35^0$

$\angle d = 145^0$ *and* $\angle b = \angle g = 35^0$

(Corresponding angles)

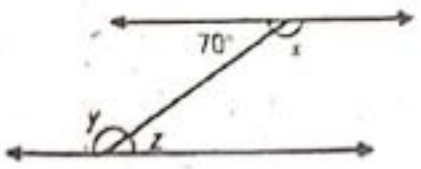
$\angle c = 145^0$ and $\angle d = \angle f = 145^0$

(Vertically opposite angles)

$\angle e = \angle b = 35^0$ (Alternate exterior angles)

$\angle e = \angle a = 35^0$ (Corresponding angles)

c.



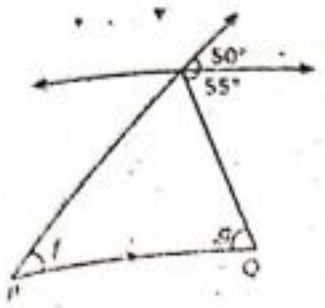

$\angle x + 70^0 = 180$

$\angle x = 180^0 - 70^0 \Rightarrow \angle x = 110^0$

$\angle x = \angle y = 110^0$ (Alternate interior angles)

$\angle z = 70^0$ (Alternate interior angles)

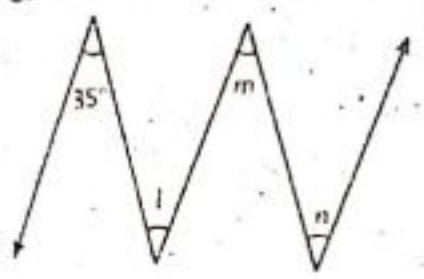
d.




$\angle f = 50^0$ (Corresponding angles)

$\angle g = 55^0$ (Alternate interior angles)

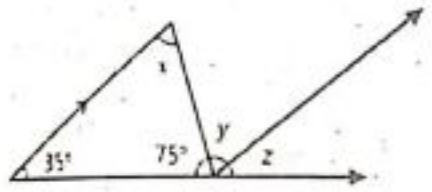
e.




$\angle l = 35^0$ (Alternate angles)

$\angle n = \angle m = \angle l = 35^0$ (Alternate angles)

f.




$\angle x + 35^0 + 75^0 = 180^0$

$\angle x + 110^0 = 180^0$

$\angle x = 180^0 - 110^0$

$\angle x = 70^0$

$\angle x = \angle y = 70^0$ (Alternate angles)

$\angle z + \angle y + 75^0 = 180^0$

(Supplementary angles)

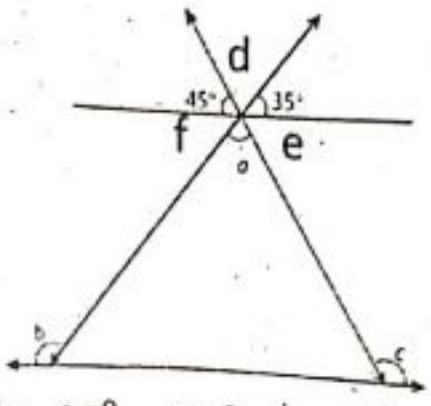
$\angle z + 70^0 + 75^0 = 180^0$

$\angle z + 145^0 = 180^0$

$\angle z = 180^0 - 145^0$

$\Rightarrow \angle z = 35^0$

g.




$\angle d + 45^0 + 35^0 = 180^0$

$\angle d + 80^0 = 180^0$

$\angle d = 180^0 - 80^0$

$\Rightarrow \angle d = 100^0$

$\angle d = \angle a = 100^0$ (Vertically opposite angles)

$\angle c = \angle d + 35^0$

$\angle c = 100^0 + 35^0$ (Corresponding angles)

$\Rightarrow \angle c = 135^0$

angles)

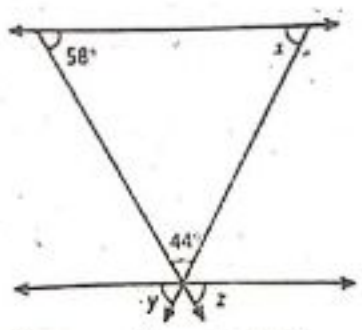
$\angle b = \angle d + 45^0$

$\angle b = 100^0 + 45^0$

$\Rightarrow \angle b = 145^0$

(Corresponding angles)

h.




$\angle x + 58^0 + 44^0 = 180^0$

$\angle x + 102^0 = 180^0$ (Interior

$\angle x = 180^0 - 102^0$

$\Rightarrow \angle x = 78^0$

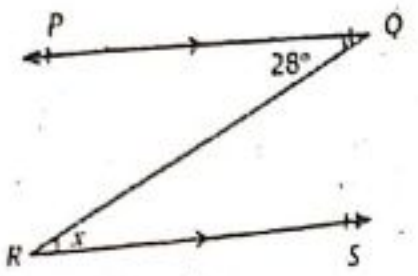
angles of triangle)

$\angle y = \angle x = 78^0$ *and* $\angle z = 58^0$

(Corresponding angles)

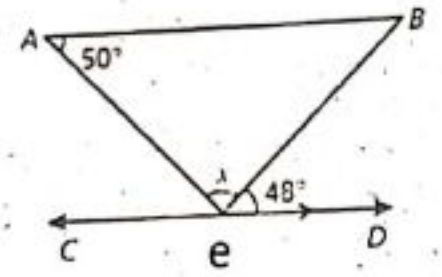
**Q3. Find the value of 'x'.**

a.




$\angle x = 28^0$ (Alternate angles)

b.




$\angle e = 50^0$ (Alternate interior angles)

$\angle x + \angle e + 48^0 = 180^0$

(Supplementary angles)

$\angle x + 50^0 + 48^0 = 180^0$

$\angle x + 98^0 = 180^0 \Rightarrow \angle x = 180^0 - 98^0$

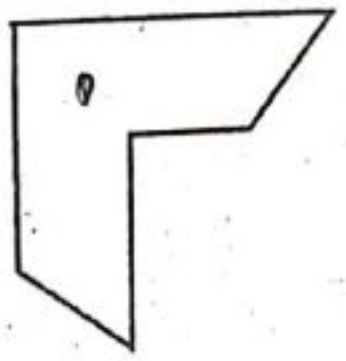
$\angle x = 82^0$

**Exercise – 9.4**

**Q1. Tick the figures that have rotational symmetry. Write the order of rotation and marks the point of rotation for the symmetric figures.**

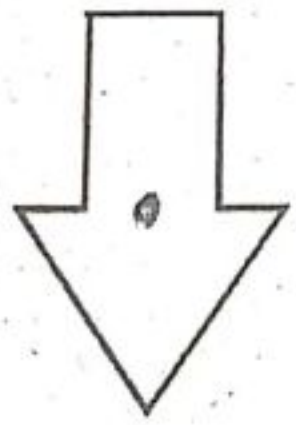
Sol.

When this figure is rotated about its center point, it looks exactly the same 4 times during a full rotation. So, it has rotational symmetry and the order of its rotational symmetry is 4.



When this figure is rotated about its center point, it looks exactly the same only 1 time during a full rotation. So, it does not have a rotational symmetry.

When this figure is rotated about its center point, it looks exactly the same 2 times during a full rotation. So, it has rotational symmetry and the order of its rotational symmetry is 2.



When this figure is rotated about its center point, it looks exactly the same only 1 times during a full rotation. So, it does not have a rotational symmetry.

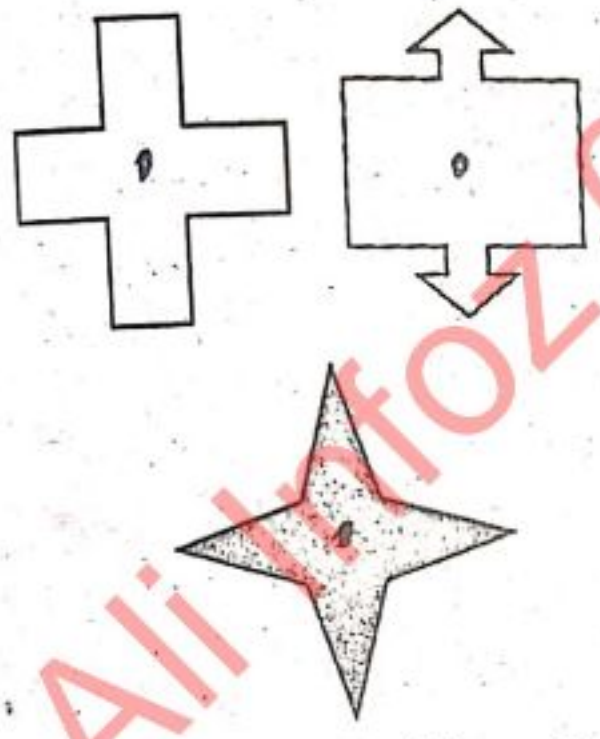
When this figure is rotated about its center point, it looks exactly the same 2

times during a full rotation. So, it has rotational symmetry and the order of its rotational symmetry is 2.

When this figure is rotated about its center point, it looks exactly the same 4 times during a full rotation. So, it has rotational symmetry and the order of its rotational symmetry is 4.

**Q2. Draw three shapes having rotational symmetry and mention the order of their rotational symmetry as well as point of rotation.**

Sol. Three shapes with rotational symmetry are:



These are the required three figures having rotational symmetry of order 4, 2 and 4 respectively.

**Review Exercise – 9**

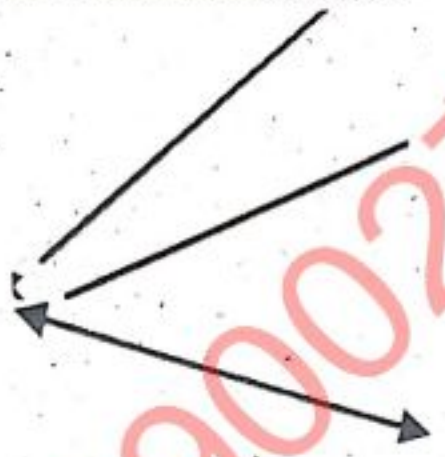
**Q1. Choose the correct option.**

a. A point has _____ dimension.
   i. 1
   ii. 2
   iii. 3
   iv. 0

b. A cuboid has _____ faces.
   i. 8
   **ii. 6**
   iii. 5
   iv. 4

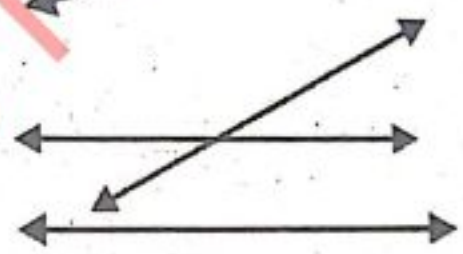
c. The pairs of lines that are cannot intersect each other.

i.

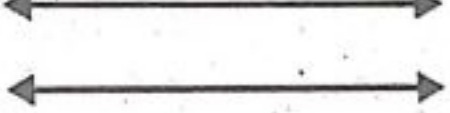


ii.

iii.

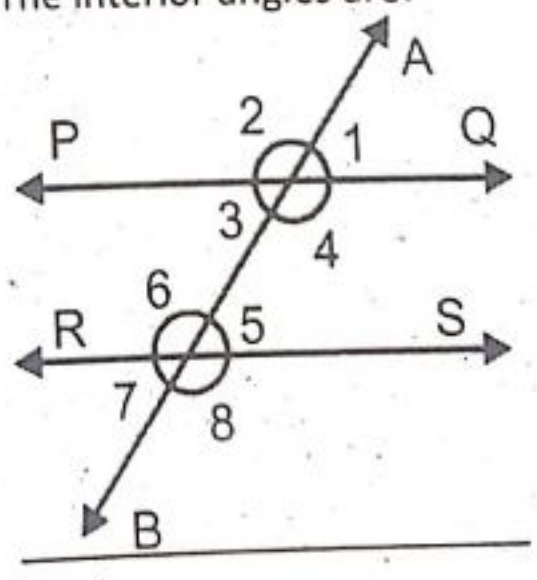


iv.



d. If a line passes through two or more given lines at different point, it is called:
   i. Alternate
   ii. Non-parallel
   iii. Parallel
   **iv. Transversal**

e. The interior angles are:



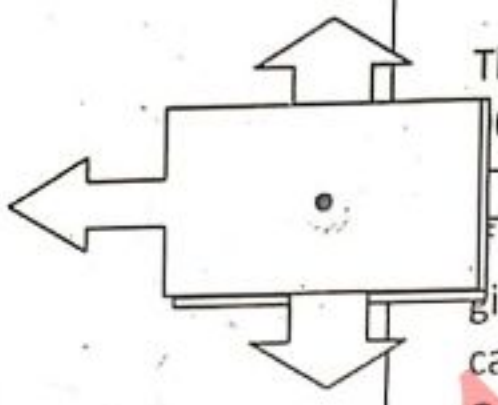
i. $\angle 1, \angle 4, \angle 5, \angle 7$

ii. $\angle 3; \angle 5, \angle 4, \angle 6$

iii. $\angle 1, \angle 4, \angle 2, \angle 6$

iv. $\angle 3, \angle 4, \angle 5, \angle 8$

f. The order of rotation of the given figure is:



i. 3
ii. 1
iii. 0
**iv. 4**

**Q2. Define the following.**

**a. Transversal :**

If a line passes through two or more given lines at different points, it is called transversal.

**b. Corresponding angles:**

When a transversal intersect two parallel lines at different points, the angles formed at the corresponding places are called corresponding angles.

**c. Alternate angles:**

When a transversal intersect two parallel lines at different points, the angles formed at the alternate places are called alternate angles.

**d. Parallel lines:**

The lines which do not intersect each other at a point, when they are extended on either side in the same direction, are called parallel lines.

**e. Perpendicular lines:**

The lines that intersect each other at $90^0$ are called perpendicular lines.

**Q3. Differentiate between parallel lines, perpendicular lines and transversal.**

Ans. **Parallel lines:**

The lines which do not intersect each other at a point, when they are extended on either side in the same direction, are called parallel lines.

**Perpendicular lines:**

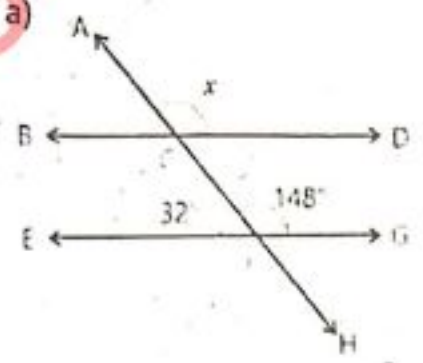
The lines that intersect each other at $90^0$ are called perpendicular lines.

**sversal :**

a line passes through two or more given lines at different points, it is called transversal.

**Q4. Find unknown angles of the following figures.**

a)

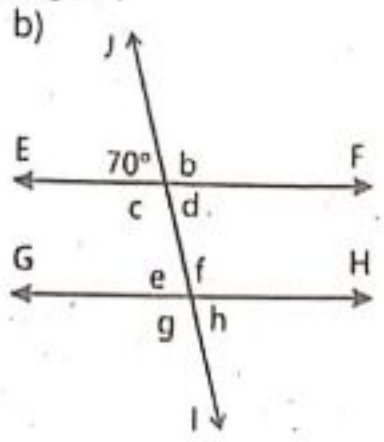



$\angle x = 148^0$ (Corresponding angles)

$\angle C = 148^0$ (Alternate interior angles)

$\angle F = 148^0$ (Vertically opposite angles)

b)



$\angle b + 70^0 = 180^0$

(Supplementary angles)

$\angle b = 180^0 - 70^0$

$\Rightarrow \angle b = 110^0$

$\angle d = 70^0$ *and* $\angle c = \angle b = 110^0$

(Vertically opposite angles)

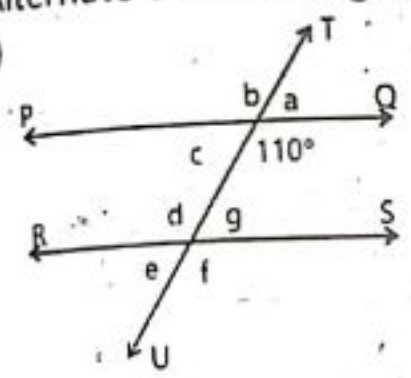
$\angle e = 70^0$ *and* $\angle f = \angle b = 110^0$

(Corresponding angles)

$\angle h = 70^0$ *and* $\angle g = \angle b = 110^0$

(Alternate exterior angles)

c)




$\angle f = 110^0$

(Corresponding angles)

$\angle b = 110^0$ *and* $\angle d = \angle f = 110^0$

(Vertically opposite angles)

$\angle c + 110^0 = 180^0$

(Supplementary angles)

$\angle c = 180^0 - 110^0$

$\Rightarrow \angle c = 70^0$

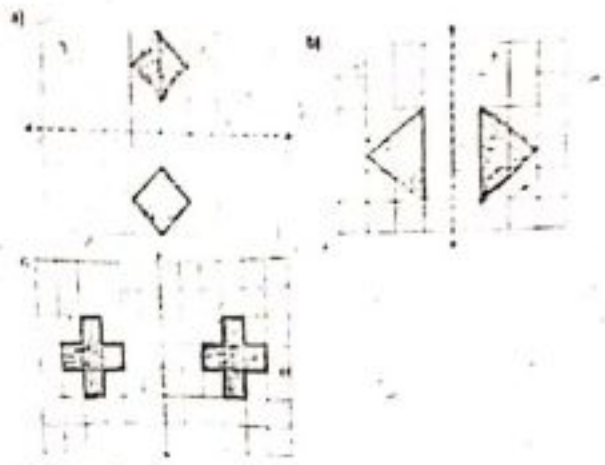
$\angle e = \angle c = 70^0$

(Corresponding angles)

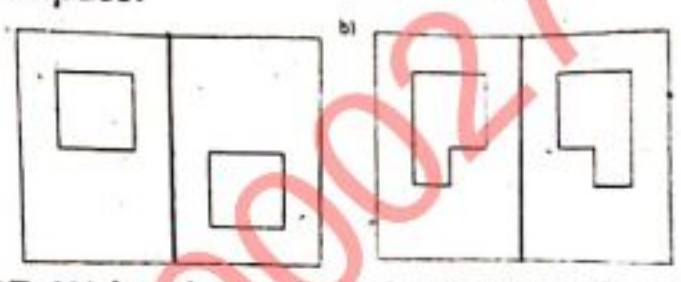
$\angle a = \angle c = 70^0$

*and* $\angle e = \angle g = 70^0$ (Vertically opposite angles)

**Q5. Reflect the images on grid paper.**

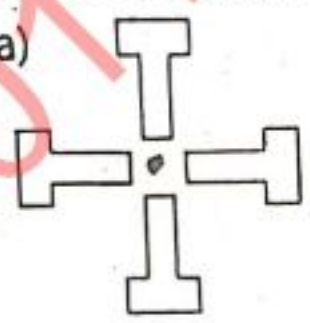


**Q6. Find and draw the line of reflection for these images using compass.**



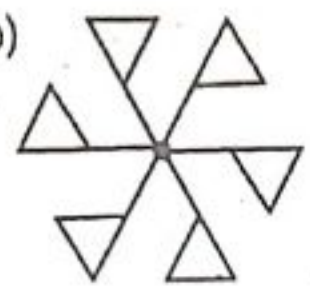
**Q7. Write the order of rotation of each figure and mark the point of rotation for the symmetric figures.**

a)



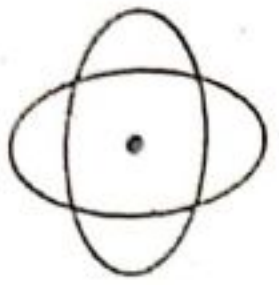
When this figure is rotated about its center point, it looks exactly the same 4 times during a full rotation. So, it has rotational symmetry and the order of its rotational symmetry is 4.

b)



When this figure is rotated about its center point, it looks exactly the same 2 times during a full rotation. So, it has rotational symmetry and the order of its rotational symmetry is 2.

c)



When this figure is rotated about its center point, it looks exactly the same 4 times during a full rotation. So, it has rotational symmetry and the order of its rotational symmetry is 4.

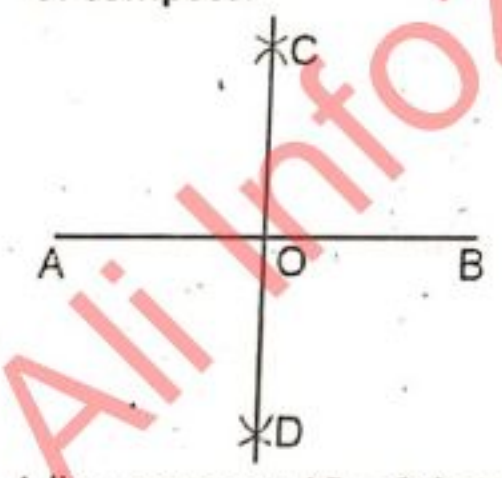
d)

When this figure is rotated about its center point, it looks exactly the same 4 times during a full rotation. So, it has rotational symmetry and the order of its rotational symmetry is 4.

## Unit – 10
## Geometrical constructions

### Exercise – 10.1

**Q1. Draw the right bisectors of the following lines segments using a pairs of compass.**




A line segment AB = 9.8 cm is given.

**Steps of Construction:**

**Step I:** Place the pointer of the compass at point A.

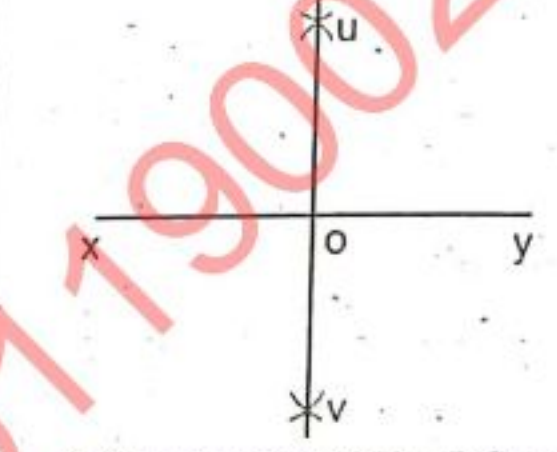
Open the compass with more than half of the measure o the line segment AB and draw an arc on the top and bottom of AB.

**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point B and draw two arc on the top and bottom of AB which intersects the previous arc at point C and D respectively.

**Step III:** Join the point C and D by a line using a ruler that will cut the line segment AB at point O.

CD is the right bisector of AB and O is the mid-point.

So AO = OB




A line segment XY = 5.6 cm is given.

**Steps of Construction:**

**Step I:** Place the pointer of the compass at point X.

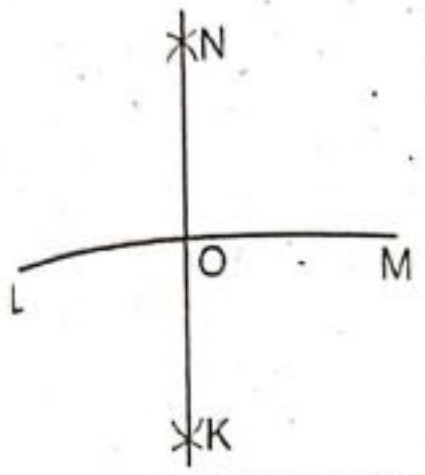
Open the compass with more than half of the measure o the line segment XY and draw an arc on the top and bottom of XY.

**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point Y and draw two arc on the top and bottom of XY which intersects the previous arc at point U and V respectively.

**Step III:** Join the point U and V by a line using a ruler that will cut the line segment XY at point O.

UV is the right bisector of XY and O is the mid-point.

So XO = OY




A line segment LM = 6.9 cm is given.

**Steps of Construction:**

**Step I:** Place the pointer of the compass at point L.

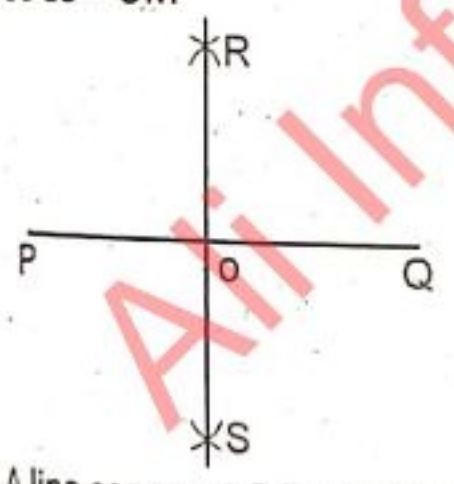
Open the compass with more than half of the measure o the line segment LM and draw an arc on the top and bottom of LM.

**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point M and draw two arc on the top and bottom of LM which intersects the previous arc at point N and K respectively.

**Step III:** Join the point N and K by a line using a ruler that will cut the line segment LM at point O.

NK is the right bisector of LM and O is the mid-point.

So LO = OM




A line segment PQ = 7.6 cm is given.

**Steps of Construction:**

**Step I:** Place the pointer of the compass at point P.

Open the compass with more than half of the measure o the line segment PQ and draw an arc on the top and bottom of PQ.

**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point B and draw two arc on the top and bottom of AB which intersects the previous arc at point R and S respectively.

**Step III:** Join the point R and S by a line using a ruler that will cut the line segment PQ at point O.

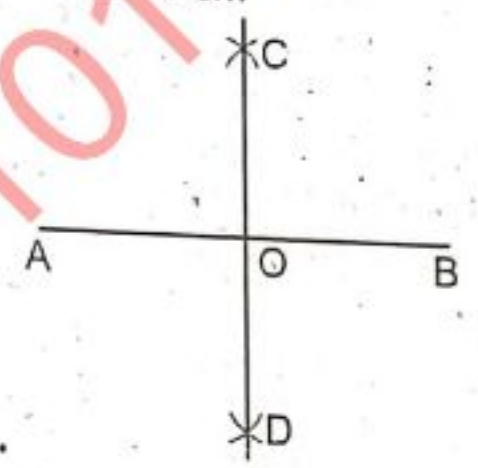
RS is the right bisector of PQ and O is the mid-point.

So PO = OQ

**Q2. Draw the following line segments and bisect them.**

a. 9 cm

Sol. AB = 9 cm




A line segment AB = 9.8 cm is given.

**Steps of Construction:**

**Step 1:** Place the pointer of the compass at point A.

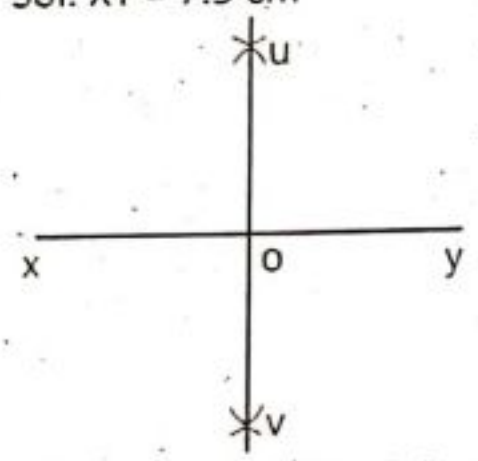
Open the compass with more than half of the measure o the line segment AB and draw an arc on the top and bottom of AB.

**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point B and draw two arc on the top and bottom of AB which intersects the previous arc at point C and D respectively.

**Step III:** Join the point C and D by a line using a ruler that will cut the line segment AB at point O.
CD is the right bisector of AB and O is the mid-point.
So AO = OB

b. 7.9 cm

Sol. XY = 7.9 cm



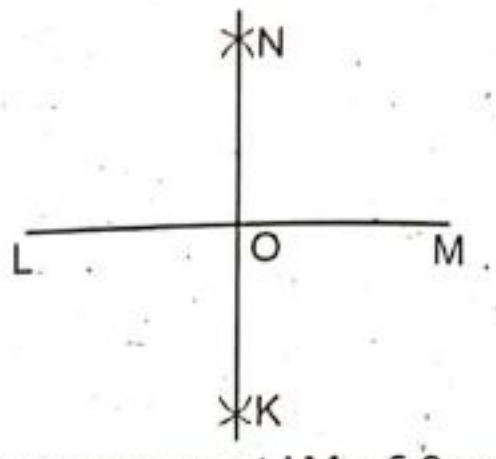

A line segment XY = 5.6 cm is given.

**Steps of Construction:**

**Step I:**Place the pointer of the compass at point X.
Open the compass with more than half of the measure o the line segment XY and draw an arc on the top and bottom of XY.
**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point Y and draw two arc on the top and bottom of XY which intersects the previous arc at point U and V respectively.
**Step III:** Join the point U and V by a line using a ruler that will cut the line segment XY at point O.
UV is the right bisector of XY and O is the mid-point.
So XO = OY

c. 8.6 cm

Sol. LM = 8.6 cm



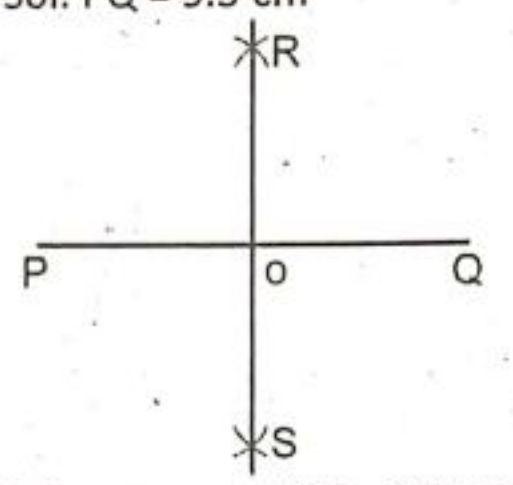

A line segment LM = 6.9 cm is given.

**Steps of Construction:**

**Step I:**Place the pointer of the compass at point L.
Open the compass with more than half of the measure o the line segment LM and draw an arc on the top and bottom of LM.
**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point M and draw two arc on the top and bottom of LM which intersects the previous arc at point N and K respectively.
**Step III:** Join the point N and K by a line using a ruler that will cut the line segment LM at point O.
NK is the right bisector of LM and O is the mid-point.
So LO = OM

d. 9.5 cm

Sol. PQ = 9.5 cm




A line segment PQ = 7.6 cm is given.

**Steps of Construction:**

**Step I:**Place the pointer of the compass at point P.

Open the compass with more than half of the measure o the line segment PQ and draw an arc on the top and bottom of PQ.

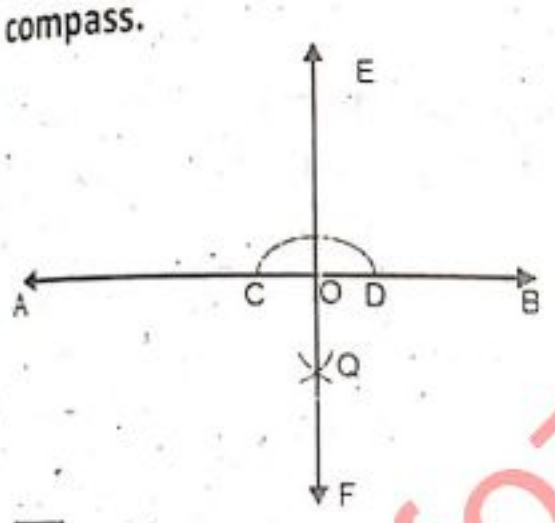
**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point B and draw two arc on the top and bottom of AB which intersects the previous arc at point R and S respectively.

**Step III:** Join the point R and S by a line using a ruler that will cut the line segment PQ at point O.

RS is the right bisector of PQ and O is the mid-point.

So PO = OQ

**Q3. Draw perpendiculars to the lines from the given points on it using a compass.**




$\overline{AB}$ is the given line and O is a point on it.

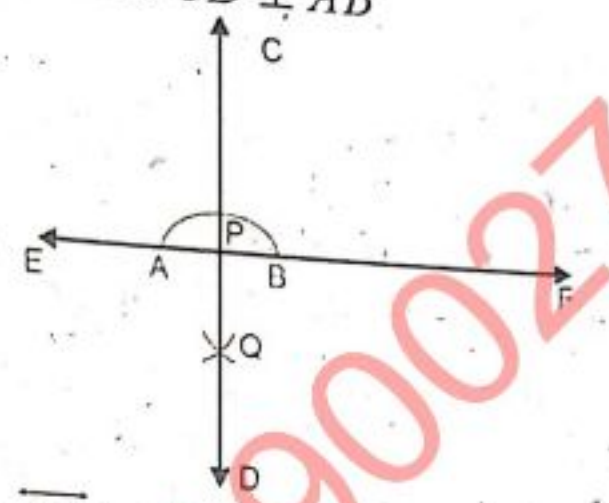
**Steps of Construction:**

**Step I:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the line $\overline{AB}$ at two points C and D respectively, such that OC = OD

**Step II:** Place the pointer of the compass at point C and draw an arc of radius greater than OC as shown in the figure.

**Step III:** With the same opening of the compass, place the pointer of the compass at point D and draw an arc which cuts the previous arc at point Q as shown in the figure.

**Step IV:** Join the point Q to O and extend it to E. So $\overline{CD}$ is the required perpendicular to the given line $\overline{AB}$ at point O. $\overline{CD} \perp \overline{AB}$




$\overleftrightarrow{EF}$ is the given line and P is a point on it.

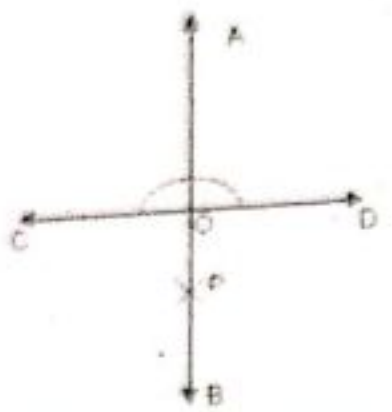
**Steps of Construction:**

**Step I:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the line $\overline{EF}$ at two points A and B respectively, such that PA = PB

**Step II:** Place the pointer of the compass at point C and draw an arc of radius greater than PA as shown in the figure.

**Step III:** With the same opening of the compass, place the pointer of the compass at point B and draw an arc which cuts the previous arc at point Q as shown in the figure.

**Step IV:** Join the point Q to P and extend it to C. So $\overline{CD}$ is the required perpendicular to the given line $\overline{EF}$ at point O. $\overline{CD} \perp \overline{EF}$




$\overline{CD}$ is the given line and O is a point on it.

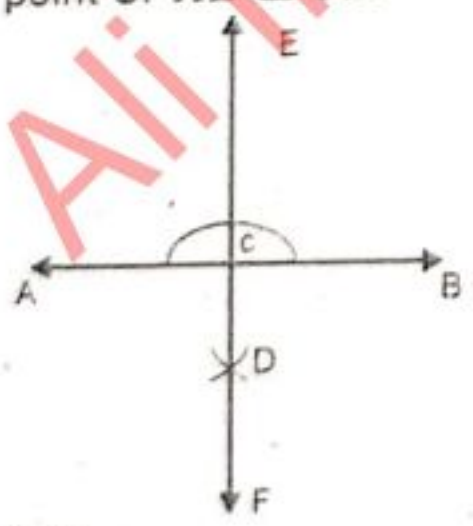
**Steps of Construction:**

**Step I:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the line $\overline{CD}$ at two points E and F respectively, such that OE = OF

**Step II:** Place the pointer of the compass at point E and draw an arc of radius greater than OE as shown in the figure.

**Step III:** With the same opening of the compass, place the pointer of the compass at point F and draw an arc which cuts the previous arc at point P as shown in the figure.

**Step IV:** Join the point P to O and extend it to A. So $\overline{AB}$ is the required perpendicular to the given line $\overline{CD}$ at point O. $\overline{AB} \perp \overline{CD}$




$\overline{AB}$ is the given line and C is a point on it.

**Steps of Construction:**

**Step I:** Place the pointer of the compass at point C and draw an arc of suitable radius that will cut the line $\overline{AB}$ at two points L and M respectively, such that CL = CM

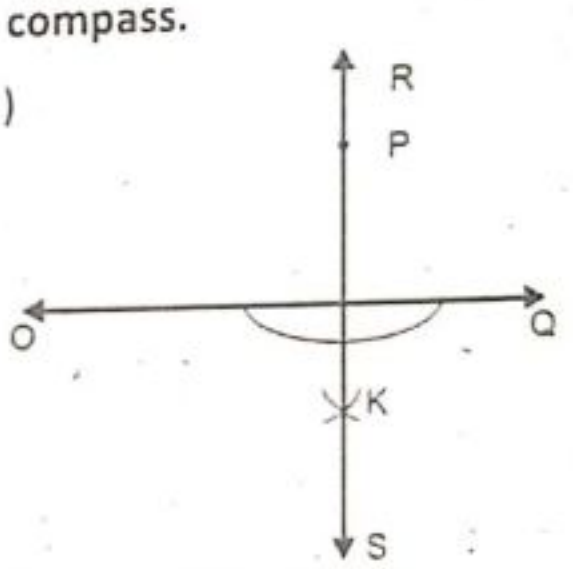
**Step II:** Place the pointer of the compass at point L and draw an arc of radius greater than CL as shown in the figure.

**Step III:** With the same opening of the compass, place the pointer of the compass at point M and draw an arc which cuts the previous arc at point D as shown in the figure.

**Step IV:** Join the point D to C and extend it to E. So $\overline{EF}$ is the required perpendicular to the given line $\overline{AB}$ at point O. $\overline{EF} \perp \overline{AB}$

**Q4. Draw perpendiculars to the given lines from the point P not on it using a compass.**

)




**Steps of Construction:**

Let $\overline{OQ}$ be the given line and P is a point not on $\overline{OQ}$.

**Step I:** Place the pointer of the compass at point P and draw an arc that will cut the line $\overline{OQ}$ at two points A and B respectively.

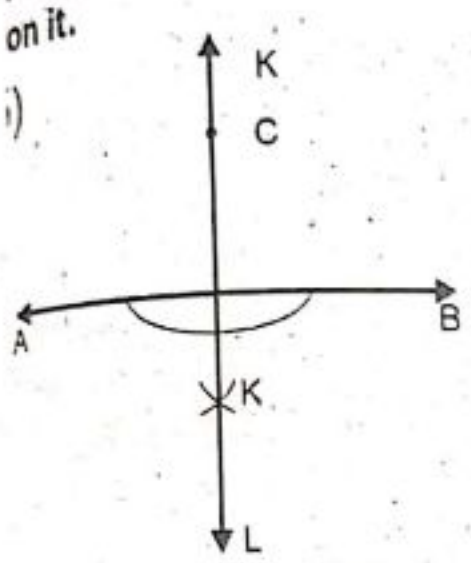
**Step II:** Using the same opening of the compass, place the pointer of the compass at point A and B and draw two

arcs on the other sides of $\overline{OQ}$ that cut each other at point K.

**Step III:** Join K to P. $\overline{KP}$ is the required perpendicular to the given line $\overline{OQ}$.

**Q5. Draw a line $\overline{AB}$ and draw a perpendicular on it froma point C not on it.**

i)




**Steps of Construction:**

Let $\overline{AB}$ be the given line and C is a point not on $\overline{AB}$.

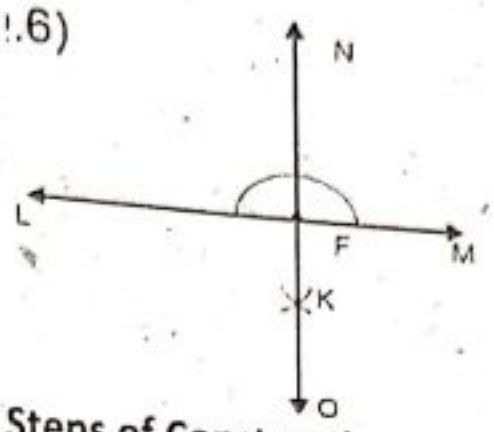
**Step I:** Place the pointer of the compass at point C and draw an arc that will cut the line $\overline{AB}$ at two points E and F respectively.

**Step II:** Using the same opening of the compass, place the pointer of the compass at point E and F and draw two arcs on the other sides of $\overline{AB}$ that cut each other at point K.

**Step III:** Join K to C. $\overline{KC}$ is the required perpendicular to the given line $\overline{AB}$.

**Q6. Draw a line $\overline{LM}$ and draw a perpendicular on it form a point F on it.**

ii.6)




**Steps of Construction:**

Let $\overline{LM}$ be the given line and F is a point on $\overline{LM}$.

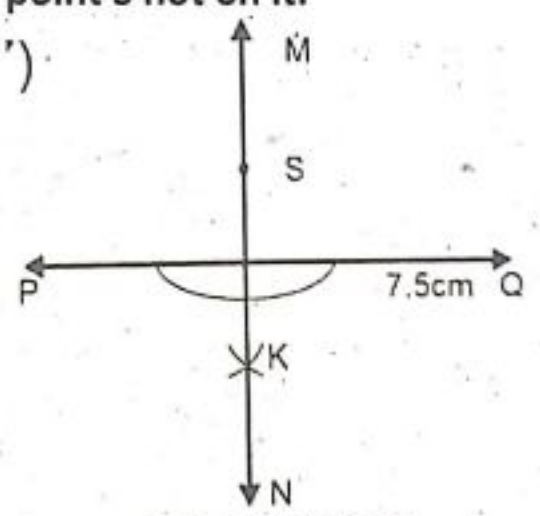
**Step I:** Place the pointer of the compass at point F and draw an arc that will cut the line $\overline{LM}$ at two points A and B respectively.

**Step II:** Using the same opening of the compass, place the pointer of the compass at point A and B and draw two arcs on the other sides of $\overline{LM}$ that cut each other at point K.

**Step III:** Join K to F. $\overline{KF}$ is the required perpendicular to the given line $\overline{LM}$.

**Q7. Draw a line segment $\overline{PQ}$ =7.5cm. Draw a perpendicular from point S not on it.**

i')




**Steps of Construction:**

Let $\overline{PQ}$ be the given line and S is a point not on $\overline{PQ}$.

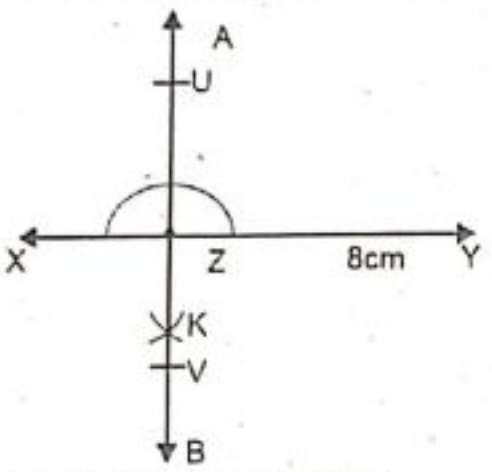
**Step I:** Place the pointer of the compass at point S and draw an arc

that will cut the line $\overline{PQ}$ at two points A and B respectively.

**Step II:** Using the same opening of the compass, place the pointer of the compass at point A and B and draw two arcs on the other sides of $\overline{PQ}$ that cut each other at point K.

**Step III:** Join K to S. $\overline{KS}$ is the required perpendicular to the given line $\overline{PQ}$

**Q8. Draw a line segment $m\overline{XY}$ =8cm. Construct a perpendicular at point Z on it such that $m\overline{XZ} = 3cm$ .**




**Steps of Construction:**

Let $\overline{XY}$ be the given line and Z is a point on $\overline{XY}$ such that $m\overline{XZ} = 3cm$ .

**Step I:** Place the pointer of the compass at point Z and draw an arc that will cut the line $\overline{XY}$ at two points A and B respectively.

**Step II:** Using the same opening of the compass, place the pointer of the compass at point A and B and draw two arcs on the other sides of $\overline{XY}$ that cut each other at point K.

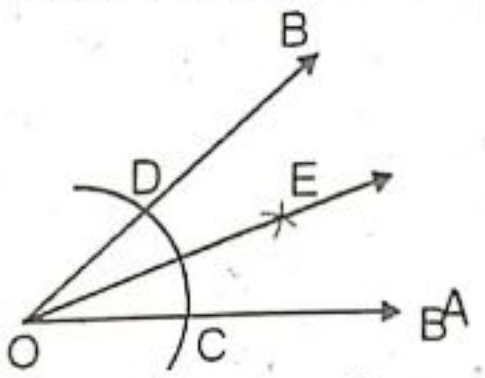
**Step III:** Join K to Z. $\overline{KZ}$ is the required perpendicular to the given line $\overline{XY}$

**Exercise – 10.2**

**Q1. Construct the following angles by using a protractor and bisect them by using a pairs of compass.**

**a. $50^0$**

Sol. An angle of $50^0$




**Steps of Construction:**

**Step I:** Construct $\angle AOB$ =$50^0$ with the help of protractor.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray OA at point C and cuts the ray OB at point D.

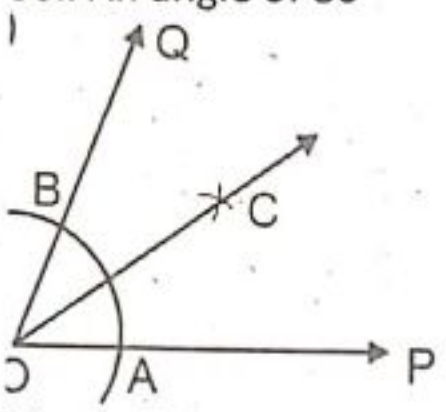
**Step III:** Place the pointer of the compass at point C and D and draw two arc of suitable radius cutting each other at point E.

**Step IV:** Using ruler draw a ray OE passing through E. this line is bisecting the angle $\angle AOB$ into two equal parts.

So, $m\angle AOE = m\angle EOA$

**b. $80^0$**

Sol. An angle of $80^0$




**Steps of Construction:**

**Step I:** Construct $\angle AOB$ =$80^0$ with the help of protractor.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray OP at point A and cuts the ray OQ at point B.

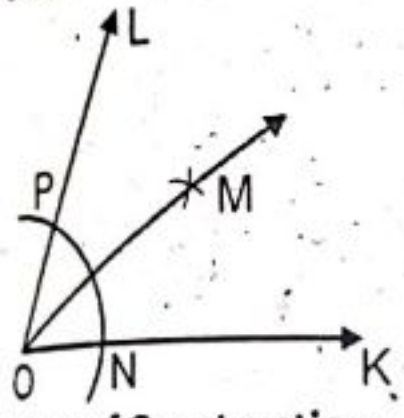
**Step III:** Place the pointer of the compass at point A and B and draw two arc of suitable radius cutting each other at point C.

**Step IV:** Using ruler draw a ray OC passing through C. this line is bisecting the angle $\angle POQ$ into two equal parts.

So, $m\angle POC = m\angle COQ$

c. $72^0$

Sol. An angle of $72^0$




**Steps of Construction:**

**Step I:** Construct $\angle KOL = 72^0$ with the help of protractor.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray OK at point N and cuts the ray OL at point P.

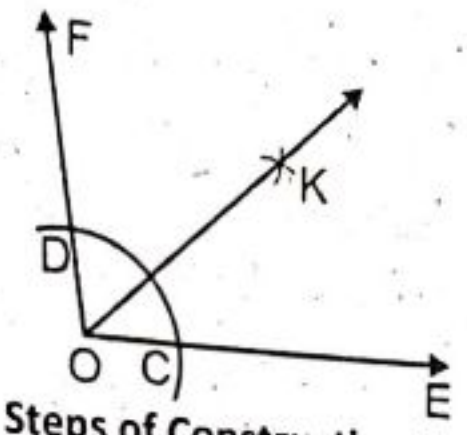
**Step III:** Place the pointer of the compass at point P and N and draw two arc of suitable radius cutting each other at point M.

**Step IV:** Using ruler draw a ray OM passing through M. this line is bisecting the angle $\angle KOL$ into two equal parts.

So, $m\angle KOM = m\angle MOL$

d. $110^0$

Sol. An angle of $110^0$




**Steps of Construction:**

**Step I:** Construct $\angle EOF = 110^0$ with the help of protractor.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray OE at point C and cuts the ray OF at point D.

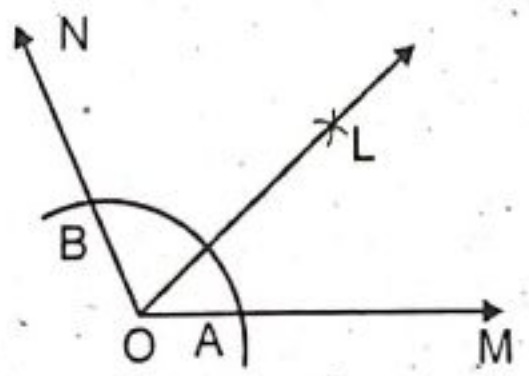
**Step III:** Place the pointer of the compass at point C and D and draw two arc of suitable radius cutting each other at point K.

**Step IV:** Using ruler draw a ray OK passing through K. this line is bisecting the angle $\angle EOF$ into two equal parts.

So, $m\angle EOK = m\angle KOF$

e. $150^0$

Sol. An angle of $150^0$




**Steps of Construction:**

**Step I:** Construct $\angle MON = 150^0$ with the help of protractor.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray OM at point A and cuts the ray ON at point B.

**Step III:** Place the pointer of the compass at point A and B and draw two

arc of suitable radius cutting each other at point L.

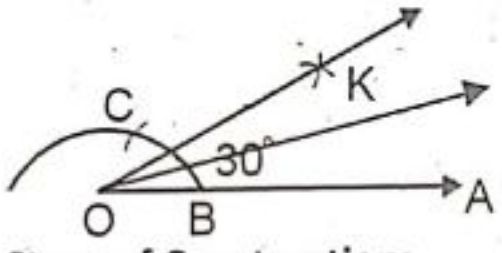
**Step IV:** Using ruler draw a ray OL passing through L. this line is bisecting the angle $\angle MON$ into two equal parts.

So, $m\angle MOL = m\angle LON$

**Q2. Construct the following angles by using pairs of compasses. Then bisect them.**

**a. $30^0$**

Sol. An angle of $30^0$




**Steps of Construction:**

**Step I:** Draw a ray $\overrightarrow{OA}$ using a ruler.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray $\overrightarrow{OA}$ at point B.

**Step III:** With the same opening of the compass, place the pointer of the compass at point B and draw an arc that will cut the previous arc at point C.

**Step IV:** Place the pointer of the compass at point B and C and draw two arcs of suitable radius touching each other at point K.

**Step V:** Draw OK with rule.

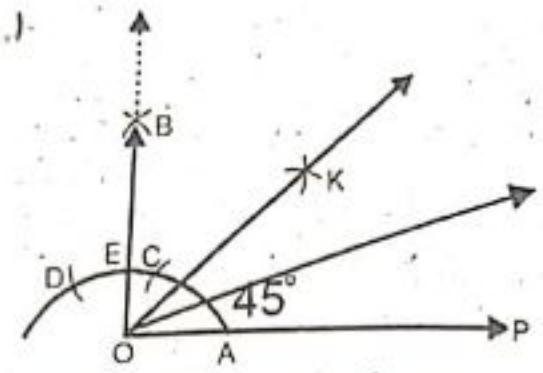
$\angle AOK = 30^0$ is the required angle.

**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.

Now this is the required bisection of the given angle.

**b. $45^0$**

Sol. An angle of $45^0$




**Steps of Construction:**

**Step I:** Draw a ray $\overrightarrow{OP}$ using a ruler.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray $\overrightarrow{OA}$ at point A.

**Step III:** With the same opening of the compass, place the pointer of the compass at point A and draw an arc that will cut the previous arc at point C and D.

**Step IV:** Place the pointer of the compass at point C and D and draw two arcs of suitable radius touching each other at point B.

**Step V:** Draw OB touching the first arc at point E. Now place the pointer of the compass at point E and A and draw arc touching each other at K. Draw OK.

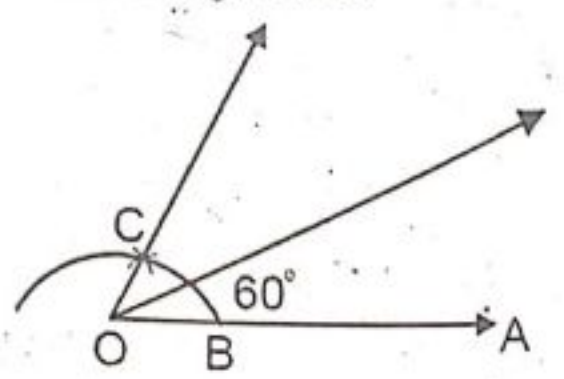
$\angle AOK = 45^0$ is the required angle.

**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.

Now this is the required bisection of the given angle.

**c. $60^0$**

Sol. An angle of $60^0$

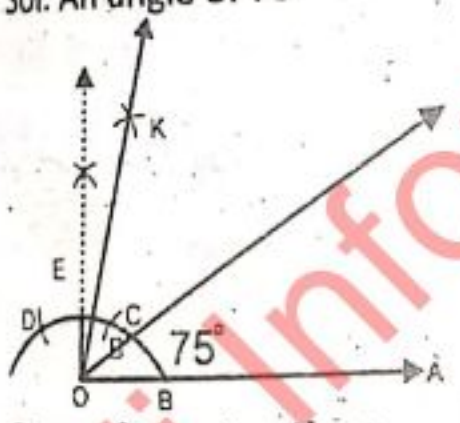


**Steps of Construction:**

**Step I:** Draw a ray $\overline{OA}$ using a ruler.
**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray $\overline{OA}$ at point B.
**Step III:** With the same opening of the compass, place the pointer of the compass at point B and draw an arc that will cut the previous arc at point C.
**Step IV:** Draw OC with rule.
$\angle AOC = 60^0$ is the required angle.
**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.
Now this is the required bisection of the given angle.

**d. $75^0$**

Sol. An angle of $75^0$

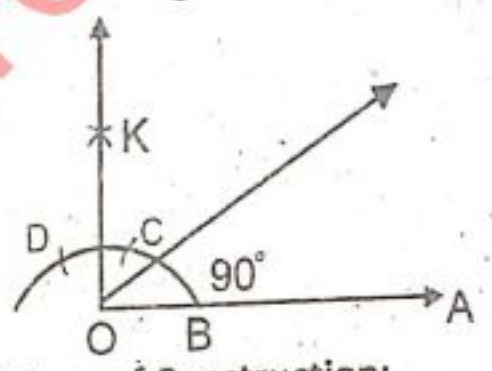



**Steps of Construction:**

**Step I:** Draw a ray $\overline{OA}$ using a ruler.
**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray $\overline{OA}$ at point B.
**Step III:** With the same opening of the compass, place the pointer of the compass at point B and draw two arcs that will cut the previous arc at point C and D.
**Step IV:** Place the pointer of the compass at point C and D and draw two arcs of suitable radius touching each other at a point. Join that point with O, which intersect the semi-circular arc at point E.
**Step V:** With E and C as center, draw two arcs touching each other at point K. Draw OK with ruler.
$\angle AOK = 75^0$ is the required angle.
**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.
Now this is the required bisection of the given angle.

**e. $90^0$**

Sol. An angle of $90^0$




**Steps of Construction:**

**Step I:** Draw a ray $\overline{OA}$ using a ruler.
**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray $\overline{OA}$ at point B.
**Step III:** With the same opening of the compass, place the pointer of the compass at point B and draw an arc that will cut the previous arc at point C and D.
**Step IV:** Place the pointer of the compass at point C and D and draw two arcs of suitable radius touching each other at point K.
**Step V:** Draw OK with rule.

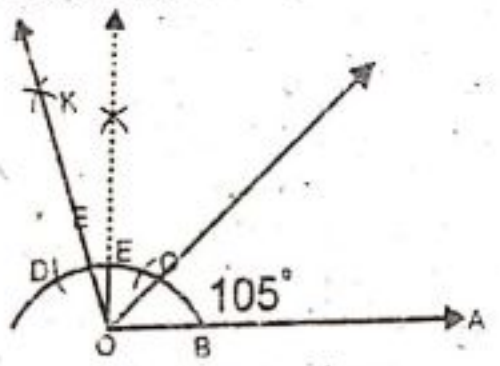
$\angle AOK = 90^0$ is the required angle.

**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.

Now this is the required bisection of the given angle.

**f. $105^0$**

Sol. An angle of $105^0$




**Steps of Construction:**

**Step I:** Draw a ray $\overrightarrow{OA}$ using a ruler.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray $\overrightarrow{OA}$ at point B.

**Step III:** With the same opening of the compass, place the pointer of the compass at point B and draw an arc that will cut the previous arc at point C and D.

**Step IV:** Place the pointer of the compass at point C and D and draw two arcs of suitable radius touching each other at a point. Join that point with O, which intersect the semi-circular arc at point E.

**Step V:** With E and D as center, draw two arcs touching each other at point K. Draw OK with ruler.

**Step V:** Draw OK with rule.

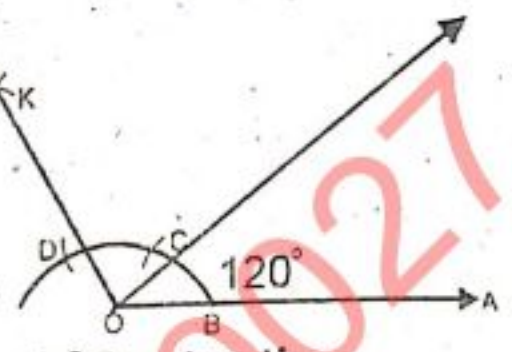
$\angle AOK = 105^0$ is the required angle.

**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.

Now this is the required bisection of the given angle.

**g. $120^0$**

Sol. An angle of $120^0$




**Steps of Construction:**

**Step I:** Draw a ray $\overrightarrow{OA}$ using a ruler.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray $\overrightarrow{OA}$ at point B.

**Step III:** With the same opening of the compass, place the pointer of the compass at point B and draw an arc that will cut the previous arc at point C and D.

**Step IV:** Draw OD with rule.

$\angle AOD = 120^0$ is the required angle.

**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.

Now this is the required bisection of the given angle.

## Review Exercise – 10

**Q1. Choose the correct option.**

a. The word geometry comes from two ____ words.

i. Latin
ii. **Greek**
iii. German
iv. Arabic

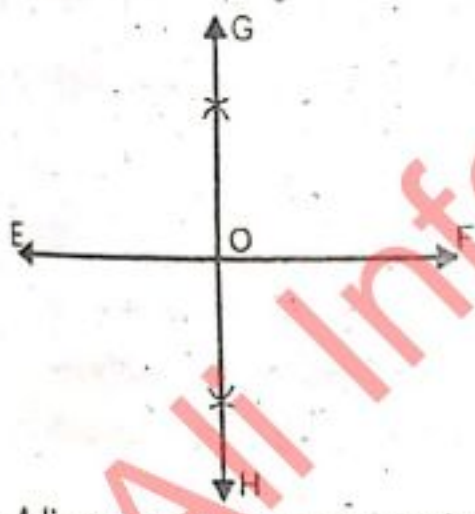
b. Bisection means to divide the line into ____ equal parts.
   i. One
   ii. **Two**
   iii. Three
   iv. Four

c. Two lines or rays are said to be perpendicular to each other if the angle formed between them is
   i. $60^0$
   ii. $45^0$
   iii. $30^0$
   iv. $90^0$

d. If we bisect a $90^0$ angle, we get two ____ angles.
   i. $30^0$
   ii. $15^0$
   iii. $40^0$
   iv. $45^0$

**Q2. Draw the right bisector of the following line segments by using a pair of compasses.**

a)




A line segment EF is given.

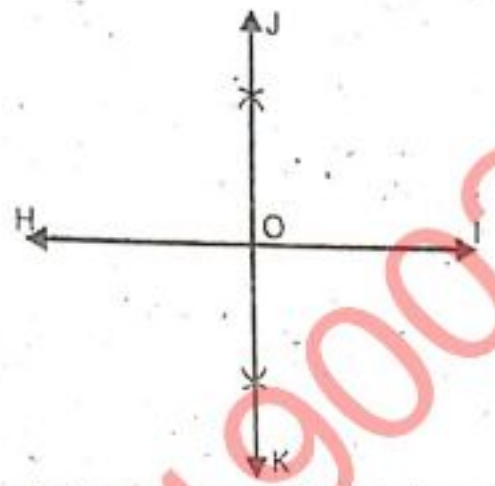
**Steps of Construction:**

**Step I:** Place the pointer of the compass at point E. Open the compass with more than half of the measure o the line segment EF and draw an arc on the top and bottom of EF.

**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point F and draw two arc on the top and bottom of EF which intersects the previous arc at point G and H respectively.

**Step III:** Join the point G and H by a line using a ruler that will cut the line segment EF at point O.GH is the right bisector of EF and O is the mid-point.

b)




A line segment HI is given.

**Steps of Construction:**

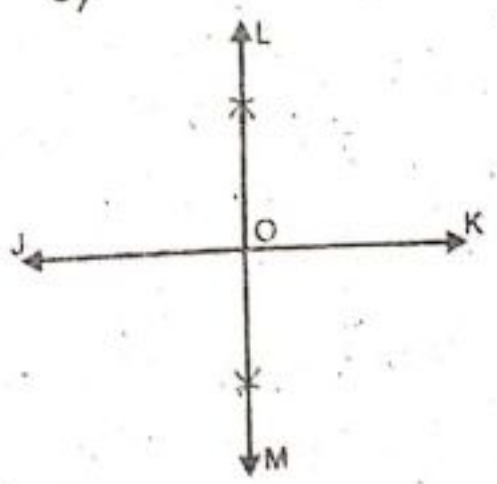
**Step I:** Place the pointer of the compass at point H. Open the compass with more than half of the measure of the line segment HI and draw an arc on the top and bottom of HI.

**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point I and draw two arc on the top and bottom of HI which intersects the previous arc at point J and K respectively.

**Step III:** Join the point J and K by a line using a ruler that will cut the line segment HI at point O.

JK is the right bisector of HI and O is the mid-point.

c)




A line segment JK is given.

**Steps of Construction:**

**Step I:** Place the pointer of the compass at point J. Open the compass with more than half of the measure o the line segment JK and draw an arc on the top and bottom of JK.

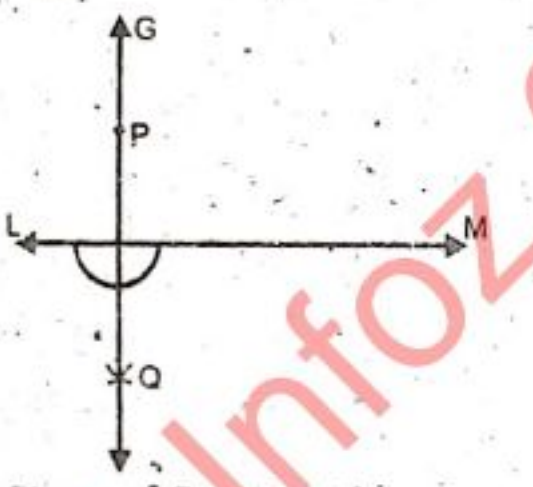
**Step II:** Similarly, using the same opening of the compass, place the pointer of the compass at point K and draw two arc on the top and bottom of JK which intersects the previous arc at point L and M respectively.

**Step III:** Join the point L and M by a line using a ruler that will cut the line segment JK at point O.

LM is the right bisector of JK and O is the mid-point.

**Q3. Draw perpendiculars form the point P to the line segment LM.**

a)




**Steps of Construction:**

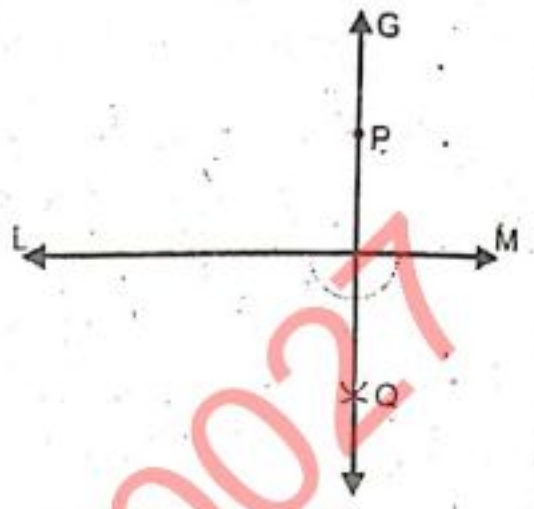
Let $\overline{LM}$ be the given line and P is not on $\overline{LM}$.

**Step I:** Place the pointer of the compass at point P and draw an arc that will cut the line $\overline{LM}$ at two points A and B respectively.

**Step II:** Using the same opening of the compass, place the pointer of the compass at point A and B and draw two arcs on the other sides of $\overline{LM}$ that cut each other at point Q.

**Step III:** Join Q to P. $\overline{QP}$ is the required perpendicular to the given line $\overline{LM}$.

b)




**Steps of Construction:**

Let $\overline{LM}$ be the given line and P is not on $\overline{LM}$.

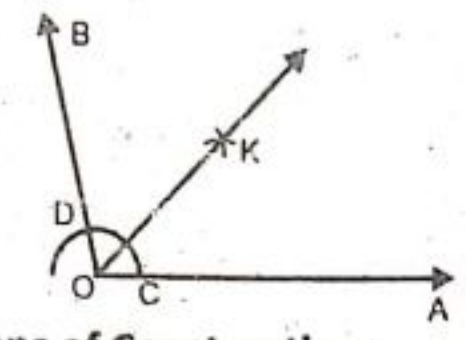
**Step I:** Place the pointer of the compass at point P and draw an arc that will cut the line $\overline{LM}$ at two points A and B respectively.

**Step II:** Using the same opening of the compass, place the pointer of the compass at point A and B and draw two arcs on the other sides of $\overline{LM}$ that cut each other at point Q.

**Step III:** Join Q to P. $\overline{QP}$ is the required perpendicular to the given line $\overline{LM}$.

**Q4. Construct the following angles by using a protractor and bisect them by using a pair of compasses.**

a)




**Steps of Construction:**

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray OA

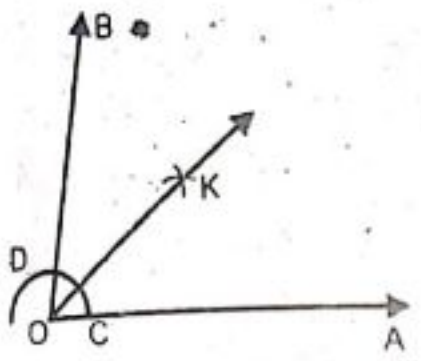
at point C and cuts the ray OB at point D.

**Step III:** Place the pointer of the compass at point C and D and draw two arc of suitable radius cutting each other at point K.

**Step IV:** Using ruler draw a ray OK passing through K. this line is bisecting the angle $\angle AOB$ into two equal parts.

So, $m\angle AOK = m\angle KOB$

b)




**Steps of Construction:**

**Step I:** Construct $\angle AOB = 85^0$ with the help of protractor.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray OA at point C and cuts the ray OB at point D.

**Step III:** Place the pointer of the compass at point C and D and draw two arc of suitable radius cutting each other at point K.

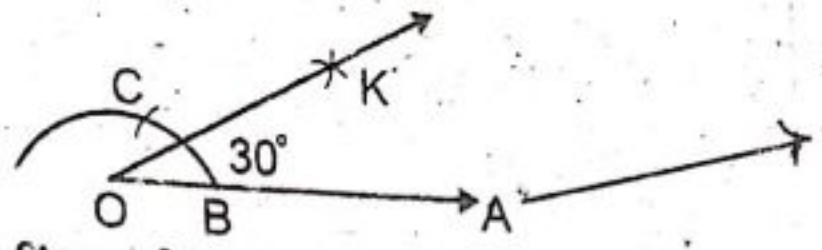
**Step IV:** Using ruler draw a ray OK passing through K. this line is bisecting the angle $\angle AOB$ into two equal parts.

So, $m\angle AOK = m\angle KOB$

**Q5. Construct the following angles by using a pair of compasses. Then bisect them.**

**a. $30^0$**

Sol. An angle of $30^0$




**Steps of Construction:**

**Step I:** Draw a ray $\overline{OA}$ using a ruler.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray $\overline{OA}$ at point B.

**Step III:** With the same opening of the compass, place the pointer of the compass at point B and draw an arc that will cut the previous arc at point C.

**Step IV:** Place the pointer of the compass at point B and C and draw two arcs of suitable radius touching each other at point K.

**Step V:** Draw OK with rule.

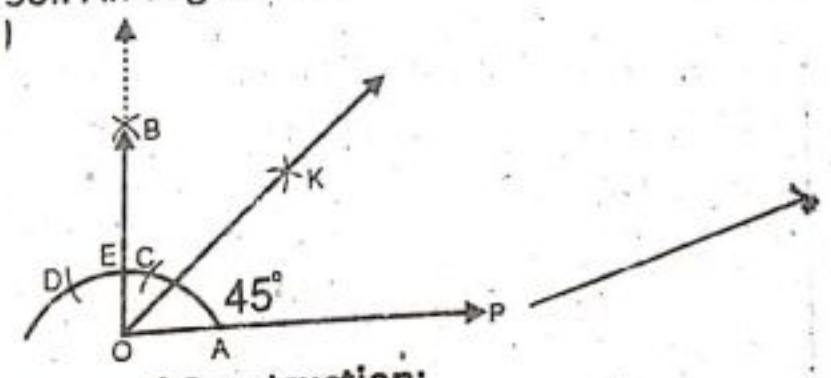
$\angle AOK = 30^0$ is the required angle.

**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.

Now this is the required bisection of the given angle.

**b. $45^0$**

Sol. An angle of $45^0$




**Steps of Construction:**

**Step I:** Draw a ray $\overline{OP}$ using a ruler.

**Step II:** Place the pointer of the compass at point O and draw an arc of

suitable radius that will cut the ray $\overrightarrow{OA}$ at point A.

**Step III:** With the same opening of the compass, place the pointer of the compass at point A and draw an arc that will cut the previous arc at point C and D.

**Step IV:** Place the pointer of the compass at point C and D and draw two arcs of suitable radius touching each other at point B.

**Step V:** Draw OB touching the first arc at point E. Now place the pointer of the compass at point E and A and draw arc touching each other at K. Draw OK.

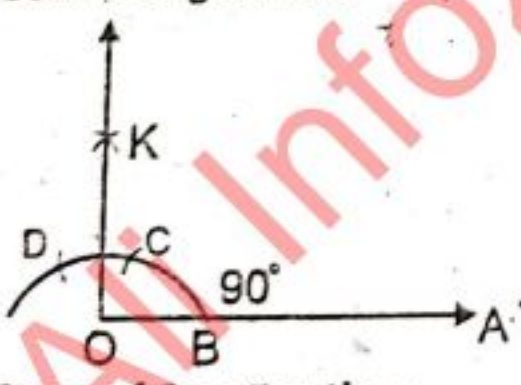
$\angle AOK = 45^0$ is the required angle.

**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.

Now this is the required bisection of the given angle.

**c. $90^0$**

Sol. An angle of $90^0$




**Steps of Construction:**

**Step I:** Draw a ray $\overrightarrow{OA}$ using a ruler.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray $\overrightarrow{OA}$ at point B.

**Step III:** With the same opening of the compass, place the pointer of the compass at point B and draw an arc that will cut the previous arc at point C and D.

**Step IV:** Place the pointer of the compass at point C and D and draw two arcs of suitable radius touching each other at point K.

**Step V:** Draw OK with rule.

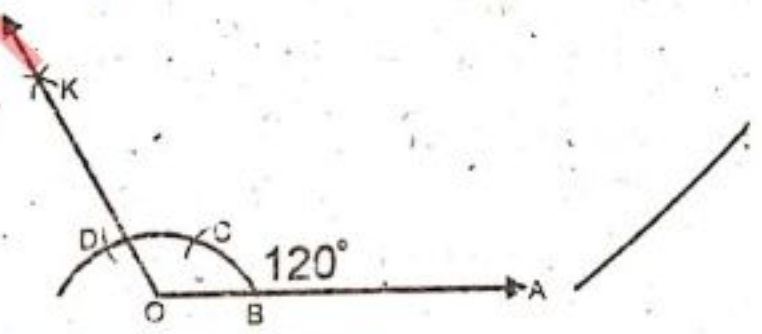
$\angle AOK = 90^0$ is the required angle.

**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.

Now this is the required bisection of the given angle.

**d. $120^0$**

Sol. An angle of $120^0$




**Steps of Construction:**

**Step I:** Draw a ray $\overrightarrow{OA}$ using a ruler.

**Step II:** Place the pointer of the compass at point O and draw an arc of suitable radius that will cut the ray $\overrightarrow{OA}$ at point B.

**Step III:** With the same opening of the compass, place the pointer of the compass at point B and draw an arc that will cut the previous arc at point C and D.

**Step IV:** Draw OD with rule.

$\angle AOD = 120^0$ is the required angle.

**Step VI:** Place the pointer of the compass at the initial and final point of the angle and draw two arc touching each other at a point, join that point to O.

Now this is the required bisection of | the given angle.

## Unit – 11
## Data Management
### Exercise – 11.1

**Q1. The following data shows the number of new books added to a library during 5 months. Draw a vertical multiple bar graph for this data using appropriate scale.**

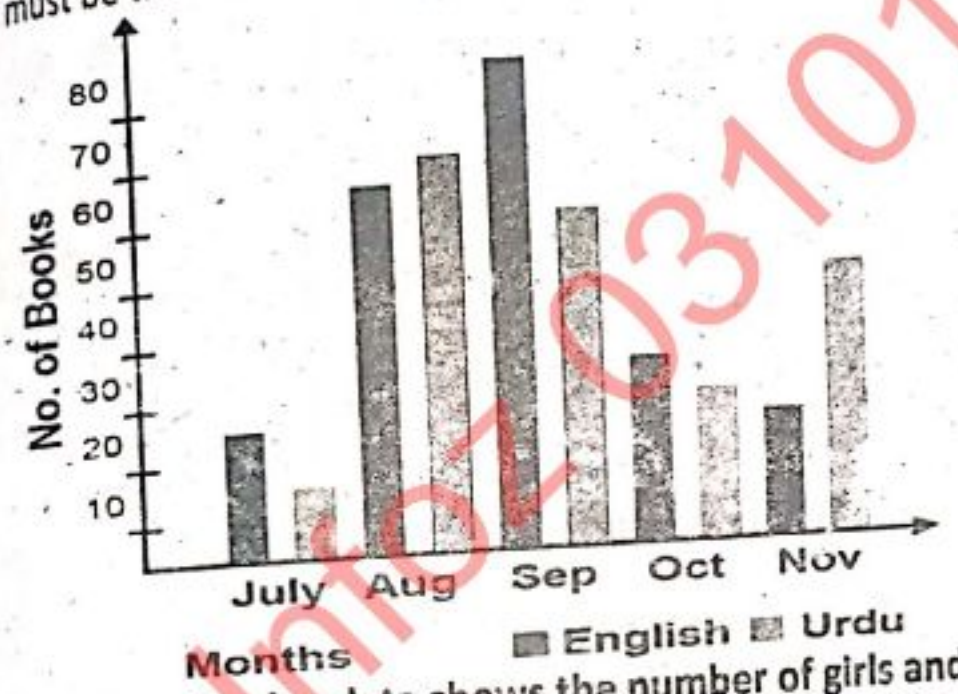
| Language | July | August | September | October | November |
|---|---|---|---|---|---|
| English | 20 | 60 | 80 | 30 | 20 |
| Urdu | 10 | 75 | 55 | 25 | 45 |

**Sol.**

**Step I:** Draw an x-axis (horizontal line) and y-axis (vertical line) perpendicular to each other.

**Step II:** Write month names along x-axis and number of books along y-axis. Choose the color for each category.

**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. The following data shows the number of girls and boys in different groups made for a mathematical competition. Draw a horizontal multiple bar graph for this data using appropriate scale.**

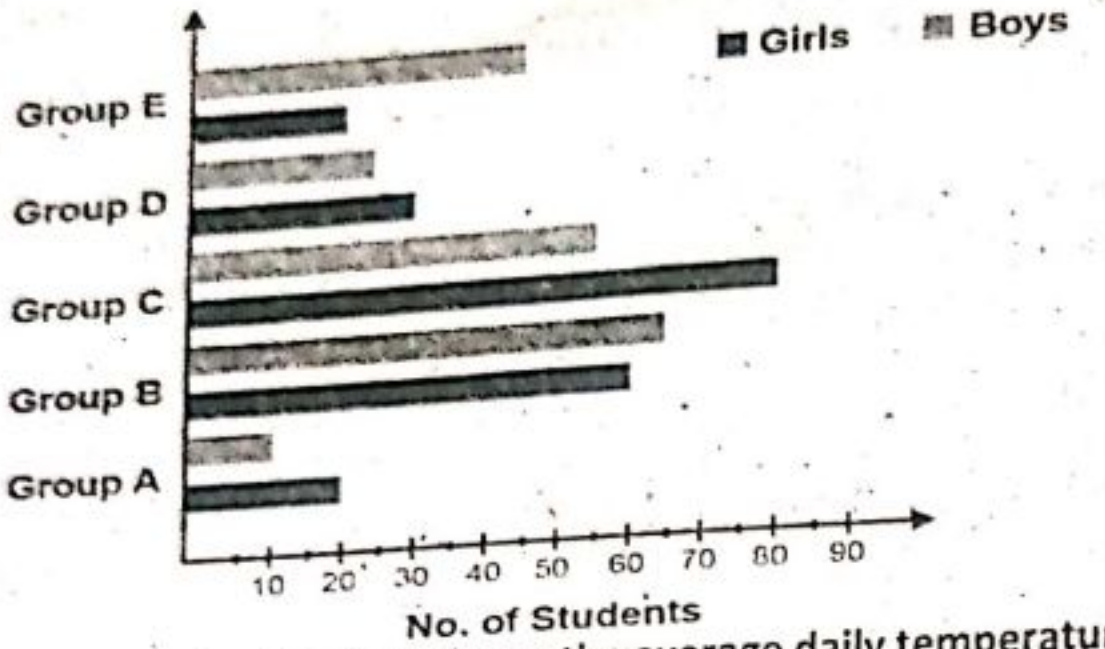
| Students | Group A | Group B | Group C | Group D | Group E |
|---|---|---|---|---|---|
| Boys | 20 | 60 | 80 | 30 | 20 |
| Girls | 10 | 75 | 55 | 25 | 45 |

**Sol.**

**Step I:** Draw an x-axis (horizontal line) and y-axis (vertical line) perpendicular to each other.

**Step II:** Write number of students along x-axis and names of groups along y-axis. Choose the color for each category.

**Step III:** Choose appropriate scale. Draw bars of the given data. The width of the bars must be the same throughout the horizontal multiple bar graph.




**Q3. The following data shows the average daily temperature of three cities. Draw a vertical multiple bar graph for this data using appropriate scale.**

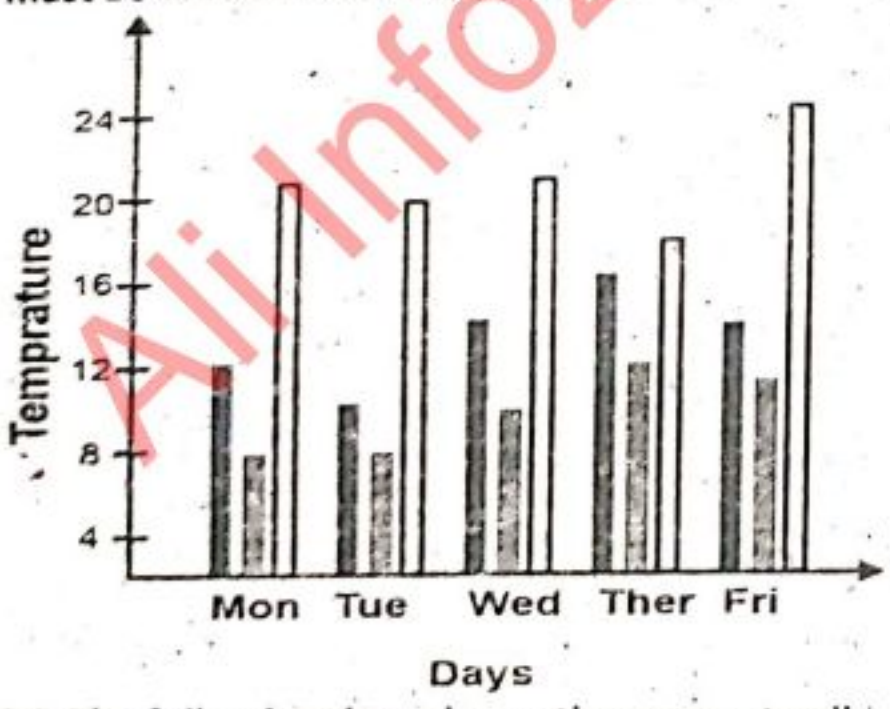
| Cities | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|
| City A | $12^0$ | $11^0$ | $14^0$ | $16^0$ | $13^0$ |
| City B | $7^0$ | $8^0$ | $10^0$ | $12^0$ | $10^0$ |
| City C | $22^0$ | $20^0$ | $22^0$ | $18^0$ | $24^0$ |

**Sol.**

**Step I:** Draw an x-axis (horizontal line) and y-axis (vertical line) perpendicular to each other.

**Step II:** Write name of days along x-axis and temperature in degrees along y-axis. Choose the color for each category.

**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.




**Q4. The following data shows the amount collected by Marwa, Hadia, Mohid, Fatima and Hassaan during three weeks to donate to the construction of a local Masjid. Draw a horizontal multiple bar graph for this data using appropriate scale.**

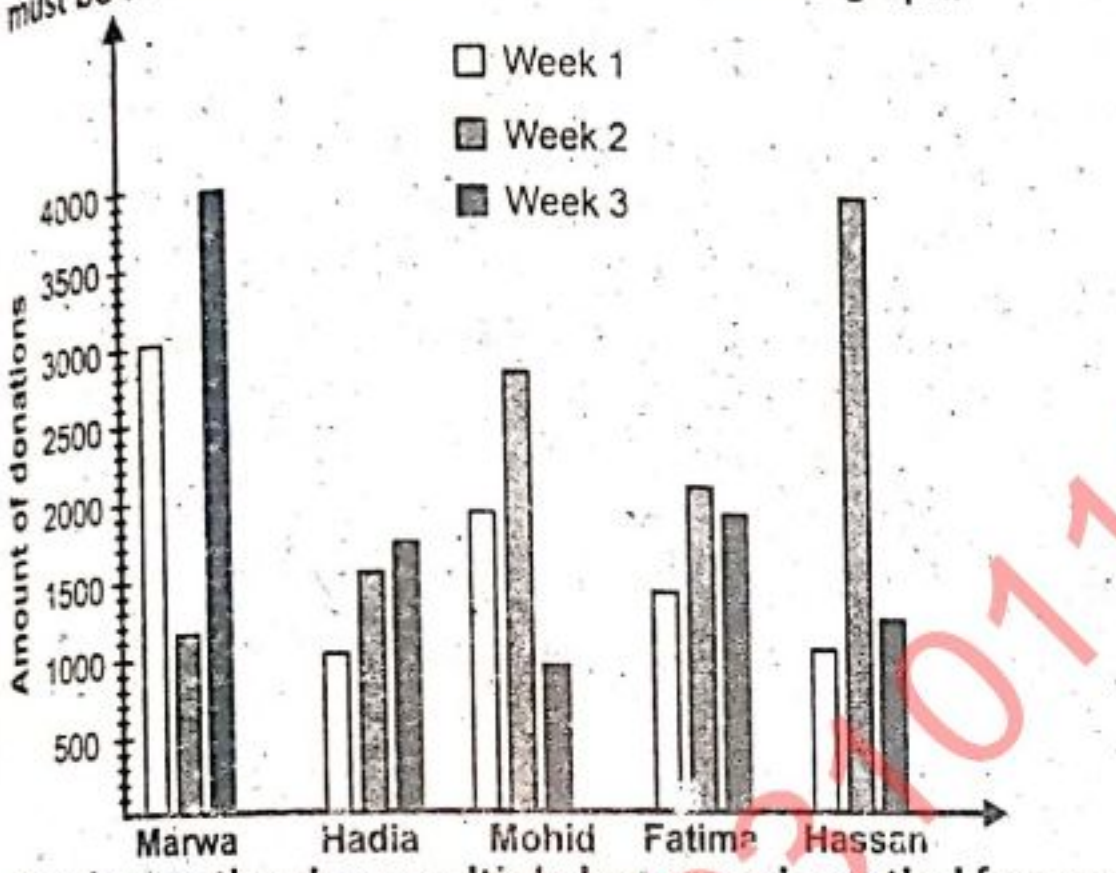
| Weeks | Marwa | Hadia | Mohid | Fatima | Hassaan |
|---|---|---|---|---|---|
| Week 1 | Rs.3200 | Rs.1000 | Rs.2000 | Rs.1400 | Rs.1000 |

| | | | | | |
|---|---|---|---|---|---|
| Week 2 | Rs.1200 | Rs.1500 | Rs.3000 | Rs.2200 | Rs.4000 |
| Week 3 | Rs.4000 | Rs.1600 | Rs.900 | Rs.2000 | Rs.1200 |

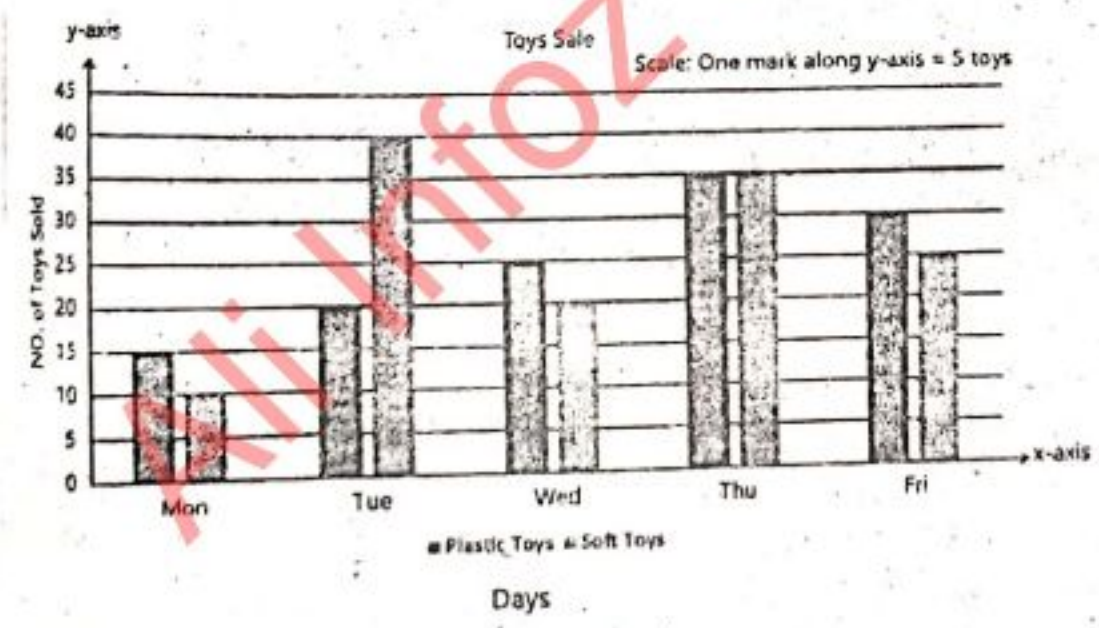
**Sol. Step I:** Draw an x-axis (horizontal line) and y-axis (vertical line) perpendicular to each other.

**Step II:** Write name of children along x-axis and amount of money along y-axis. Choose the color for each category. i.e. week 1, week 2 and week 3.

**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.




**Q5. Observe the given multiple bar graph in vertical form and answer the questions given.**




a. **What is the title of the graph?**
Sol. Toys Sale.

b. **What information is shown on the X-axis?**
Sol. Days.

c. **What information is shown on the Y-axis?**
Sol. Number of toys sold.

d. **How many plastic toys were sold on Monday?**

Sol. 15

e. **How many soft toys were sold on Wednesday?**

Sol. 20

f. **On which day the least number of plastic toys were sold?**

Sol. On Monday

g. **On which day the greatest number of soft toys were sold?**

Sol. On Tuesday

h. **What is the total number of soft toys sold on Tuesday and Wednesday altogether?**

Sol. Tuesday = 40 and Wednesday = 20

Total soft toys sold on both days = 40 + 20 = 60

i. **On which day the greatest number of plastic toys were sold?**

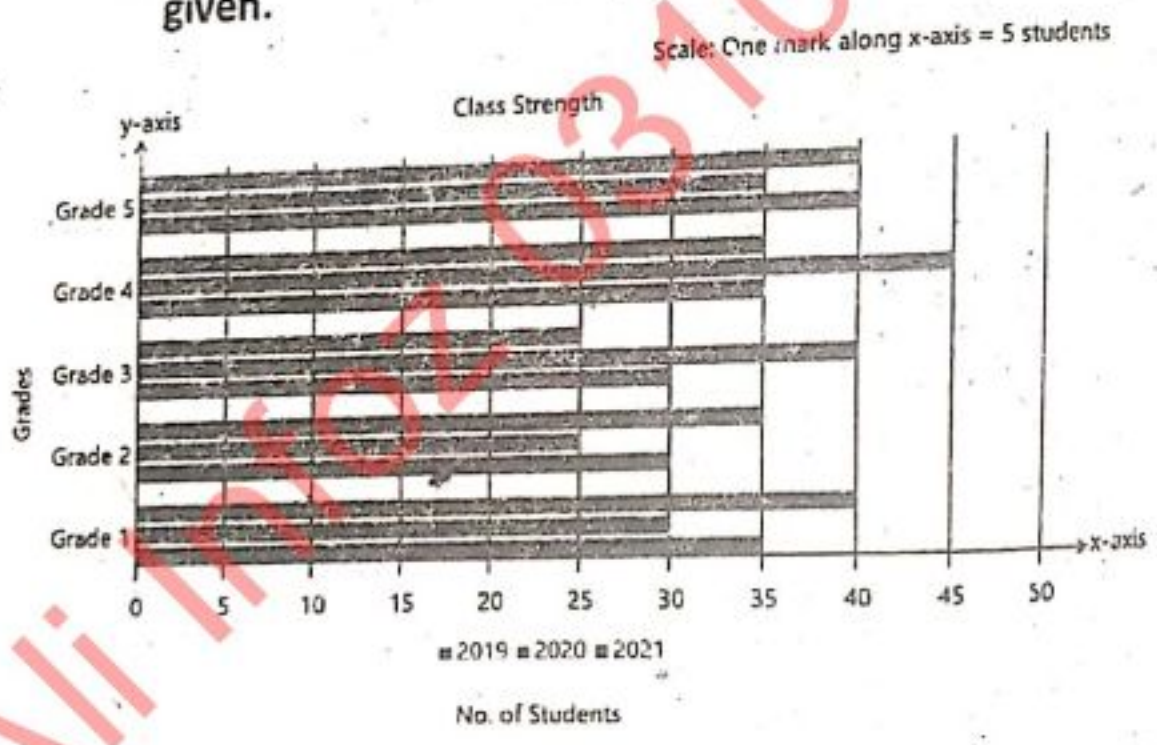
Sol. On Thursday

j. **What is the difference between the number of soft toys sold on Tuesday and Thursday?**

Sol. On Tuesday = 40 and On Thursday = 35

Difference = 40 – 35 = 5

**Q6. Observe the given multiple bar graph in horizontal form and answer the questions given.**




a. **What is the title of the graph?**

Sol. Class strength

b. **What information is shown on the X-axis?**

Sol. Number of students

c. **What information is shown on the Y-axis?**

Sol. Grades

d. **What is the class strength of grade 5 students in 2021?**

Sol. 40

e. **What is the class strength of grade 3 students in 2019?**

Sol. 25

f. **What is the difference in the class strength of grade 4 and grade 5 in 2021?**
Sol. Grade 5 = 40 and Grade 4 = 35 so, difference = 5

g. **What is the difference in the class strength of grade 1 and grade 2 in 2020?**
Sol. Grade 1 = 30 and Grade 2 = 25 so, difference = 5

h. **Which year has the greatest number of grade 3 students?**
Sol. In 2020.

i. **Which year has the least number of grade 2 students?**
Sol. In 2020.

j. **In which year the greatest number of students were there in Grade 4?**
Sol. In 2020.

k. **In which year the least number of students were there in grade 5?**
Sol. In 2020.

## Exercise – 11.2

**Q1. Razia obtained the following marks in the different subjects.**

| Subject | Marks |
|---|---|
| Maths | 90 |
| English | 75 |
| Social Studies | 60 |
| Urdu | 70 |
| Islamiat | 65 |

**Draw pie chart for this data:**

**Sol.** First we find the measurement of the central angles by using the following method.

Sum of all marks = 90 + 75 + 60 + 70 + 65 = 360

Using formula:

$$\text{Subject} = \frac{\text{Marks}}{\text{Total marks}} \times 360$$

$$\text{Mathematics} = \frac{90}{360} \times 360 = 90$$

$$\text{English} = \frac{75}{360} \times 360 = 75$$

$$\text{Social Studies} = \frac{60}{360} \times 360 = 60$$

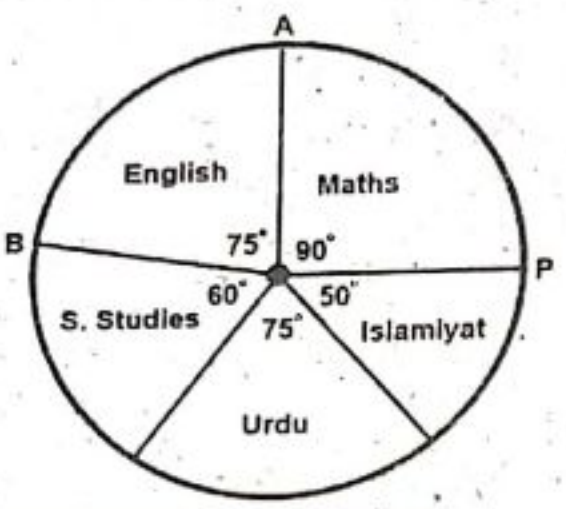
$$\text{Urdu} = \frac{70}{360} \times 360 = 70$$

$$\text{Islamiat} = \frac{65}{360} \times 360 = 65$$

**Step I:** Draw a circle of suitable radius and draw its radius OP.

**Step II:** Construct an angle of $90^0$ representing the marks of Mathematics.

**Step III:** Construct angles of $75^0$, $60^0$,$70^0$, and $65^0$ representing marks of English, Social Studies, Urdu and Islamiat respectively.




**Q2. Draw pie charts for the following data:**

i. **The population of 6 cities of Pakistan is given below.**

| City | Population (in Million) |
|---|---|
| A | 18 |
| B | 15 |
| C | 12 |
| D | 10 |
| E | 4 |
| F | 1 |

**Sol.** First we find the measurement of the central angles by using the following method.

Sum of all population = 18 + 15 + 12 + 10 + 4 + 1 = 60

Using formula:

$$\text{City} = \frac{\text{Population}}{\text{Total population}} \times 360 \quad \text{City A} = \frac{18}{60} \times 360 = 108$$

$$\text{City B} = \frac{15}{60} \times 360 = 90 \qquad \text{City C} = \frac{12}{60} \times 360 = 72$$

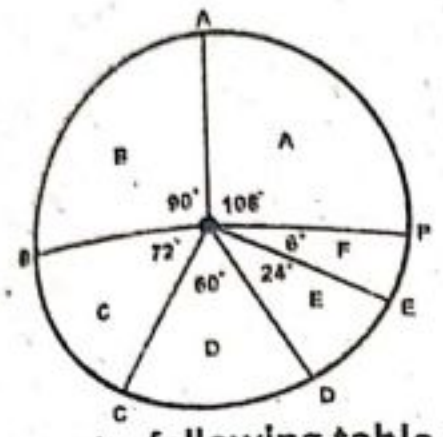
$$\text{City D} = \frac{10}{60} \times 360 = 60 \quad \text{City F} = \frac{4}{60} \times 360 = 24$$

$$\text{City E} = \frac{1}{60} \times 360 = 6$$

**Step I:** Draw a circle of suitable radius and draw its radius OP.

**Step II:** Construct an angle of $108^0$ representing the population in Millions of City A.

**Step III:** Construct angles of $90^0$, $72^0$,$60^0$, $24^0$ and $6^0$representing the population in Millions of City A, B, C, D, E and F respectively.




ii. **The following table shows Amna's activities in a day:**

| Activities | Time (Hours) |
|---|---|
| Reciting Quran | 2 |
| School | 6 |
| Meal | 1 |
| Play | 2 |
| Study | 4 |
| Using Computer | 1 |
| Sleep | 8 |

**Sol.** First we find the measurement of the central angles by using the following method.

Sum of all time = 2 + 6 + 1 + 2 + 4 + 1 + 8 = 24

Using formula:

$$\text{Activity} = \frac{\text{Time}}{\text{Total time}} \times 360$$

$$\text{Reciting Quran} = \frac{2}{24} \times 360 = 30$$

$$\text{School} = \frac{6}{24} \times 360 = 90$$

$$\text{Meal} = \frac{1}{24} \times 360 = 15$$

$$\text{Play} = \frac{2}{24} \times 360 = 30$$

$$\text{Study} = \frac{4}{24} \times 360 = 60$$

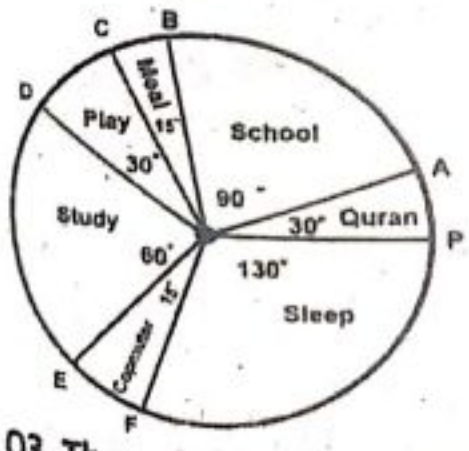
$$\text{Using Computer} = \frac{1}{24} \times 360 = 15$$

$$\text{Sleep} = \frac{8}{24} \times 360 = 120$$

**Step I:** Draw a circle of suitable radius and draw its radius OP.

**Step II:** Construct an angle of $30^0$ representing the time in hours for Reciting Holy Quran.

**Step III:** Construct angles of $90^0$, $15^0$, $30^0$, $60^0$, $15^0$ and $120^0$ representing the time in hours for reciting Quran, School, Meal, Play, Study, Using Computer and Sleep respectively.




**Q3. The number of students in different sections of class VII are given below:**

| Section | Number of students |
|---|---|
| A | 73 |
| B | 65 |
| C | 50 |
| D | 42 |
| E | 30 |

**Draw pie chart for the given data.**

**Sol.** First we find the measurement of the central angles by using the following method.

Sum of all time = 73 + 65 + 50 + 42 + 30 = 260

Using formula:

$$\text{Activity} = \frac{\text{Time}}{\text{Total time}} \times 360$$

$$\text{Section A} = \frac{73}{260} \times 360 = 101$$

$$\text{Section B} = \frac{65}{260} \times 360 = 90$$

$$\text{Section C} = \frac{50}{260} \times 360 = 69$$

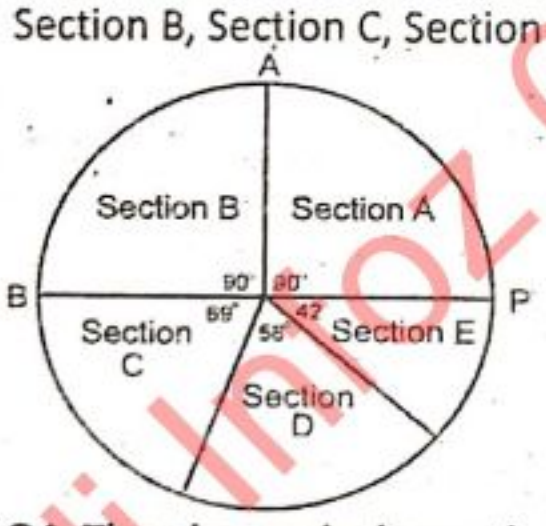
$$\text{Section D} = \frac{42}{260} \times 360 = 58$$

$$\text{Section E} = \frac{30}{260} \times 360 = 42$$

**Step I:** Draw a circle of suitable radius and draw its radius OP.

**Step II:** Construct an angle of $101^0$ representing the number of students in Section A.

**Step III:** Construct angles of $90^0$, $58^0$, $69^0$ and $42^0$ representing the number of students in Section B, Section C, Section D and Section E respectively.




**Q4. The pie graph shows the sale of 180 litres of milk by a milkman in a day. Read this pie chart and answer the following questions.**

Sol. Total liters of milk = 180

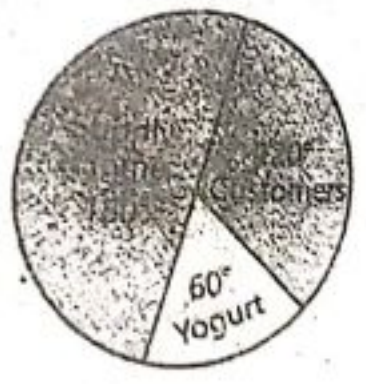
i. How many litres does he supply to houses?

Sol. Supply to houses = $\frac{180^0}{360^0} \times 180 = 90\,litres$

ii. How many litres does he sell to the customers?

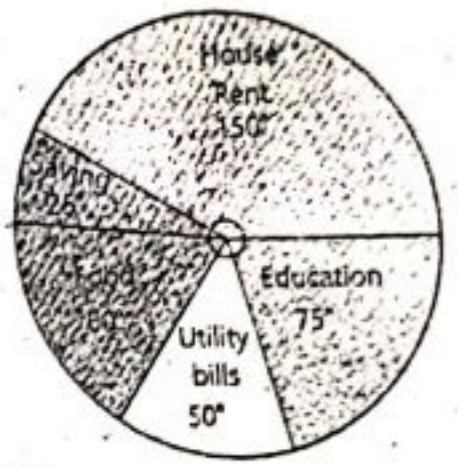
Sol. Selling to customers = $\frac{120^0}{360^0} \times 180 = 60\,litres$

iii. How many litres does he use for yogurt?



Sol. Use for yogurt = $\frac{60^0}{360^0} \times 180 = 30 \, litres$

**Q5. The monthly expenditure of Rauf is shown by a pie graph. If the monthly income of Rauf is Rs.7200, find the answers of the following questions:**




i. **What is the largest expenditure of Rauf and how much?**

Sol. The largest expenditure of Rauf is the House rent.

House rent = $\frac{150^0}{360^0} \times 72000 = Rs.30,000$

ii. **What amount does he spend on education and food?**

Sol. On education = $\frac{75^0}{360^0} \times 72000 = Rs.15,000$

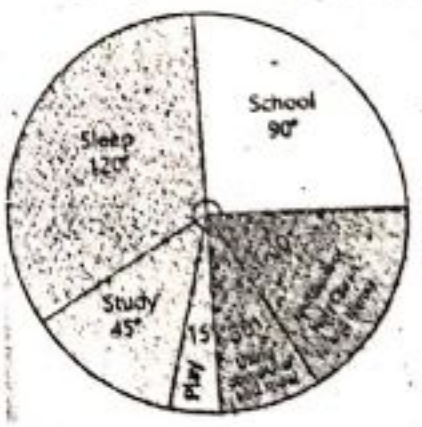
iii. **How much does he pay as utility bills?**

Sol. Utility bills = $\frac{50^0}{360^0} \times 72000 = Rs.10,000$

iv. **What amount does he save?**

Sol. Savings = $\frac{25^0}{360^0} \times 72000 = Rs.5,000$

**Q6. Sana's activities in a day are shown by a pie graph. Read the graph and answer the following questions: (Hint: 1 day = 24 hours)**




i. **How much time does she spend in school?**

Sol. Time spent in school = $\frac{90^0}{360^0} \times 24 = 6 \ Hours$

ii. **How many hour des she sleep?**

Sol. Sleeping time = $\frac{120^0}{360^0} \times 24 = 8 \ Hours$

iii. **How many hours does she study?**

Sol. Study time = $\frac{45^0}{360^0} \times 24 = 3 \ Hours$

iv. **In which activity does she spend the least time? And howmuch?**

Sol. The least time spent in an activity is the activity of Playing.

Time in playing = $\frac{15^0}{360^0} \times 24 = 1 \ Hours$

**v. How much time does she spend in using computer and meal?**

Sol. Using Computer and Meal =

$$\frac{30^0}{360^0} \times 24 = 2 \ Hours$$

**vi. How many hours does she spend on recitation of the Holy Quran and Namaz?**

Sol. Recitation of Holy Quran and

Namaz = $\frac{60^0}{360^0} \times 24 = 4 \ Hours$

## Exercise – 11.3

**Q1. Azan makes a list of students about their favorite subjects. Show this in the form of grouped data and then answer the given questions:**

**English , Science, Math, Urdu, Urdu, English, Urdu, Math, Math, Science, English, English, Science, Science, Science, Science, Math, Math, English, Urdu**

**a) Which subject is the most favorite?**

**b) Which subject is the least favorite?**

**Sol.**

| Subject | Number |
|---|---|
| English | 5 |
| Math | 6 |
| Urdu | 4 |
| Science | 6 |

a. The most favorite subject is Science and Math.

b. The least favorite subject is Urdu.

**Q2. The given data is the weight of class 6 students:**

**20kg, 24kg, 21kg, 18kg, 20kg, 24kg, 21kg, 18kg, 19kg, 24kg, 19kg, 21kg, 24kg, 20kg, 18kg, 18kg, 20kg, 24kg, 18kg, 24kg, 26kg, 21kg, 19kg, 26kg.**

**Show it in the form of grouped data. Also:**

**a) Tell the number of students that have a weight less than 20 kg.**

**b) Tell the number of students that have a weight greater than 21 kg.**

Sol. In grouped data form:

| Group | Number of students |
|---|---|
| 18 – 19 | 8 |
| 20 – 21 | 8 |
| 22 – 23 | 0 |
| 24 – 25 | 6 |
| 26 - 27 | 2 |

a. There are 8 students whose weight is less than 20 kg.

b. There are 8 students whose weight is greater than 21 kg.

## Exercise – 11.4

**Q1. Calculate the mean of the following data.**

**i. 46, 50, 39, 50, 38**

Sol. Mean of 46, 50, 39, 50, 38

$$\bar{x} = \frac{\sum x}{n}$$

$$\Rightarrow \bar{x} = \frac{46+50+39+50+38}{5}$$

$$\bar{x} = \frac{223}{5} \Rightarrow \bar{x} = 44.6 \ \textbf{Ans.}$$

**ii. 108, 115, 138, 190**

Sol. Mean of 108, 115, 138, 190

$$\bar{x} = \frac{\sum x}{n}$$

$$\Rightarrow \bar{x} = \frac{108+115+138+190}{4}$$

$$\bar{x} = \frac{551}{4} \Rightarrow \bar{x} = 137.75 \text{ Ans.}$$

iii. **210, 237, 340**

Sol. Mean of 210, 237, 340

$$\bar{x} = \frac{\sum x}{n}$$

$$\Rightarrow \bar{x} = \frac{210+237+340}{3}$$

$$\bar{x} = \frac{787}{3} \Rightarrow \bar{x} = 262.33 \text{ Ans.}$$

**Q2. The monthly income of 10 employees of a factory is:**
**Rs.6000, Rs.65230, Rs.78600, Rs.8000, Rs.9350, Rs.9680, Rs.1030, Rs.1236, Rs.14340, Rs.15000.**
**Calculate the average of their monthly income.**

**Sol.** To find average or Mean of the monthly income of 10 employees. We will use the formula

$\bar{x} = \frac{\sum x}{n}$ Putting values

$$\bar{x} = \frac{6000+65230+78600+8000+9350+9680+1030+1236+14340+15000}{10}$$

$$\bar{x} = \frac{208,466}{n} \quad \bar{x} = 20,846.6 \text{ Ans.}$$

**Q3. Find the median of the following sets of observations.**

i. **15, 12, 13, 10, 8**

Sol. Median for the data 15, 12, 13, 10, 8

First arrange the data: 8, 10, 12, 13, 15

Here n = 5

So, Median = $\left(\frac{n+1}{2}\right)^{th}$ term

Median = $\left(\frac{5+1}{2}\right)^{th} = \left(\frac{6}{2}\right)^{th} = 3^{rd}$ term

i.e Median = 12 **Ans.**

ii. **100, 106, 101, 108, 98, 93**

Sol. Median for the data 100, 106, 101, 108, 98, 93.

First arrange the data: 93, 98, 100, 101, 106, 108

Here n = 6

So, Median = $\left(\frac{n+1}{2}\right)^{th}$ term

Median = $\left(\frac{6+1}{2}\right)^{th} = \left(\frac{7}{2}\right)^{th} = 3.5^{th}$ term

$3.5^{th}$ is the half way between $3^{rd}$ and $4^{th}$ term.

$3^{rd}$ term = 100 $4^{th}$ term = 101

Hence Median = $\left(\frac{100+101}{2}\right) = \frac{201}{2} = 100.5$

i.e Median = 100.5 Ans.

iii. **84, 72, 95, 90, 65, 68, 69 70**

Sol. Median for the data 84, 72, 95, 90, 65, 68, 69 70

First arrange the data: 65, 68, 69, 70, 72, 84, 90, 95.

Here n = 8

Median = $\left(\frac{8+1}{2}\right)^{th} = \left(\frac{9}{2}\right)^{th} = 4.5^{th}$ term

$4.5^{th}$ is the half way between $4^{th}$ and $5^{th}$ term.

$4^{th}$ term = 70 $5^{th}$ term = 72

Hence Median = $\left(\frac{70+72}{2}\right) = \frac{142}{2} = 71$

i.e Median = 71 **Ans.**

**Q4. Find out the mode for each of the following.**

i. **7, 8, 8, 13, 15, 15, 16**

Sol. Mode for the data 7, 8, 8, 13, 15, 15, 16

Mode = 8 and 15

ii. **100, 120, 120, 120, 120, 150**

Sol. Mode for the data 100, 120, 120, 120, 120, 150

Mode = 120

iii. **357, 402, 427, 500**

Sol. Mode for the data 357, 402, 427, 500

This data has no mode.

**Exercise – 11.5**

**Q1. Describe the following with example:**

**a) Experiments**

**Sol.** An experiment is a process which gives some results/ outcomes.

**b) Random Experiments**

**Sol.** An experiment will be called a random experi8ment if it has two or more possible results. Example of random experiment is flipping a coin.

**c) Outcomes**

**Sol.** The possible results of a random experiment is called an outcomes. For example: when rolling a dice, there are total six possible outcomes can be 1 or 2 or 3 or 4 or 5 or 6.

**d) Sample space**

**Sol.** The sample space is the set of all possible outcomes of an experiment. For example: the sample space for rolling a dice is:

Sample space: S = {1, 2, 3, 4, 5, 6}

**e) Events**

**Sol.** An event is an outcome or a collection of outcomes. An event is a subset of a sample space. For example: tossing a coin and getting a head is an event, rolling a die and getting a 5 is an event.

**f) Equally likely events**

**Sol.** The outcomes in a sample space will be called equally likely event if each outcome has the same chance of occurring while the outcomes having different chance of occurring are not equally likely outcomes.

**Q2. Saad has a bag with 14 blocks. Six are red, two are green, four are blue and two are yellow. What is the probability that if he chooses one block, randomly without seeing, it will be red?**

**Also find:**

**Sol.** Number of possible outcomes = 14

Number of desired outcomes = 6 (red)

Probability of event P(red) =

$$\frac{\text{Number of desired outcomes}}{\text{Number of all possible outcomes}}$$

$$P(\text{red}) = \frac{6}{14}$$

$$P(red) = \frac{3}{7} \textbf{ Ans.}$$

**a) Sample space**

**Sol.** Number of possible outcomes = 14

So Sample space = 14

**b) P(green)**

**Sol.** Number of possible outcomes = 14

Number of desired outcomes = 2 (green)

Probability of event P(green) =

$$\frac{\text{Number of desired outcomes}}{\text{Number of all possible outcomes}}$$

$$P(green) = \frac{2}{14}$$

$$P(green) = \frac{1}{7} \text{ Ans.}$$

c) **P(yellow)**

**Sol.** Number of possible outcomes = 14
Number of desired outcomes = 2 (yellow)
Probability of event P(yellow) =

$$\frac{\text{Number of desired outcomes}}{\text{Number of all possible outcomes}}$$

$$P(yellow) = \frac{2}{14}$$

$$P(yellow) = \frac{1}{7} \text{ Ans.}$$

d) **P(Not blue)**

**Sol.** Number of possible outcomes = 14
Number of desired outcomes = 10 (not blue)
Probability of event P(green) =

$$\frac{\text{Number of desired outcomes}}{\text{Number of all possible outcomes}}$$

$$P(not\ blue) = \frac{10}{14}$$

$$P(not\ blue) = \frac{5}{7} \text{ Ans.}$$

**Q3. There are 14 candies in a jar. Hamza takes one candy randomly without looking at the candies. Find:**

a) **The sample space**

**Sol.** Number of possible outcomes = 14
So Sample space = 14

b) **The probability of picking a chocolate candy**

**Sol.** Number of possible outcomes = 14
Number of desired outcomes = 4 (Chocolate candy)
Probability of event P(Chocolate candy) =

$$\frac{\text{Number of desired outcomes}}{\text{Number of all possible outcomes}}$$

$$P(Chocolate\ candy) = \frac{4}{14}$$

$$P(Chocolate\ candy) = \frac{2}{7} \text{ Ans.}$$

c) **The probability of picking a strawberry candy**

**Sol.** Number of possible outcomes = 14
Number of desired outcomes = 3 (Strawberry candy)
Probability of event P(Strawberry candy) =

$$\frac{\text{Number of desired outcomes}}{\text{Number of all possible outcomes}}$$

$$P(Strawberry\ candy) = \frac{3}{14}$$

$$P(Strawberry\ candy) = \frac{3}{14} \text{ Ans.}$$

d) **The probability of not picking a chocolate candy**

**Sol.** Number of possible outcomes = 14

Number of desired outcomes = 10 (Not | Chocolate candy)
Probability of event P(Not Chocolate candy) =

$$\frac{\text{Number of desired outcomes}}{\text{Number of all possible outcomes}}$$

P(Not Chocolate candy) = $\frac{10}{14}$

$P(\textit{Not Chocolate candy}) = \frac{5}{7}$ **Ans.**

**e) The probability of picking an orange candy**

**Sol.** Number of possible outcomes = 14
Number of desired outcomes = 7 (Orange candy)
Probability of event P(Orange candy) =

$$\frac{\text{Number of desired outcomes}}{\text{Number of all possible outcomes}}$$

P(Orange candy) = $\frac{7}{14}$ $P(\textit{Orange candy}) = \frac{1}{2}$ **Ans.**

**f) The probability of not picking an orange candy**

**Sol.** Number of possible outcomes = 14
Number of desired outcomes = 7 (Not Orange candy)
Probability of event P(Not Orange candy) =

$$\frac{\text{Number of desired outcomes}}{\text{Number of all possible outcomes}}$$

P(Not Orange candy) = $\frac{7}{14}$ $P(\textit{Not Orange candy}) = \frac{1}{2}$ **Ans.**

**g) What is more likely to be picked; an orange candy or a strawberry candy?**

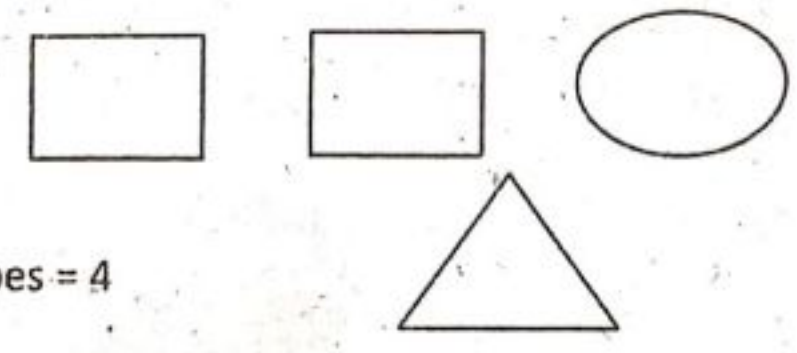
**Sol.** Probability of Picking an orange candy = $\frac{1}{2}$

Probability of picking a strawberry candy = $\frac{3}{14}$

Orange candy is more likely to be picked.

**Q4. Draw 2D shapes (as sample space) for each of these according to the below mentioned probabilities:**

**a) P(square) = $\frac{2}{4}$**



**Sol.** P(square) = $\frac{2}{4}$

Total number of 2D shapes = 4

Number of squares = 2

b) **P(circle) = $\frac{3}{8}$**

c) **Sol.** P(circle) = $\frac{3}{8}$

Total number of 2D shapes = 8

Number of circles = 3

d) **P(triangles)= $\frac{1}{3}$**

**Sol.** P(triangles)= $\frac{1}{3}$

Total number of 2D shapes = 3

Number of triangles = 1

**Q5. Look at the spinner and find:**

a) **The sample space**

**Sol.** Total number of outcomes = 8

b) **The probability:**

i. **P(red)**

**Sol.** Total number of outcomes = 8

Number of desired outcomes = 3

Probability of event P(red) = $\frac{3}{8}$

ii. **P(green)**

**Sol.** Total number of outcomes = 8

Number of desired outcomes = 3

Probability of event P(green) = $\frac{3}{8}$

iii. **P(blue)**

**Sol.** Total number of outcomes = 8

Number of desired outcomes = 1

Probability of event P(blue) = $\frac{1}{8}$

iv. **P(yellow)**

**Sol.** Total number of outcomes = 8

Number of desired outcomes = 1

Probability of event P(yellow) = $\frac{1}{8}$

**Q6. The pond has 10 blue, 8 red, 7 green and 4 yellow fish. What is the probability that a randomly caught fish will be a:**


a) **Red fish**

**Sol.** Total number of outcomes = 29

Number of desired outcomes = 8

Probability of event P(red fish) = $\frac{8}{29}$

b) **Blue fish**

**Sol.** Total number of outcomes = 29

Number of desired outcomes = 10

Probability of event P(red fish) = $\frac{10}{29}$

c) **Green fish**

**Sol.** Total number of outcomes = 29

Number of desired outcomes = 7

Probability of event P(red fish) = $\frac{7}{29}$

**Q7. A box contains 8 buttons out of which 5 are transparent. What is the**

**probability that a randomly selected button will not be a transparent one?**

**Sol.** Total number of outcomes = 8
Number of desired outcomes = 3
Probability of event P(not transparent)

$$= \frac{3}{8}$$

**Q8. In a pack of randomly packed 14 pencils, 11 are blue ones.**

a) **What is the probability that a randomly selected pencil will be blue?**

**Sol.** Total number of outcomes = 14
Number of desired outcomes = 11
Probability of event P(blue pencil) =

$$\frac{11}{14}$$

b) **What is the probability that a randomly selected pencil will not be blue?**

**Sol.** Total number of outcomes = 14
Number of desired outcomes = 3
Probability of event P(not blue pencil) =

$$\frac{3}{14}$$

**Q9. Ali picks a card randomly.**

**4 7 7 0 3 8**

a) **What is the sample space?**

**Sol.** Sample space: S = {4, 7, 7, 0, 3, 8}

b) **What are the possible outcomes?**

**Sol.** The possible outcomes are: 4, 7, 7, 0, 3, 8

c) **What is the probability that a randomly selected card will have a 7?**

**Sol.** Total number of outcomes = 6
Number of desired outcomes = 2
Probability of event P(7) =

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

d) **What is the probability that a randomly selected card will have a 3?**

**Sol.** Total number of outcomes = 6
Number of desired outcomes = 1

Probability of event P(3) = $\frac{1}{6}$ **Ans.**

## Review Exercise – 11

**Q1. Choose the correct option.**

a) The information on the basis of which these graphs are drawn is called:
   i. Knowledge ii. Table
   **iii. Data** iv. Product

b) Two or more related categories of data are represented in a:
   i. Single bar
   ii. **Multiple bar**
   iii. Pie bar graph
   iv. Line bar graph

c) The sum of central angles of pie graph must be equal to:
   i. $160^0$ ii. $380^0$ iii. $360^0$ iv. $180^0$

d) Which of these shows discrete data?
   i. The mass of an animal
   ii. **The number of rooms in a hotel**
   iii. The length of a chain
   iv. The capacity of a water container

e) The mode of the data 9, 10, 12, 13, 13, 13, 15, 15, 16, 16 is

i. 9 ii. 15
iii. 16
**iv. 13**

f) The median of the data 23, 23, 23, 23, 45, 45, 56, 67, 73, 89 is:
i. 20 ii. 23
**iii. 45**
iv. 46

**Q2. Define the following with examples:**

**a) Discrete data**

**Sol.** The values or quantities that are in whole number form are fall under discrete data. The values in discrete data are countable.
For example: the number of students in Grade 6.
Population of Islamabad.

**b) Continuous data**

**Sol.** The values or quantities that can presented in fraction or decimal fall under continuous data. The values in continuous data are not countable.
For example: The volume of liquid or the height of a person.

**c) Grouped data**

**Sol.** When collected data from any source is organized in groups/categories to show some meaning, this data is called grouped data.
For example: we can group the temperature of a place in 4 groups:
Number of days when temperature lies between 15 – 20 = 3
Number of days when temperature lies between 21 – 25 = 5
Number of days when temperature lies between 26 – 30 = 4
Number of days when temperature lies between 31 – 35 = 2

**d) Ungrouped data**

**Sol.** When data is collected from any source it does not convey to us any meaningful information to understand. This data is called ungrouped data.
For example: Temperature of a place in different days are:
$32^0$ C, $16^0$ C, $25^0$ C, $31^0$ C, $28^0$ C, $27^0$ C, $29^0$ C, $22^0$ C, $30^0$ C.

**e) Mean**

**Sol.** The sum of values divided by the number of values is called Mean or Arithmetic Mean (A.M)

Formula: $A.M = \frac{sum\ of\ value}{number\ of\ values}$

Mean is represented by $\bar{x}$ i.e.

$$\bar{x} = \frac{\sum x}{n}$$

**f) Median**

**Sol.** The median is the value which divides the values into two equal halves arranged either in ascending or descending order.
For example: The median of the data 3, 2, 5, 7, 9, 10, 11 is 9.

**g) Mode**

**Sol.** The frequently occurring value (or values) in the data is called mode of the data. If no number is repeated in the data then the data has no mode. If two or more than two numbers have the same frequency in the data then those numbers will be the mode.
For example: Mode of the data 2, 3, 3, 3, 4, 4, 5, 5, 5, 5, 6, 6, 6 is 5.

**Q3. Fahad made a list of students about their favorite games. Show this in the form of grouped data:**
**Cricket, Hockey, Hockey, Cricket, Football, Hockey, Cricket, Basketball, Hockey, Cricket, Football, Cricket,**

**Football, Cricket, Football, Badminton, Badminton, Basketball, Badminton, Basketball, Basketball.**

a) **Which game is most favorite?**
b) **Which game is the least favorite?**

Sol. First we find the frequencies of all games.

| Games | Frequency |
|---|---|
| Cricket | 6 |
| Hockey | 4 |
| Football | 4 |
| Badminton | 3 |
| Basketball | 4 |

a) The most favorite game is Cricket.
b) The least favorite game is Badminton.

**Q4. The following table shows the profit gained by 3 shopkeepers during five months. Draw a multiple bar graph for this data.**

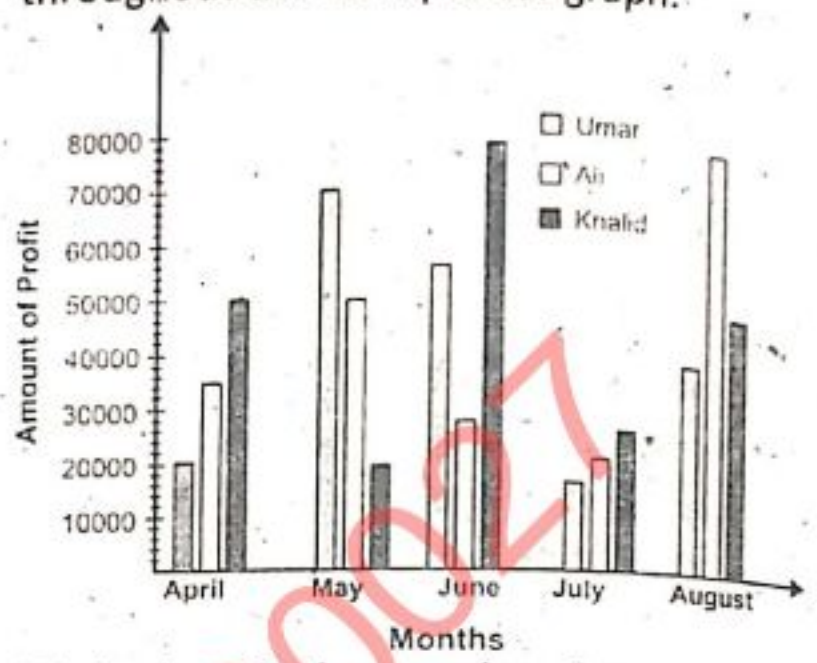
| | April | May | June | July | August |
|---|---|---|---|---|---|
| Umar | Rs.20000 | Rs.65000 | Rs.55000 | Rs.15000 | Rs.35000 |
| Ali | Rs.35000 | Rs.45000 | Rs.30000 | Rs.20000 | Rs.76000 |
| Khalid | Rs.52000 | Rs.19000 | Rs.78000 | Rs.25000 | Rs.54000 |

Sol.

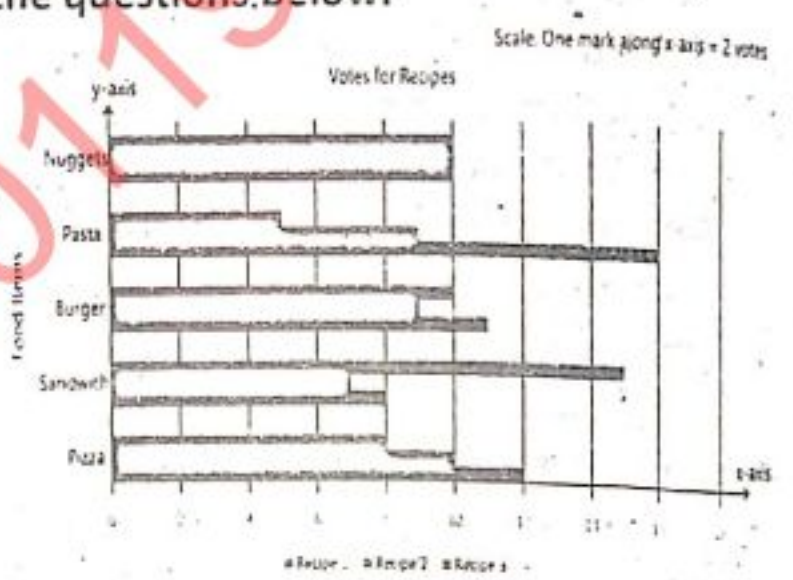
**Step I:** Draw an x-axis (horizontal line) and y-axis (vertical line) perpendicular to each other.

**Step II:** Write name of months along x-axis and amount of money along y-axis. Choose the color for each category. i.e. Ali, Umar and Khalid.

**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.




**Q5. Look at the bar graph and answer the questions below.**




a) **Which items recipe got the greatest vote?**

Sol. Recipe 3 of Pasta.

b) **How many people vote for the recipe 3 of the pasta?**

Sol. 16 people.

c) **How many people vote for three recipes of sandwich?**

Sol. For recipe 1 of sandwich = 15 people

For recipe 2 of sandwich = 7 people

For recipe 3 of sandwich = 8 people

Total votes = 15 + 7 + 8 = 30

d) **How many people vote for the recipe 2 of pizza?**

Sol. 10 people.

e) **How many people vote for recipe 1 of the burger?**

Sol. 10 people.

**Q6. The following table shows the money Ahmad spends on food in the first 5 months of the year.**

| Months | January | February | March | April | May |
|---|---|---|---|---|---|
| Spend of food | 9000 | 12000 | 11780 | 1450 | 1340 |

**Draw a pie chart of this data.**

**Sol.** First we find the measurement of the central angles by using the following method.

Sum of all time = 9000 + 12000 + 11780 + 1450 + 1340 = 35,570

Using formula:

$$\text{Months} = \frac{\text{Spend money}}{\text{Total money}} \times 360$$

$$\text{January} = \frac{9000}{35570} \times 360 = 91$$

$$\text{February} = \frac{12000}{35570} \times 360 = 121$$

$$\text{March} = \frac{11780}{35570} \times 360 = 120$$

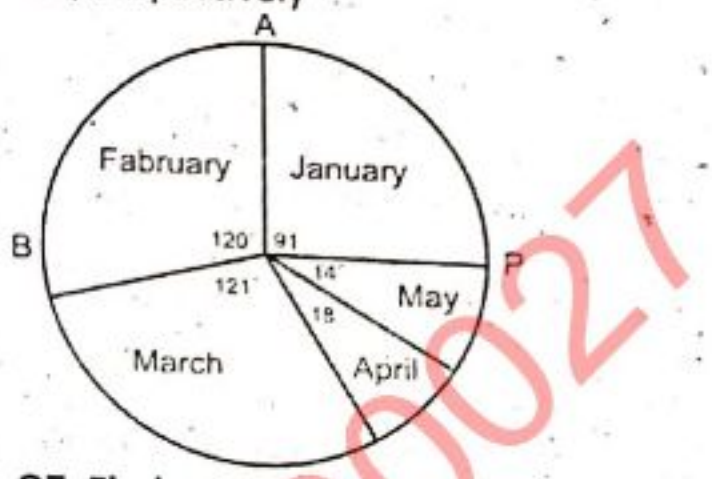
$$\text{April} = \frac{1450}{35570} \times 360 = 16$$

$$\text{May} = \frac{1340}{35570} \times 360 = 14$$

**Step I:** Draw a circle of suitable radius and draw its radius OP.

**Step II:** Construct an angle of $91^0$ representing the amount of money spend on food for the month of January.

**Step III:** Construct angles of $121^0$, $120^0$, $16^0$ and $14^0$ representing the amount of money spend for food in the months of February, March, April and May respectively




**Q7. Find mean, median and mode for the following observations**

I. **52, 48, 50, 49, 47**

Sol. Mean:

$$\bar{x} = \frac{\sum x}{n} \Rightarrow \bar{x} = \frac{52+48+50+49+47}{5}$$

$$\bar{x} = \frac{246}{5} \Rightarrow \bar{x} = 49.2 \text{ Ans}$$

Median: First arrange the data

47, 48, 49, 50, 52

Here n = 5

$$\text{Median} = \left(\frac{n+1}{2}\right)^{th} \text{ term} =$$

$$\left(\frac{5+1}{2}\right)^{th} = \left(\frac{6}{2}\right)^{th} = 3^{rd} \text{ term}$$

Median = 49 **Ans.**

Mode; in the data none of the term is repeated so this data has no mode.

II. **207, 301, 205, 350, 322, 205**

Sol.Mean:

$$\bar{x} = \frac{\sum x}{n} \Rightarrow \bar{x} = \frac{207+301+205+350+322+205}{6}$$

$$\bar{x} = \frac{1590}{5} \Rightarrow \bar{x} = 265 \text{ Ans}$$

Median: First arrange the data

205, 205, 207, 301, 322, 350

Here n = 6

Median = $\left(\frac{n+1}{2}\right)^{th}$ term =

$\left(\frac{6+1}{2}\right)^{th} = \left(\frac{7}{2}\right)^{th}$ = 3.5$^{th}$ term

3.5$^{th}$ term is the half way between 3$^{rd}$ and 4$^{th}$ term

3$^{rd}$ term = 207 and 4$^{th}$ term = 301

Median = $\left(\frac{207+301}{2}\right) = \frac{508}{2} = 254$

Median = 254 **Ans.**

Mode: in the data the frequency of 205 is 2. So mode of the data is 205.