Smart SERIES

8

JUNIOR Mathematics

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UNIT-1 SETS

EXERCISE:1.1

Q-1: Let A=$\{x / x \in N \wedge$ is a multiple of $6\}$

B={x/x $\in N \wedge X$ x is a multiple of 3}

is set A a subset of set B.

Sol: Set A={6,12,18.....} B={3,6,9,12.....}

As every element of A is an element of B.

$\therefore A \subseteq B$ (A is a subset of B)

Q-2: Let A={a,b,c} and B= {a,c,e,g,k} is set A,a Subset of set B.

Sol: Here A $\not\subseteq$ B as b $\in$ A but b $\notin$ B.

So A is not a subset of B.

Q-3: Write Three proper subsets of the following.

(i) A= {1,3,5} (ii) B= {a,b,c} (iii) C= {1,2,3,4}

Sol: **(i)** A= {1,3,5}

Proper subsets = { }, {3}, {1,5}

(ii) B = {a,b,c}

Proper subsets = {a}, {c}, {b,c}

(iii) C = {1,2,3,4}

Proper subsets = {1,2}, {2,3}, {1,2,4}

Q-4: Find the power sets of the following sets.

(i) X= {0,1} (ii) Y= {1,2,4} (iii) {T= -4,-3,-1}

Sol: (i) X = {0,1}

(ii) P(x) = {{ }, {0},{1},{0,1}

(iii) Y = {1,2,4}

P(X) = {{ }, {1}, {2}, {4}, {1,2}, {1,4}, {2,4}, {1,2,4}}

(iii) T = {-4, -3, -1}

P(T)={{ },{-4},{-3},{-1},{-4,-3}X{-4,-1},{-3,-1},{-4,-3,-1}}

Q-5: Write the power set of A= {a,b,d}

Sol: A= {a,b,d}

p(A) = {{ }, {a}, {b}, {d}, {a,b}, {a,d}, {b,d}, {a,b,d}}

EXERCISE- 1.2

Q-1: For the following sets prove that $A \cup B = B \cup A$.

(i) A = {a,e,i,o,u} B = {a,b}

(ii) A = {1,2,3} B = ϕ

Sol: (i) A = {a,e,i,o,u} B = {a,b}

$A \cup B$ = {a,e,i,o,u} $\cup$ {a,b}

= {a,b,e,i,o,u} ..... (i)

$B \cup A$ = {a,b} $\cup$ {a,e,i,o,u}

= {a,b,e,i,o,u} ..... (ii)

By answers (i) and (ii) it is verified that

$A \cup B = B \cup A$

(ii) A = {1,2,3} B = ϕ

$A \cup B = \{1,2,3\} \cup \phi$

= {1,2,3} ..... (i)

$B \cup A = \phi \cup \{1,2,3\}$

= {1,2,3} ..... (ii)

By answers (i) and (ii) it is verified that

$A \cup B = B \cup A$

Q-2: Prove that for any set A= {1,3,5,7,9}

(i) $A \cup \phi = A$ **(ii)** $A \cup A = A$

(iii) $A \cap \phi = \phi$ **(iv)** $A \cap A = A$

Sol: (i) A = {1,3,5,7,9}

$A \cup \phi$ = {1,3,5,7,9} $\cup \phi$

= {1,3,5,7,9} = A (Proved)

(ii) $A \cup A$ = {1,3,5,7,9} $\cup$ {1,3,5,7,9}

$= \{1,3,5,7,9\} = A$ (Proved)

(iii) $A \cap \phi = \{1,3,5,7,9 \cap \phi$

$= \phi \qquad = \phi$ (Proved)

(iv) $A \cap A = \{1,3,5,7,9\} \cap \{1,3,5,7,9\}$

$= \{1,3,5,7,9\} = A$ (Proved)

Q-3: Let S= {a,b,e} R= {b,c,d,f} then prove that

(i) $R \cap S = S \cap R$ (ii) $R \cup S = S \cup R$

Sol: (i) S= {a,b,e} R= {b,c,d,f}

$S \cap R = \{a,b,e\} \cap \{b,c,d,f\} = \{b\}$ ..... (i)

$R \cap S = \{b,c,d,f\} \cap \{a,b,e\}$

$= \{b\}$ ..... (ii)

By answers 1 and 2 it is verified that

$R \cap S - S \cap R$

(ii) $R \cup S = \{b,c,d,f\} \cup \{a,b,e\}$

$= \{a,b,c,d,e,f\}$ ..... (i)

$S \cup R = \{a,b,c\} \cup \{a,c,d,f\}$

$= \{a,b,c,d,e,f\}$ .....

(ii) By answer (i) and (ii) it is verified that

$R \cup S - S \cup R$

Q-4: Let A= {a,b} B= {b,c,d} then prove that

(i) $A \cup B = B \cup A$ (ii) $A \cap B \neq B \cup A$

Sol: A= {a,b} b = {b,c,d}

(i) $A \cup B = \{a,b\} \cup \{b,c,d\}$

$= \{a,b,c,d\}$ ..... (i)

$B \cup A = \{b,c,d\} \cup \{a,b\}$

$= \{a,b,c,d\}$ ..... (ii)

By answers 1 and 2 it is verified that

$A \cup B = B \cup A$

(ii) $A \cap B = \{a,b\} \cap \{b,c,d\}$

$= \{b\}$ ..... (i)

$B \cup A = \{b,c,d\} \cup \{a,b\}$

$= \{a,b,c,d\}$ ..... (ii)

By answer 1 and 2 it is verified that

$$A \cap B \neq B \cup A$$

Q-5: Let A= {1,2,3} and B=ϕ, show that

(i) $A \cup B = A$ (ii) $A \cap B = B$

Sol: A= {1,2,3} B= ϕ

(i) $A \cup B = \{1,2,3\} \cup \phi$

$= \{1,2,3\} = A$ (Proved)

(ii) $A \cap B = \{1,2,3\} \cap \phi$

$= \phi = B$ (Proved)

Q-6: if A={1,2,3,4} B= {2,4,5,6} C= {1,3,4,6,8} verify that

(i) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

Sol: A= {1,2,3,4} B= {2,4,5,6} C= {1,3,4,6,8}

(i) L.H.S $B \cup C = \{2,4,5,6\} \cup \{1,3,4,6,8\}$

$= \{1,2,3,4,5,6,8\}$

$A \cap (B \cup C) = \{1,2,3,4\} \cap \{1,2,3,4,5,6,8\}$

$= \{1,2,3,4\}$ ..... (i)

R.H.S $A \cap B = \{1,2,3,4\} \cap \{2,4,5,6\}$

$= \{2,4$

$A \cap C = \{1,2,3,4\} \cap \{1,3,4,6,8\}$

$= \{1,3,4\}$

$(A \cap B) \cup (a \cap c) = \{2,4\} \cup \{1,3,4\}$

$= \{1,2,3,4\}$ ..... (ii)

By 1 and 2 it is proved that

$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

Q-7: Let U= {1,2,3.....10} A= {1,2,3,4} B= {2,4,6,8,10}

verify that (i) $(A \cup B)^c = A^c \cap B^c$.

(ii) $(A \cap B)^c = A^c \cup B^c$

Sol: U= {1,2,3.....10} A= {1,2,3,4} B= {2,4,6,8,10}

(i) L.H.S $A \cup B$ = {1,2,3,4} $\cup$ {2,4,6,8,10}

= {1,2,3,4,6,8,10}

$(A \cup B)^c = U - (A \cup B)$ = {1,2,3....10}-{1,2,3,4,6,8,10}

= {5,7,9}

R.H.S A^c $U - A$ = {1,2,3....10}-{1,2,3,4}

= {5,6,7,8,9,10}

B^c $U - B$ = {1,2,3,4....10}-{2,4,6,8,10}

= {1,3,5,7,9}

$A^c \cap B^c$ = {5,6,7,8,9,10} $\cap$ {1,3,5,7,9}

= {5,7,9} ..... (2)

By answer 1 and 2 it is proved that

$(A \cup B)^c = A^c \cap B^c$

(ii) L.H.S $A \cap B$ = {1,2,3,4} $\cap$ {2,4,6,8,10}

= {2,4}

$(A \cap B)^c = U - (A \cap B)$ = {1,2,3....10}-{2,4}

= {1,3,5,6,7,8,9,10} ..... (1)

R.H.S A^c $U - A$ = {1,2,3,4...10}-{1,2,3,4}

= {5,6,7,8,9,10}

$B^c \quad U - B \quad = \{1,2,3,4....10\}-\{2,4,6,8,10\}$

$= \{1,3,5,7,9\}$

$A^c \cup B^c \quad = \{5,6,7,8,9,10\} \cup \{1,3,5,7,9\}$

$= \{1,3,5,6,7,8,9,10\}$ ..... (2)

By the answers 1 and 2, it is proved that

$$(A \cap B)^c = A^c \cup B^c$$

Q-8: Verify through Ven diagrams

(i) $A \cup B = B \cup A$ **(ii)** $A \cap B = B \cap A$

(a) A= {3,5,7,9,11,13} B= {5,9,13,17,21,25}

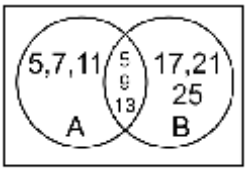
(b) C= {a,b,c,d,e} D= {a,e,i,o,u}

(c) M= {x/x∈ N∧ 5≤ x≤ 9} N= {x/∈ W∧ O≤ x≤ 5}

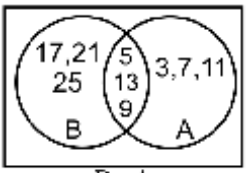
(d) The Sets of N and W

Sol: (a) A= {3,5,7,9,11,13} B= {5,9,13,17,21,25}

(i)

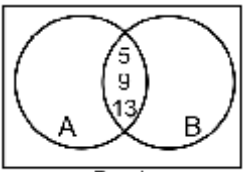


A∪B

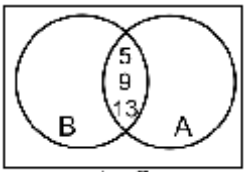


B∪A

(ii)



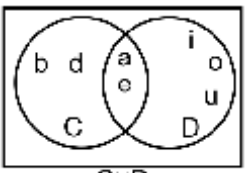
B∩A



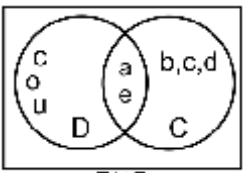
A∩B

(b) C= {a,b,c,d,e} D= {a,e,i,o,u}

(i)

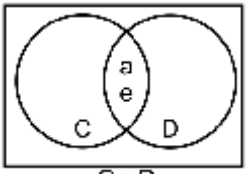


C∪D

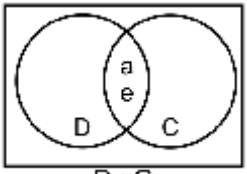


D∪C

(ii)



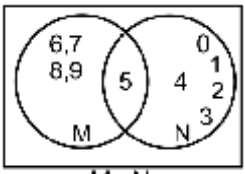
C∩D



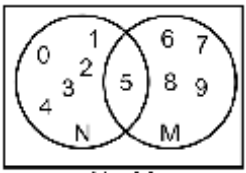
D∩C

(c) M= {5,6,7,8,9} N= {0,1,2,3,4,5}

(i)

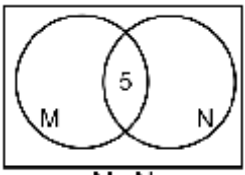


M∪N

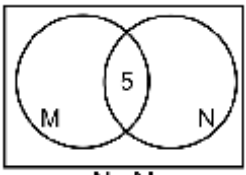


N∪M

(ii)



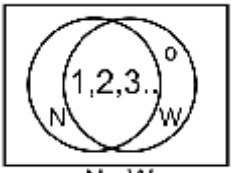
M∪N



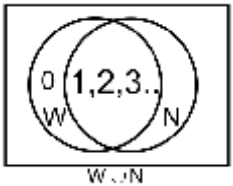
N∩M

(d) N= {1,2,3....} W= {0,1,2.....}

(i)

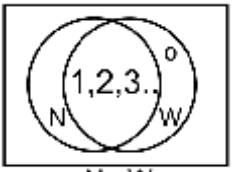


N∪W

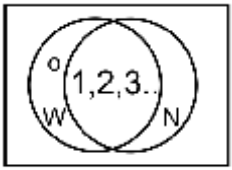


W∪N

(ii)

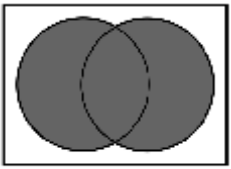


N∩W

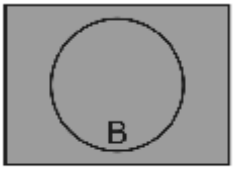


W∩N

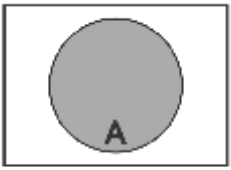
Q-9: Copy the following figures and shade according to the operations mentioned below each.



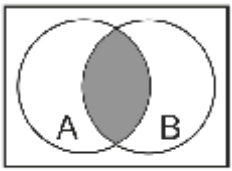
A∪B



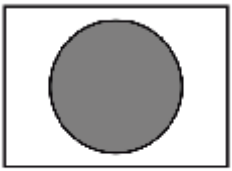
U∪B



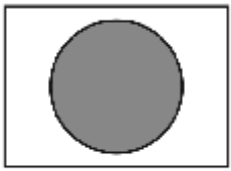
$A \cup A$



$A \cap B$



$U \cap A$



$A \cap A$

UNIT-2 REAL NUMBERS

EXERCISE- 2.1

☆ **Find the sum of the following numbers without actually adding the numbers.**

Q-1; 1+3+5+7

Sol: Number of numbers = 4 Sum = 4^2 = 16

Q-2; 1+3+5+7+9+11

Sol: Number of numbers = 6 Sum = 6^2 = 36

Q-3; 1+3+5+7+9+11+13+15

Sol: Number of numbers = 8 Sum = 8^2 = 64

Q-4; 1+3+5+7+9+11+13+15+17

Sol: Number of numbers = 9 Sum = 9^2 = 81

Q-5; 1+3+5+7+9+11+13+15+17+19+21

Sol: Number of numbers = 11 Sum = 11^2 = 121

Q-6; 1+3+5+7+9+11+13+15+17+19+21+23+25

Sol: Number of numbers = 13 Sum = 13^2 = 169

Q-7; 1+2+3+4+3+2+1

Sol: Central single number = 4 Sum = 4^2 = 16

Q-8; 1, 2, 3, 4, 5, 6, 5, 4, 3, 2, 1

Sol: Central single number = 6 Sum = 6^2 = 36

Q-9; 1+2+3+4+5+6+7+8+7+6+5+4+3+2+1

Sol: Central single number = 8 Sum = 8^2 = 64

EXERCISE: 2.2

Q-1; Find the square roots of the following numbers by prime factorization method.

(i)	64	(ii)	100	(iii)	484	(iv)	900
(v)	1156	(vi)	3136	(vii)	1225	(viii)	1764

(i) 64

$64 = 2\times2\times2\times2\times2\times2 = 2^2\times2^2\times2^2$

$\sqrt{64} = \sqrt{2^2\times2^2\times2^2} = 2\times2\times2 = 8$

$\therefore \quad \sqrt{64} = 8$

2	64
2	32
2	16
2	8
2	4
2	2
	1

(ii) 100

$= 100 = 2\times2\times5\times5 \quad 2^2\times5^2$

$\sqrt{100} = \sqrt{2^2\times5^2} = 2\times5 = 10$

$\therefore \quad \sqrt{100} = 10$

2	100
2	50
5	25
5	5
	1

(iii) 484

$= 484 = 2\times2\times11\times11 = 2^2\times11^2$

$\sqrt{484} = \sqrt{2^2\times11^2} = 2\times11 = 22$

$\therefore \quad \sqrt{484} = 22$

2	484
2	242
11	121
11	11
	1

(iv) 900

$= 900 = 2\times2\times3\times3\times5\times5 \quad 2^2\times3^2\times5^2$

$\sqrt{900} = \sqrt{2^2\times3^2\times5^2} = 2\times3\times5 = 30$

$\therefore \quad \sqrt{900} = 30$

2	900
2	450
3	225
3	75
5	25
5	5
	1

Q-2: Find the square roots of the following decimals by prime factorization method.

(i) 38.44 (ii) 12.25 (iii) 6.25 (iv) 72.25

(v) 39.69 (vi) 10.24 (vii) 100.00 (viii) 4.84

Sol: (i) $\mathbf{38.44 = \frac{3844}{100}}$

$$= \frac{3844}{100} = \frac{2\times2\times31\times31}{2\times2\times5\times5} = \frac{2^2\times31^2}{2^2\times5^2}$$

$$= \sqrt{38.44} = \sqrt{\frac{3844}{100}} = \sqrt{\frac{2^2\times31^2}{2^2\times5^2}}$$

$$= \frac{2\times31}{2\times5} = \frac{62}{10} = 6.2$$

2	3844
2	1922
31	961
31	31
	1

=

2	100
2	50
5	25
5	5
	1

$\therefore \quad \sqrt{38.44} = 6.2$

(ii) $\mathbf{12.25 = \frac{1225}{100}}$

$$= \frac{1225}{100} = \frac{5\times5\times7\times7}{2\times2\times5\times5} = \frac{5^2\times7^2}{2^2\times5^2}$$

$$= \sqrt{12.25} = \sqrt{\frac{5^2\times7^2}{2^2\times5^2}} = \frac{5\times7}{2\times5} = \frac{35}{10} = 3.5$$

5	1225
5	245
7	49
7	7
	1

2	100
2	50
5	25
5	5
	1

$\therefore \quad \sqrt{12.25} = 3.5$

(iii) $\mathbf{6.25 = \frac{625}{100}}$

$$= \frac{625}{100} = \frac{5\times5\times5\times5}{2\times2\times2\times2} = \frac{5^2\times5^2}{2^2\times5^2}$$

$$= \sqrt{6.25} = \sqrt{\frac{5^2\times5^2}{2^2\times5^2}} = \frac{5\times5}{2\times5} = \frac{25}{10} = 2.5$$

5	625
5	125
5	25
5	5
	1

=

2	100
2	50
5	25
5	5
	1

$\therefore \quad \sqrt{6.25} = 2.5$

(iv) $72.25 = \frac{7225}{100}$

$= \frac{7225}{100} = \frac{5\times5\times17\times17}{2\times2\times5\times5} = \frac{5^2\times17^2}{2^2\times5^2}$

$= \sqrt{7225} = \sqrt{\frac{5^2\times17^2}{2^2\times5^2}} = \frac{5\times17}{2\times5} = \frac{85}{10} = 8.5$

5	7225
5	1445
17	289
17	17
	1

2	100
2	50
5	25
5	5
	1

$\therefore \quad \sqrt{72.25} = 8.5$

(v) $39.69 = \frac{3969}{100}$

$\frac{3969}{100} = \frac{3\times3\times3\times3\times7\times7}{2\times2\times5\times5} = \frac{3^2\times3^2\times7^2}{2^2\times5^2}$

$\sqrt{39.69} = \sqrt{\frac{3^2\times3^2\times7^2}{2^2\times5^2}} = \frac{3\times3\times7}{2\times5} = \frac{63}{10}$

$\therefore \quad \sqrt{39.69} - \frac{63}{10} - 6.3$

3	3669
3	1223
3	441
3	147
7	49
7	7
	×

5	7225
5	1445
17	289
17	17
	1

(vi) $10.54 - \frac{1024}{100}$

$\frac{1024}{100} - \frac{2\times2\times2\times2\times2\times2\times2\times2\times2\times2}{2\times2\times5\times5}$

$= \frac{2^2\times2^2\times2^2\times2^2\times2^2}{2^2\times5^2}$

$\sqrt{10.24} = \sqrt{\frac{2^2\times2^2\times2^2\times2^2\times2^2}{2^2\times5^2}}$

$- \frac{2\times2\times2\times2\times2}{2\times5} - \frac{32}{10} - 3.2$

$\therefore \quad \sqrt{10.24} = 3.2$

2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

2	100
2	50
5	25
5	5
	1

(vii) $100.00 - \frac{100000}{100}$

$$= \frac{10000}{100} - \frac{2\times2\times2\times2\times5\times5\times5\times5}{2\times2\times5\times5}$$

$$= \frac{2^2\times2^2\times5^2\times5^2}{2^2\times5^2}$$

$$\sqrt{100.00} = \sqrt{\frac{2^2\times2^2\times5^2\times5^2}{2^2\times5^2}}$$

$$= \frac{2\times2\times5\times5}{2\times5}$$

$$= \frac{100}{10} - 10 \quad \therefore \sqrt{100.00} - 10$$

2	10000
2	5000
2	2500
2	1250
5	625
5	125
5	25
5	5
	1

=

2	100
2	50
5	25
5	5
	1

(viii) $\mathbf{4.84 - \frac{4.84}{100}}$

$$\frac{484}{100} = \frac{2\times2\times11\times11}{2\times2\times5\times5} = \frac{2^2\times11^2}{2^2\times5^2}$$

$$\sqrt{4.84} = \sqrt{\frac{2^2\times11^2}{2^2\times5^2}} = \frac{2\times11}{2\times5} = \frac{22}{10} = 2.2$$

2	100
2	50
5	25
5	5
	1

=

2	484
2	242
11	121
11	11
	1

$\therefore \quad 4.84 = 2.2$

EXERCISE: 2.3

Q-1: Find square roots by division method.

(i) 841 (ii) 7921 (iii) 1296 (iv) 9801

(v) 42025 (vi) 49284 (vii) 46225 (viii) 78961

(ix) 119025

(i) 841

2	841
+2	4
49	441
	441
	×

$\therefore \quad \sqrt{841} = 29$

(ii) 7921

```
        89
    8 | 7921
   +8 | 64
  169 | 1521
      | 1521
      |   x
```

$\therefore \quad \sqrt{7921} = 89$

(iii) 1296

```
        36
    3 | 1296
   +3 | 9
   66 | 396
      | 396
      |   x
```

$\therefore \quad \sqrt{1296} = 36$

(iv) 9801

```
        99
    9 | 9801
   +9 | 81
  189 | 1701
      | 1701
      |   x
```

$\therefore \quad \sqrt{9801} = 99$

(v) 42025

```
        205
    2 | 42025
   +2 | 4
  405 | 2025
      | 2025
      |   x
```

$\therefore \quad \sqrt{42025} = 205$

(vi) 49284

```
        222
    2 | 49284
   +2 | 4
   42 | 92
      | 84
  442 | 884
      | 884
      |   x
```

$\therefore \quad \sqrt{49284} = 222$

(vii) 46225

```
      215
    ------
  2 | 46225
 +2 | 4
 41 | 62
 +1 | 41
425 |  2125
     | 2125
     |    x
```

$\therefore \quad \sqrt{46225} = 215$

(viii) 78961

```
      281
    ------
  2 | 78961
 +2 | 4
 48 | 389
 +8 | 384
561 |  561
     | 561
     |   x
```

$\therefore \quad \sqrt{78961} = 281$

(ix) 119025

```
      345
    ------
  3 | 119025
 +3 |  9
 64 | 290
 +4 | 256
685 | 3425
     | 3425
     |    x
```

$\therefore \quad \sqrt{119025} = 345$

Q-2: Find the square roots of the following by division method.

(i) 46.24 (ii) 13.69 (iii) 9.8596

(iv) 42.5104 (v) 0.000225 (vi) 727.9204

(vii) 207.0721 (viii) 460.1025

(i) 46.24

```
      6.8
   6 | 46.24
  +6 | 36
 128 | 1024
     | 1024
     |   x
```

$\therefore \quad \sqrt{46.24} = 6.8$

(ii) 13.69

```
      3.7
   3 | 13.69
  +3 | 9
  67 | 469
     | 469
     |   x
```

$\therefore \quad \sqrt{13.69} = 3.7$

(iii) 9.8596

```
      3.14
   3 | 9.8596
  +3 | 9
  61 | 85
  +1 | 61
 624 | 2496
     | 2496
     |   x
```

$\therefore \quad \sqrt{9.8596} = 3.14$

(iv) 42.5104

```
      6.52
   6 | 42.51 04
  +6 | 36
 125 | 651
  +5 | 625
1302 | 2604
     | 2604
     |   x
```

$\therefore \quad \sqrt{42.5104} = 6.52$

(v) 0.000225

```
        0.015
   0 | 0.000225
  +0 | 0
  00 | 00
  +0 | 00
 001 | 02
     | 01
  25 | 125
     | 125
     |   x
```

$\therefore \quad \sqrt{0.000225} = 0.015$

(vi) 727.9204

```
        26.98
   2 | 727.9204
  +2 | 4
  46 | 327
  +6 | 276
 529 |  5192
  +9 |  4761
5388 |   43104
     |   43104
     |     x
```

$\therefore \quad \sqrt{727.9204} = 26.98$

(vii) 207.0721

```
        14.39
   1 | 207.0721
  +1 | 1
  24 | 107
  +4 |  96
 283 | 1107
  +3 |  849
2869 | 25821
     | 25821
     |     x
```

$\therefore \quad \sqrt{207.0721} = 14.39$

(viii) 460.1025

```
        21.45
   2 | 460.1025
  +2 | 4
  41 | 60
  +1 | 41
 424 |  1910
  +4 |  1696
4285 |   21425
     |   21425
     |     x
```

$\therefore \quad \sqrt{460.1025} = 21.45$

Q-3; Find the square roots of the following by division method.

(i) $\frac{1681}{841}$ (ii) $\frac{361}{625}$ (iii) $\frac{1296}{1225}$

(iv) $\frac{3025}{729}$ (v) $\frac{2116}{2601}$ (vi) $\frac{2025}{1444}$

(vii) $\sqrt{40\,41\,64}$ (viii) $\sqrt{9\,67\,121}$ (ix) $\sqrt{21\,51\,169}$

(i) $\frac{1681}{841}$

		41			29
4		1681	2		841
+4		16	+2		4
81		81	49		441
		81			441
		x			x

$$= \sqrt{\frac{1681}{841}} = \frac{41}{29}$$

(ii) $\frac{361}{625}$

		19			25
1		361	2		625
+1		1	+2		4
29		261	45		225
		261			225
		x			x

$$= \sqrt{\frac{361}{625}} = \frac{19}{25}$$

(iii) $\frac{1296}{1225}$

		36			35
3		1296	3		1225
+3		9	+3		9
66		396	65		325
		396			325
		x			x

$$= \sqrt{\frac{1296}{1225}} = \frac{36}{35}$$

(iv) $\frac{3025}{729}$

$$\begin{array}{r|l} & 55 \\ 5 & \overline{3025} \\ +5 & 25 \\ \hline 105 & 525 \\ & 525 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 27 \\ 2 & \overline{729} \\ +2 & 4 \\ \hline 47 & 329 \\ & 329 \\ \hline & \times \end{array} \qquad = \sqrt{\frac{3025}{729}} = \frac{55}{27}$$

(v) $\frac{2116}{2601}$

$$\begin{array}{r|l} & 46 \\ 4 & \overline{2116} \\ +4 & 16 \\ \hline 86 & 516 \\ & 516 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 51 \\ 5 & \overline{2601} \\ +5 & 26 \\ \hline 101 & 101 \\ & 101 \\ \hline & \times \end{array} \qquad = \sqrt{\frac{2116}{2601}} = \frac{46}{51}$$

(vi) $\sqrt{40\frac{41}{64}} = \sqrt{\frac{2601}{64}}$

$$\begin{array}{r|l} & 51 \\ 5 & \overline{2601} \\ +5 & 26 \\ \hline 101 & 101 \\ & 101 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 8 \\ 8 & \overline{64} \\ +8 & 64 \\ \hline & \times \end{array} \qquad = \sqrt{40\frac{41}{64}} = \frac{51}{8} = 6\frac{3}{8}$$

(vii) $\sqrt{9\frac{67}{121}} = \sqrt{\frac{1156}{121}}$

$$\begin{array}{r|l} & 34 \\ 3 & \overline{1156} \\ +3 & 9 \\ \hline 64 & 256 \\ & 256 \\ \hline & \times \end{array} \qquad \begin{array}{r|l} & 11 \\ 1 & \overline{121} \\ +1 & 1 \\ \hline 21 & 21 \\ & 21 \\ \hline & \times \end{array} \qquad = \sqrt{9\frac{67}{121}} = \frac{34}{11} = 3\frac{1}{11}$$

(ix) $\sqrt{21\frac{51}{169}} = \frac{3600}{169}$

	60
6	3600
+6	36
120	000
	000
	x

	13
1	169
+1	1
23	69
	69
	x

$= \sqrt{21\frac{51}{169}} = \frac{60}{13} = 4\frac{8}{13}$

EXERCISE: 2.4

Q-1: Find the square roots of following correct to two places of decimals.

(i) 4 (ii) 7 (iii) 2.5

(iv) $2\frac{1}{2}$ (v) $\frac{13}{7}$ (vi) 1.7

(i) 5

	2.236
2	5.000000
+2	4
42	100
+2	84
443	1600
+3	1329
4466	27100
	26796
	304

$\sqrt{5} = 2.236..... = 2.24$

(ii) 7

	2.645
2	7.000000
+2	4
46	300
+6	276
524	2400
+4	2096
5285	30400
	26425
	3975

$\sqrt{7} = 2.645..... = 2.65$

(iii) 2.5

	1.581
1	2.500000
+1	1
25	150
+5	125
308	2500
+8	2464
3161	3600
	3161

$\sqrt{2.5} = 1.581..... = 1.58$

(iv) $1\frac{1}{2} = \frac{3}{2} = 1.5$

	1.224
1	1.500000
+1	1
22	50
+2	44
242	600
+2	484
2444	11600
+4	9776
	1824

$\sqrt{1\frac{1}{2}} = 1.224..... = 1.22$

(v) $\frac{13}{5} - 2.6$

	1.612
1	2.600000
+1	1
26	160
+6	156
321	400
+1	321
3222	7900
+2	6444
	1456

$\sqrt{\frac{13}{5}} = 1.612..... = 1.61$

(vi) 1.7

	1.303
1	$1.\overline{70}\,\overline{00}\,\overline{00}$
+1	1
23	70
+3	69
260	100
+0	000
2603	10000
	7809
	2191

$\sqrt{1.7} = 1.303..... = 1.30$

EXERCISE- 2.5

Q-1: The area of a square field is 196 square meters. Find the length of the side of the square.

Sol: In squares

Area $= (\text{side})^2$

or Side $= \sqrt{\text{area}}$

Here area $= 196\text{m}^2$

So side $= \sqrt{196\text{m}^2} = 14$ meters

Q-2: Area of a circular field is 74536m² Find circumference of circule $\left(\pi = \frac{22}{7}\right)$.

Sol: Area of circle $= \pi r^2$

$74536 = \frac{22}{7}\pi^2$

$\pi^2 = 74536 \times \frac{7}{22}$

$\pi^2 = 23716$

$\sqrt{\pi^2} = \sqrt{23716}$

$\pi = 154\text{m}$

Circumference $C = 2\pi r$

$$= 2 \times \frac{22}{7} \times 154$$

$$= 968m$$

Q-3: Find the least number of 4 digits which is a perfect square.

Sol: Least number of 4 digits is 1000 By taking square root.

```
      32
  3 | 1000
 +3 |  9
 62 | 100
    | -124
    | -24
```

So we have to add it in 1000 to get least number of 4 digits which is a perfect square = 1000+24 = 1024.

Q-4: Find the least number which must be Subtracted from 3151 to make it a perfect square.

Sol: Taking square root of 3151 which number will be remainder that will be subtracted to make it perfect square.

```
      56
  5 | 3151
    | 25
106 | 651
    | 636
    | 15
```

So 15 will be subtracted.

Q-5: The product of two positive numbers is 230496. one of the numbers is 6 times the other. Find the numbers.

Sol: Let one number = x

second number = 6x

According to statement

$x \times 6x$ = 230496

$6x^2$ = 230496

x^2 = $230496 \div 6 - 38416$

$\sqrt{x^2}$ = $\sqrt{38416}$

x = 196

So first number = x = 196

second number = 6x=6x196=1176

Q-6: In a certain garden there were 8 rows of trees, To plant 8 trees in each row, how many trees are required.

Sol: No of rows = 8

No of trees in each row = 8

Total trees required = 8x8

= $(8)^2$

= 64 trees

Q-7: In a garden there are 1024 coconut trees If the number of trees in rows along length and breadth be same then how many trees are there in each row.

Sol:

No of trees in each row = square root of total trees.

No of trees in each row = $\sqrt{1024}$

= 32 trees

	32
3	1024
+3	9
62	124
	124
	x

Q-8: What Least number of soldiers should be with drawn from 9122 soldiers so that the soldiers may be arranged in squared form.

Sol: After taking square root of 9122, the remainder should be subtracted.

```
      95
  9 | 9122
 +9 | 81
185 | 1022
    | 925
    | 87
```

As 87 is remainder so we have to subtract or withdraw 87 soldiers to arrange remaining soldiers in squared form.

Q-9: What least number of soldiers should be subtracted from 53600 soldiers so that soldiers can be arranged in a solid square.

Sol: Here remainder will be subtracted from total soldiers.

```
      231
  2 | 53600
    | 4
 43 | 136
    | 129
461 |  700
    |  461
    |  239
```

So for squred formation 239 soldier will be subtracted.

Q-10: A general wishing to arrange 63512 soldiers in a solid square found that there is an access of 8 soliders. How many soliders were in each row.

Sol: Total Soliders = 63512

Excess = 8

Remaing soldiers = 63512-8 = 63504

No. of soldiers in each row = $\sqrt{63504}$

= 252 soldiers

```
      252
  2 | 63504
    | 4
 45 | 235
    | 225
502 | 1004
    | 1004
    |  x
```

EXERCISE- 2.6

Q-1: Find the cubes of the following numbers.

(i) 11 (ii) 1.3 (iii) 4.5

(iv) $\frac{14}{17}$ (v) $\frac{-13}{15}$ (vi) $\frac{-3.6}{4.1}$

Sol: (i) $(11)^3 = 11 \times 11 \times 11 = 1331$

(ii) $(1.3)^3 = 1.3 \times 1.3 \times 1.3 = 2.197$

(iii) $(4.5)^3 = 4.5 \times 4.5 \times 4.5 = 91.125$

(iv) $\left(\frac{14}{17}\right)^3 = \frac{14}{17} \times \frac{14}{17} \times \frac{14}{17} = \frac{2744}{4913}$

(v) $\left(\frac{13}{15}\right)^3 = \frac{13}{15} \times \frac{13}{15} \times \frac{13}{15} = \frac{2197}{3375}$

(vi) $\left(\frac{3.6}{4.1}\right)^3 = \frac{3.6}{4.1} \times \frac{3.6}{4.1} \times \frac{3.6}{4.1} = \frac{46.656}{68.921}$

Q-2: Find the cube root of each of the following numbers.

(i) 64 (ii) 512 (iii) 10648

(iv) 27000 (v) 15625 (vi) 110592

Sol: **(i)** $\sqrt[3]{64} = (64)^{1/3}$

$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^3 \times 2^3$

$\sqrt[3]{64} = \sqrt[3]{2^3 \times 2^3}$

$= 2 \times 2 = 4$

2	64
2	32
2	16
2	8
2	4
2	2
	1

(ii) $\sqrt[3]{512} = (512)^{\frac{1}{3}}$

$512 = 2\times2\times2\times2\times2\times2\times2\times2\times2 = 2^3\times2^3\times2^3$

$(512)^{\frac{1}{3}} = (2^3\times2^3\times2^3)^{\frac{1}{3}}$

$= 2^{3\times\frac{1}{3}}\times2^{3\times\frac{1}{3}}\times2^{3\times\frac{1}{3}}$

$= 2\times2\times2 = 8$

2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

(iii) $\sqrt[3]{10648} = (10648)^{1/3}$

$10648 = 2\times2\times2\times11\times11\times11 = 2^3\times11^3$

$(10648)^{\frac{1}{3}} = (2^3\times11^3)^{\frac{1}{3}}$

$= 2^{3\times\frac{1}{3}}\times11^{3\times\frac{1}{3}}$

$= 2\times11 = 22$

2	10648
2	5324
2	2662
11	1331
11	121
11	11
	1

(iv) $\sqrt[3]{27000} = (27000)^{\frac{1}{3}}$

$27000 = 2\times2\times2\times3\times3\times3\times5\times5\times5$

$= 2^3\times3^3\times5^3$

$(27000)^{\frac{1}{3}} = (2^3\times3^3\times5^3)^{\frac{1}{3}}$

$= 2^{3\times\frac{1}{3}}\times3^{3\times\frac{1}{3}}\times5^{3\times\frac{1}{3}}$

$= 2\times3\times5 = 30$

2	27000
2	13500
2	6750
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

(v) $\sqrt[3]{15625} = (15625)^{1/3}$

$15625 = 5\times5\times5\times5\times5\times5$

$= 5^3\times5^3$

$(15625)^{1/3} = (5^3\times5^3)^{1/3}$

$= 5^{3\cdot\frac{1}{3}}\times5^{3\times\frac{1}{3}}$

$= 5\times5 = 25$

5	15625
5	3125
5	625
5	125
5	25
5	5
	1

(vi) $\sqrt[3]{110592} = (110592)^{1/3}$

$110592 = 2\times2\times2\times2\times2\times2\times2\times2\times$

$2\times2\times2\times2\times3\times3\times3$

$= 2^3\times2^3\times2^3\times2^3\times3^3$

$(110592)^{1/3} = (2^3\times2^3\times2^3\times2^3\times3^3)^{1/3}$

$= 2^{3\cdot\frac{1}{3}}\times2^{3\times\frac{1}{3}}\times2^{3\cdot\frac{1}{3}}\times2^{3\times\frac{1}{3}}\times3^{3\cdot\frac{1}{3}}$

$= 2\times2\times2\times2\times3 = 48$

$\therefore \sqrt[3]{110592} = 48$

2	110592
2	55296
2	27648
2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

EXERCISE- 2.7

Q-1: Which of the following numbers are perfect cubes.

(i) 729 (ii) 100 (iii) 243

(iv) 400 (v) 3375 (vi) 127000

Sol: (i) $729 = 3\times3\times3\times3\times3\times3 = 3^3\times3^3$

So it is a perfect cube

(ii) 100= $2\times2\times5\times5=\ 2^2\times5^2$

Factors not cubes so not perfect cube

(iii) 243= $3\times3\times3\times3\times3=\ 3^3\times3^2$

Not perfect cube

(iv) 400= $2\times2\times2\times2\times5\times5=2^3\times2^1\times5^2$

Not a perfect cube

(v) 3375= $3\times3\times3\times5\times5\times5=\ 3^3\times5^3$

It is a perfecr cube.

(vi) 127000= $2\times2\times2\times5\times5\times127=2^3\times5^2\times127^1$

Not a perfect cube.

Q-2: Find the cube roots of the following numbers by factorication method.

(i) $\frac{8}{27}$ **(ii)** $\frac{27}{125}$ **(iii)** **0.1331**

(iv) **0.64** **(v)** **0.125** **(vi)** **4.913**

Sol: (i) $\frac{8}{27}=\frac{2\times2\times2}{3\times3\times3}$

$\sqrt[3]{\frac{8}{27}}=\sqrt[3]{\frac{2^3}{3^3}}=\frac{2}{3}$

2	8
2	4
2	2
	1

3	27
3	9
3	3
	1

(ii) $\frac{27}{125}$ $\frac{3\times3\times3}{5\times5\times5}$ $\frac{3^3}{5^3}$

$\sqrt[3]{\frac{27}{125}}=\sqrt[3]{\frac{3^3}{5^3}}=\frac{3}{5}$

3	27
3	9
3	3
	1

5	125
5	25
5	5
	1

(iii) $0.1331=\frac{1331}{10000}=\frac{11\times11\times11}{10\times10\times10\times10}$

$$\sqrt[3]{0.1331} = \sqrt[3]{\frac{11^3}{10^3 \times 10}} = \frac{11}{10\sqrt[3]{10}}$$

11	1331
11	121
11	11
	1

10	10000
10	1000
10	100
10	10
	1

(iv) $$0.64 = \frac{64}{100} = \frac{2\times2\times2\times2\times2\times2}{2\times2\times5\times5}$$

$$\sqrt[3]{0.64} = \sqrt[3]{\frac{2^3 \times 2^3}{100}} = \frac{2\times2}{\sqrt[3]{100}} = \frac{4}{\sqrt[3]{100}}$$

2	64
2	32
2	16
2	8
2	4
2	2
	1

2	100
2	50
5	25
5	5
	1

(v) $$0.125 = \frac{125}{1000} = \frac{5\times5\times5}{10\times10\times10} = \frac{5^3}{10^3}$$

$$\sqrt[3]{0.125} = \sqrt[3]{\frac{5^3}{10^3}} = \frac{5}{10} = 0.5$$

5	125
5	25
5	5
	1

17	1000
17	100
17	10
	1

(vi) $$4.913 = \frac{4913}{1000} = \frac{17\times17\times17}{10\times10\times10}$$

$$\sqrt[3]{4.913} = \sqrt[3]{\frac{17^3}{10^3}} = \frac{17}{10}$$

17	4913
17	289
17	17
	1

10	1000
10	100
10	10
	1

UNIT-3 DIFFERENT NUMBER SYSTEM

EXERCISE - 3.1

Q-1: Convert the following numbers of the decimals system into binary system.

(i) 2025 (ii) 881 (iii) 2701

Sol: (i) 2025

2025= $(11111101001)_2$

2	2025	
2	1012	- 1
2	506	- 0
2	253	- 0
2	126	- 1
2	63	- 0
2	31	- 1
2	15	- 1
2	7	- 1
2	3	- 1
	1	- 1

(ii) 881

881 $(1101110001)_2$

2	881	
2	440	- 1
2	220	- 0
2	110	- 0
2	55	- 0
2	27	- 1
2	13	- 1
2	6	- 1
2	3	- 0
	1	- 1

(iii) 2701

2701 $(100010001101)_2$

2	2701	
2	1350	-1
2	675	-0
2	337	-1
2	168	-1
2	84	-0
2	42	-0
2	21	-0
2	10	-1
2	5	-0
2	2	-0
	1	-0

Q-2: Convert decimal number to base 5.

(a) 392 (b) 2317 (c) 3211

(a) 392

5	392	
5	78	-2
5	15	-3
	3	-0

392 $(3032)_5$

(b) 2317

5	2317	
5	463	-1
5	92	-0
5	18	-1
	3	-3

2317 $(33232)_5$

(c) 3211

5	3211	
5	642	-1
5	128	-2
5	25	-3
5	5	-0
	1	-0

3211 $(100321)_5$

Q-3: Convert to octal system (Base 8)

(a) 53210 (b) 840 (c) 7881

(a) 53210

8	53210	
8	6651	-2
8	831	-3
8	103	-7
8	12	-7
	1	-4

53210 $(147732)_8$

(b) 840

8	840	
8	105	-0
8	13	-1
	1	-5

840 $(1510)_8$

(c) 7881

8	7881	
8	985	-1
8	123	-1
8	15	-3
	1	-7

7881 $(17311)_8$

EXERCISE- 3.2

Q-1: Convert the following into decimal system.

(i) $(101)_2$ (ii) $(2055)_8$ (iii) $(1101120)_5$

(iv) $(5016)_8$ (v) $(1450)_8$ (vi) $(1100101001)_2$

(vii) $(3100)_8$ (viii) $(1001110)_2$

Sol: (i) $(101)_2$

$= 1\times 2^2 + 0\times 5^1 + 1\times 2^0$

$= 4 + 0 + 1 = 5$

(ii) $(2055)_8$

$= 2\times 8^3 + 0\times 8^2 + 5\times 8^1 + 5\times 8^0$

$= 2\times 512 + 0\times 64 + 5\times 8 + 5\times 1$

$= 1024+0+40+5 = 1069$

(iii) $(1101120)_5$

$= 1\times 5^6 + 1\times 5^5 + 0\times 5^4 + 1\times 5^3 + 1\times 5^2 + 2\times 5^1 + 0\times 5^0$

$= 15625 + 3125 + 0 + 125 - 25 - 10 + 0$

$= 18910$

(iv) $(5016)_8$

$= 5\times 8^3 + 0\times 8^2 + 1\times 8^1 - 6\times 8^0$

$= 2560+0+8+6$

$= 2574$

(v) $(1450)_8$

$= 1\times 8^3 + 4\times 8^2 + 5\times 8^1 + 0\times 8^0$

$= 512+256+40+0$

$= 808$

(vi) $(1100101001)_2$

$= 1\times2^9+1\times2^8+0\times2^7+0\times2^6+1\times2^5+$

$0\times2^4+1\times2^3+0\times2^2+0\times2^1+1\times2^0$

= 512+256+0+0+32+0+8+0+0+1

= 809

(vii) $(3100)_8$

$= 3\times8^3+1\times8^2+0\times8^1-0\times8^0$

= 1536+64+0+0

= 1600

(viii) $(1001110)_2$

$= 1\times2^6+0\times2^5+0\times2^4+1\times2^3+1\times2^2-1\times2^1+1\times2^0$

= 64 + 0 + 0 + 8 + 4 + 2 + 0

= 78

EXERCISE- 3.3

Addition, subtraction and multiplication in base 2.

Q-1: Add

(i) $(101)_2+(111)_2$ (ii) $(110010011)_2+(101010101)_2$

(i) $(101)_2+(111)_2$

$$\begin{array}{r} (101)_2 \\ +\,(111)_2 \\ \hline (1100)_2 \end{array}$$

(ii) $(110010011)_2+(101010101)_2$

$$\begin{array}{r} (110010011)_2 \\ +\,(101010101)_2 \\ \hline (1011101000)_2 \end{array}$$

Q-2: Subtract:

(i) $(100111)_2-(10101)_2$

(ii) $(11010101)_2-(1101101)_2$

Sol: (i) $(100111)_2 - (10101)_2$

$$\begin{array}{r} (100111)_2 \\ (\ 10101)_2 \\ \hline (\ 10010)_2 \end{array}$$

(ii) $(11010101)_2 - (1101101)_2$

$$\begin{array}{r} (11010101)_2 \\ (1101101)_2 \\ \hline (1101000)_2 \end{array}$$

Q-3: Multiply

(i) $(11111)_2 \times (10101)_2$

(ii) $(111001)_2 \times (101010)_2$

Sol: (i) $(11111)_2 \times (10101)_2$

$$\begin{array}{r} (11111)_2 \\ \times (10101)_2 \\ \hline 11111 \\ 00000\times \\ 11111\times\times \\ 00000\times\times\times \\ 11111\times\times\times\times \\ \hline (1010001011)_2 \end{array}$$

(ii) $(111001)_2 \times (101010)_2$

$$\begin{array}{r} (111001)_2 \\ \times (101010)_2 \\ \hline 000000 \\ 111001\times \\ 000000\times\times \\ 111001\times\times\times \\ 000000\times\times\times\times \\ 111001\times\times\times\times\times \\ \hline (100101011010)_2 \end{array}$$

EXERCISE- 3.4

Q-1: Addition, subtraction and multiplication in base 5.

Add: (i) $(4)_5 + (3)_5$ (ii) $(12433)_5 + (32243)_5$

(i) $(4)_5 + (3)_5$

$$\begin{array}{r} (4)_5 \\ +(3)_5 \\ \hline (12)_5 \end{array}$$

(ii) $(12433)_5 + (32243)_5$

$$\begin{array}{r} (12433)_5 \\ +(31243)_5 \\ \hline (100231)_5 \end{array}$$

Q-2: Subtract:

(i) $(3421)_5 - (2143)_5$ (ii) $(5432)_5 - (4331)_5$

(i) $(3421)_5 - (2143)_5$

$$\begin{array}{r} (3421)_5 \\ -(2143)_5 \\ \hline (1223)_5 \end{array}$$

(ii) $(5432)_5 - (4331)_5$

$$\begin{array}{r} (5432)_5 \\ -(4331)_5 \\ \hline (1101)_5 \end{array}$$

Q-3: Multiply.

(i) $(23)_5 \times (14)_5$ (ii) $(421)_5 \times (234)_5$

(i) $(23)_5 \times (14)_5$

$$\begin{array}{r} (23)_5 \\ \times(14)_5 \\ 102 \\ 23\times \\ \hline (332)_5 \end{array} \qquad (432)_5$$

(ii) $(421)_5 \times (234)_5$

$$\begin{array}{r} (421)_5 \\ (234)_5 \\ \hline 3234 \\ 2313\times \\ 1342\times\times \\ \hline (221114)_5 \end{array} \qquad (221114)_5$$

EXERCISE- 3.5

Q-1: Add:

(i) $(64)_8 + (44)_8$ (ii) $(255636)_8 + (143576)_8$

(i) $(64)_8 + (44)_8$

$$\begin{array}{r} (64)_8 \\ +(44) \\ (130)_8 \end{array} \qquad (130)_8$$

(ii) $(255636)_8 + (143576)_8$

$$\begin{array}{r} (255636)_8 \\ +(143576)_8 \\ (421434)_8 \end{array} \qquad (421434)_8$$

Q-2: Subtract.

(i) $(604)_8 - (247)_8$ (ii) $(455122)_8 - (216634)_8$

(i) $(604)_8 - (247)_8$

$(604)_8$
$(247)_8$
$(335)_8$

$(335)_5$

(ii) $(455122)_8 - (216634)_8$

$(455122)_8$
$(216634)_8$
$(236266)_8$

$(236266)_8$

Q-3: Multiply.

(i) $(36)_8 \times (43)_8$ (ii) $(2465)_8 \times (465)_8$

(i) $(36)_8 \times (43)_8$

$(36)_8$
$\times (43)_8$
132
170 ×
$(2032)_8$

$(2032)_8$

(ii) $(2465)_8 \times (465)_8$

$(2465)_8$
$\times (465)_8$
15011
17476 ×
12324 × ×
$(1444371)_8$

$(1444371)_8$

Q-4: Solve and express answer in decimal number system.

(i) $127 + (2123)_5 - (110010)_2$

(ii) $(101011001010)_2 \times (40401)_5 + (4301)_8 \times (111101)_2$

(iii) $\{(571)_8 + (10111110)_2\} \times \{4569 - (3755)_8\}$

(iv) $\{(3420)_5 - (1110001)_2\} \times \{4569 - (3785)_8\}$

Sol: (i) $127 + (2123)_5 - (110010)_2$

$(2132)_5 = 2 \times 5^3 + 1 \times 5^2 + 3 \times 5^1 - 2 \times 5^0$

$= 250 + 25 + 15 + 2$

$= 292$

$(110010)_2 = 1 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 - 1 \times 2^1 + 0 \times 2^0$

$= 32 + 16 + 0 + 0 + 2 + 0$

$= 50$

$\therefore \quad 127 + 292 - 50 - 369$

(ii) $\mathbf{(101011001010)_2 \times (40401)_5 + (4301)_8 \times (111101)_2}$

$(1010111010)_2 = 1\times 2^9 + 0\times 2^8 + 1\times 2^7 + 0\times 2^6 + 1\times 2^5$

$+1\times 2^4 + 1\times 2^3 + 0\times 2^2 + 1\times 2^1 + 0\times 2^0$

$= 512 + 0 + 128 + 0 + 32 + 16 + 8 + 0 + 2 + 0$

$= 698$

$(40401)_5 = 4\times 5^4 + 0\times 5^3 + 4\times 5^2 - 0\times 5^1 + 1\times 5^0$

$= 2500 + 0 + 100 + 0 + 1$

$= 2601$

$(4301)_8 = 4\times 8^3 + 3\times 8^2 - 0\times 8^1 + 1\times 8^0$

$= 2048 + 192 + 0 + 1$

$= 2241$

$(111101)_2 = 1\times 2^5 + 1\times 2^4 + 1\times 2^3 + 1\times 2^2 + 0\times 2^1 + 1\times 2^0$

$= 32 + 16 + 8 + 4 + 0$

$= 60$

$= 698\times 2601 + 2241\times 60$

$= 1815498 + 134460$

$= 1949958$

(iii) $\mathbf{\{(571)_8 + (10111110)_2\} \times (315)_8 + (2143)_5\}}$

$(571)_8 = 5\times 8^2 - 7\times 8^1 - 1\times 8^0 \quad 320 - 56 + 1$

$= 377$

$(10111110)_2 = 1\times 2^7 + 0\times 2^6 + 1\times 2^5 + 1\times 2^4$

$+1\times 2^3 + 1\times 2^2 + 1\times 2^1 + 0\times 2^0$

$= 128 + 0 + 32 + 16 + 8 + 4 + 2 + 0 = 190$

$(315)_8 = 3\times8^2 + 1\times8^1 + 5\times8^0 \quad 192+8+5$

$= 205$

$(2143)_5 = 2\times5^3 + 1\times5^2 + 4\times5^1 + 3\times5^0$

$= (377+190)\times205+298$

$= 567\times205+298=116235+298$

$= 116533$

(iv) $\{(3420)_5 - (1110001)_2\}\times\{4569 - (3785)_8\}$

$(3420)_5 = 3\times5^3 + 4\times5^2 - 2\times5^1 + 0\times5^0$

$= 375 + 100 + 10 + 0 = 485$

$(1110001)_2 = 1\times2^6 + 1\times2^5 - 1\times2^4 + 0\times2^3$

$+0\times2^2 - 0\times2^1 + 0\times2^0$

$= 64 + 32 + 16 + 0 + 0 + 0 + 1$

$= 113$

$(3785)_5 = 3\times8^3 + 7\times8^2 + 8\times8^1 + 5\times8^0$

$= 1536 + 448 + 64 + 5$

$= 2053$

$= (485 - 113)\times(4569 - 2053)$

$= 372 \times 2516$

$= 935952$

UNIT-4 ALGEBRAIC EXPRESSIONS

EXERCISE- 4.1

Q-1: Determine the degree of each of the following polynomials.

(i) $x^4 - x^3y^2 + x^2y$

(ii) $x + 7x^2y^2 - 6xy^5 - 18$

(iii) $ax^4 - bx^3$ **where a and b are constants**

(iv) $c - ax^2y^2 - bx^3y$ **where a, b and c are constants.**

Sol: (i) $x^4 - x^3y^2 + x^2y$

As the term x^3y^2 has highest sum of exponents 3+2=5, so degree of polynomial is "5"

(ii) $x + 7x^2y^2 - 6xy^5 - 18$

As highest sum of exponents in term $6xy^5$ is 1+5=6, so degree of polynomial is "6"

(iii) $ax^4 - bx^3$

As d and b are constants, term ax^4 has highest exponent 4 so degree of polynomial is 4.

(iv) $c - ax^2y^2 - bx^3y$ (a, b, c, are constant In this polynomial and highest exponent is 4 So degree of polynomial is "4".

Q-2: Write the numerical co-efficients of the following terms.

(i) $5x^2$ **(ii)** $7xy$ **(iii)** $\frac{-3}{8}a^2b$

(iv) $3pq^2$ **(v)** $27m^3$

Sol: (i) $5x^2$

Here neumerical co-efficient is "5"

(ii) $7xy$

Numerical co-efficient is "7"

(iii) $\frac{-3}{8}a^2b$

Numerical co-efficient of term is" $\frac{3}{8}$"

(iv) $3pq^2$

In the term neumerical co-efficient is "3"

(v) $27m^3$

Here neumerical co-efficient is "27"

Q-3: Which of the following are algebraic expressions.

(i) x^2-5yz (ii) 2+m+n

(iii) $215\div2\times2$ (iv) $11a^2+6b^2-5$

(v) $310-15+6^2$

Sol: (i) x^2-5yz is algebraic expression.

(ii) 2+m+n is algebraic expression.

(iii) $215\div2\times2$ not algebraic expression.

(iv) $11a^2+6b^2-5$ is algebraic expression.

(v) $310-15+6^2$ is also algebraic expression.

EXERCISE- 4.2

Add the following polynomials.

Q-1: 3a+7b and 2a-3b

Sol: = 3a+7b and 2a-3b

$$\begin{array}{r} 3a+7b \\ 2a\quad 3b \\ \hline 5a-4b \end{array}$$

Q-2: 8x+6 and 4x-3

Sol: = 8x+6 and 4x-3

$$\begin{array}{r} 8x+6 \\ 4x\quad 3 \\ \hline 12x+3 \end{array}$$

Q-3: p-2q and 3p+4q+5r

Sol: = p-2q and 3p+4q+5r

$$\begin{array}{r} p-2q \\ 3p+4q+5r \\ \hline 4p+2q+5r \end{array}$$

Q-4: 4a-3b-4c, 3b-6c-5a and 3a+4b+7c

Sol: = 4a-3b-4c, 3b-6c-5a and 3a+4b+7c

$$\begin{array}{r} 4a-3b-4c \\ -5a+3b-6c \\ 3a+4b+7c \\ \hline 2a+4b-3c \end{array}$$

Q-5: $4x^2-3x+7, 8+4x-x^2$ *and* $5x-2x^2-10$

Sol: = $4x^2-3x+7, 8+4x-x^2$ *and* $5x-2x^2-10$

$$\begin{array}{r} 4x^2-3x+7 \\ x^2+4x+8 \\ 2x^2+5x-10 \\ x^2+6x+5 \end{array}$$

Q-6: $3m-m^2+1, 6m-9$ *and* m^2-4m+7

Sol: = $3m-m^2+1, 6m-9$ *and* m^2-4m+7

$$\begin{array}{r} -m^2+3m+1 \\ 6m-9 \\ m^2-4m-7 \\ \hline 5m-1 \end{array}$$

Q-7: 2p-3p+4r, 3p-10q-5r and 9p+5q+r

Sol: = 2p-3p+4r, 3p-10q-5r and 9p+5q+r

$$\begin{array}{r} 2p-3q+4x \\ 3p-10q-5r \\ 9p+5q+r \\ 14P-7q \end{array}$$

Q-8: $5x-3y+7z,\ 2x+y-z$

Sol: = $5x-3y+7z,\ 2x+y-z$

$$\begin{array}{r} 5x-3y+7z \\ 2x+y-z \\ \hline 7x-2y+6z \end{array}$$

EXERCISE- 4.3

Q-1: Subtract the first polynomial from the second polynomial.

(i) 7a+6b, 10a-9b **(ii) 2x-3y, 3x+y**

(iii) 3m-4, 5m+7 **(iv) P-2q, 3p+5q**

(v) $x^2-3x-6,\ 2x^2+5x-4$

(vi) a-2c-4b, 5c-3b+2a

(vii) x-5y-9z, 10z+2x-8y

(i) = 7a+6b, 10a-9b

$$= \begin{array}{r} 10a \quad 9b \\ \pm 7a \pm 6b \\ \hline 3a - 15b \end{array}$$

(ii) = 2x-3y, 3x+y

$$= \begin{array}{r} 3x + y \\ \pm 2x \mp 3y \\ \hline x + 4y \end{array}$$

(iii) = 3m-4, 5m+7

$$= \begin{array}{r} 5m \quad 7 \\ \pm 3m \mp 4 \\ \hline 2m + 11 \end{array}$$

(iv) = P-2q, 3p+5q

$$= \begin{array}{r} 3p + 5q \\ \pm P \mp 2q \\ \hline 2P + 7q \end{array}$$

(v) = $x^2-3x-6,\ 2x^2+5x-4$

$$= \begin{array}{r} 2x^2+5x-4 \\ \pm x^2 \mp 3x \mp 6 \\ \hline x^2 - 8x + 2 \end{array}$$

(vi) = a-2c-4b, 5c-3b+2a

$$= \begin{array}{r} 2a - 3b + 5c \\ \pm a \mp 4b \mp 2c \\ \hline a - b + 7c \end{array}$$

(vii) = x-5y-9z, 10z+2x-8y

$$= \begin{array}{r} 2x - 8y + 10z \\ \pm x \mp 5y \mp 9z \\ \hline x - 3y + 19z \end{array}$$

Q-2: Subtract x+y+z from the sum of x+y-2z and 2x-y+z.

Sol:

$$\begin{array}{r} x + y \quad 2z \\ 2x - y + z \\ \hline 3x \qquad - z \\ \pm x \pm y \pm z \\ 2x - y - 2z \end{array}$$

Q-3: Subtract sum of 3a-b+c and -b-c from 5a-b-c

Sol:

$$\begin{array}{r} 3a - b + c \\ -b - c \\ \hline 3a - 2b \end{array} \qquad \begin{array}{r} 5a - b - c \\ +3a + 2b \\ \hline 2a - b - c \end{array}$$

EXERCISE- 4.4

Multiply:

Q-1: (i) $(4x^3)(5x^2)$ (ii) $(3xy)(yz)$

(iii) $(abc)(4b^2c)$ (iv) $(7l^2m^3)(4l^5m^2)$

(v) $(11x^6)(2xy)$

Sol: (i) $(4x^3)(5x^2)$ $= 4\times 5x^{3+2} = 20x^5$

(ii) $(3xy)(yz)$ $= 3x.y^{1+1}.z = 3xy^2z$

(iii) $(abc)(4b^2c)$ $= 1\times 4ab^{1+2}c^{1+1} = 4ab^3c^2$

(iv) $(7l^2m^3)(4l^5m^2)$ $= 7\times 4l^{2+5}m^{3+2} = 28l^7m^5$

(v) $(11x^6)(2xy)$ $= 11\times 2x^{6+1}y = 22x^7y$

Q-2: a^2+5a-6 by $2a+a$

Sol: a^2+5a-6 by $2a+a$

METHOD-1; $(2a+1)(a^2+5a-6)$

$= 2a(a^2+5a-6)+1(a^2+5a-6)$

$= 2a^3+10a^2-12a+a^2+5a-6$

$= 2a^3+10a^2+a^2-12a+5a-6$

$= 2a^3+11a^2-7a-6$

METHOD-2:

$$\begin{array}{r} a^2+5a-6 \\ 2a+1 \\ 2a^3+10a^2-12a \\ a^2+5a-6 \\ \hline 2a^3+11a^2-7a-6 \end{array}$$

Q-3: $4x^2+16x+15$ *by* $x-3$

Sol:

$$
\begin{array}{l}
4x^2+16x+15 \\
x-3 \\
4x^3 + 16x^2 + 15x \\
\quad\quad 12x^2 \quad 48x \quad 45 \\
\hline
4x^3 + 4x^2 \quad 33x \quad 45
\end{array}
$$

Q-4: a^2-2a+1 *by* $a-1$

Sol:

$$
\begin{array}{l}
a^2-2a+1 \\
a-1 \\
a^3 \quad 2a^2 + a \\
\quad\quad a^2 + 2a \quad 1 \\
\hline
a^3 \quad 3a^2 + 3a \quad 1
\end{array}
$$

Q-5: $a^2+2ab+b^2$ *by* $a-6$

Sol:

$$
\begin{array}{l}
a^2 - 2ab + b^2 \\
a-6 \\
a^3 + 2a^2b + ab^2 \\
\quad\quad\quad\quad\quad\quad 6a^2 \quad 12ab \quad 6b^2 \\
\hline
a^3 + 2a^2b + ab^2 \quad 6a^2 \quad 12ab + 6b^2
\end{array}
$$

Q-6: x^2-1 *by* $2x^3+1$

Sol:

$$
\begin{array}{l}
x^2 - 1 \\
2x^3 + 1 \\
\hline
2x^4 - 2x^2 \\
\quad\quad + x \quad 1 \\
\hline
2x^4 \quad x^2 \quad 1
\end{array}
$$

Q-7: x^2-x+1 *by* $x+1$

Sol:

$$
\begin{array}{l}
x^2 - x - 1 \\
x + 1 \\
\hline
x^3 + x^2 + x \\
\quad\quad x^2 + x + 1 \\
\hline
x^3 + 2x^2 + 2x + 1
\end{array}
$$

Q-8: P^2+P+1 *by* $P-1$

Sol:

$$\begin{array}{l} p^2-p+1 \\ p \quad 1 \\ \hline p^3+p^2+p \\ \quad -p^2-p-1 \\ \hline \quad p^3-1 \end{array}$$

Q-9: $2m^2+n+6$ *by* m^2+3n

Sol:

$$\begin{array}{l} 2m^2+n+6 \\ m^2+3n \\ \hline 2m^4+m^2n+6m^2 \\ \qquad 6m^2n \qquad +3n^2+18n \\ \hline 2m^4+7m^2n+6m^2+3n^2+18n \end{array}$$

Q-10: Subtract the product (x^2-xy+y^2) of and (x+y) from the product of (x^2+xy+y^2) and (x-y).

Sol:

$$\begin{array}{l} x^2-xy+y^2 \\ x-y \\ \hline x^3-\cancel{x^2y}+\cancel{xy^2} \\ \quad +\cancel{x^2y}-\cancel{xy^2}+y^3 \\ \quad x^3+y^3 \end{array} \qquad \begin{array}{l} x^2+xy+y^2 \\ x-y \\ \hline x^3+\cancel{x^2y}+\cancel{xy^2} \\ \quad -\cancel{x^2y}-\cancel{xy^2}-y^3 \\ \quad x^3-y^3 \end{array}$$

$$\begin{array}{r} \cancel{x^3}-y^3 \\ \pm\cancel{x^3}\pm y^3 \\ \hline 2y^3 \end{array}$$

EXERCISE- 4.5

Q-1: Divide.

(i) (x^2-1) *by* $(x+1)$ (ii) (x^3+1) *by* $(x+1)$

(iii) $(6x^2-5x+1)$ *by* $(2x-1)$

(iv) $(2x^3+4x^2+3x+1)$ *by* $(x+1)$

(v) $(8x^3 + y^3)\ by\ (2x + y)$

(vi) $(x^3 + x^2 - 14x - 24)\ by\ (x + 2)$

(vii) $(x^2 - 3x - 18)\ by\ (x + 3)$

(viii) $(x^2 + x - 12)\ by\ (x - 3)$

(ix) $(x^3 + 3x^2 + x + 3)\ by\ (x^2 + 1)$

(x) $(x^2 - 2x + 2)\ by\ (x + 2)$

Sol; (i) $(x^2 - 1)\ by\ (x + 1)$

$$
\begin{array}{r|l}
 & x - 1 \\
\hline
x - 1 & x^2 - 1 \\
 & -x^2 \pm x \\
 & \cancel{x} \quad \cancel{1} \\
 & \mp \cancel{x} \mp \cancel{1} \\
 & \times
\end{array}
$$

$(x^2 - 1) \div (x + 1) = (x - 1)$

(ii) $(x^3 + 1)\ by\ (x + 1)$

$$
\begin{array}{r|l}
 & x^2 \quad x \quad 1 \\
\hline
x - 1 & \cancel{x^3} \quad + 1 \\
 & -\cancel{x^3} \quad \pm x \\
 & -\cancel{x^2} + \cancel{1} \\
 & \mp \cancel{x^2} \mp \cancel{1} \\
\hline
 & x + \cancel{1} \\
 & \pm x \pm \cancel{1} \\
\hline
 & \times
\end{array}
$$

$(x^3 + 1) \div (x + 1) = x^2 - x + 1$

(iii) $(6x^2 - 5x + 1)\ by\ (2x - 1)$

$$
\begin{array}{r|l}
 & 3x \quad 1 \\
\hline
2x - 1 & \cancel{6x^2} - 5x + 1 \\
 & -\cancel{6x^2} \mp 3x \\
\hline
 & -\cancel{2x} + \cancel{1} \\
 & \mp \cancel{2x} \pm \cancel{1} \\
 & \times
\end{array}
$$

$(6x^2 - 5x + 1) \div (2x - 1) = 3x - 1$

(iv) $(2x^3+4x^2+3x+1)$ *by* $(x+1)$

$$
\begin{array}{r|l}
 & 2x^2+2x+1 \\
x+1 & 2x^3+4x^2+3x+1 \\
 & \pm 2x^3 \pm 2x^2 \\
\hline
 & 2x^2+3x+1 \\
 & -2x^2 \pm 2x \\
\hline
 & x+1 \\
 & x \pm 1 \\
\hline
 & \times
\end{array}
$$

$(2x^3-4x^2+3x-1)\div(x+1)$

$(2x^2+2x-1)$

(v) $(8x^3+y^3)$ *by* $(2x+y)$

$$
\begin{array}{r|l}
 & 4x^2-2xy+y^2 \\
2x+y & 8x^3+\quad y^3 \\
 & =8x^3 \pm 4x^2y \\
 & -4x^2y-\quad y^3 \\
 & -4x^2y=2xy^2 \\
\hline
 & 2xy^2+y^3 \\
 & =2xy^2 \pm y^3 \\
\hline
 & \times
\end{array}
$$

$(8x^3-y^3)\div(2x-y)$

$(4x^2-2xy+y^2)$

(vi) $(x^3+x^2-14x-24)$ *by* $(x+2)$

$$
\begin{array}{r|l}
 & x^2-x-12 \\
x\quad 2 & x^3+x^2\quad 14x\quad 24 \\
 & \pm x^3 \pm 2x^2 \\
\hline
 & x^2\quad 14x\quad 24 \\
 & \mp x^2 = 2x \\
\hline
 & 12x\quad 24 \\
 & \mp 12x = 24 \\
\hline
 & \times
\end{array}
$$

$(x^3+x^2-14x-24)\div(x+2)$

(x^2-x-12)

(vii) $(x^2-3x-18)$ *by* $(x+3)$

$$
\begin{array}{r|l}
 & x-6 \\
x-3 & x^2-3x-18 \\
 & \pm x^2 \pm 3x \\
\hline
 & 6x\quad 18 \\
 & \mp 6x = 18 \\
\hline
 & \times
\end{array}
$$

$(x^2-3x-18)\div(x-3)=(x-6)$

(viii) $(x^2+x-12)\,by\,(x-3)$

$$
\begin{array}{r|l}
 & x+4 \\
\hline
x-3 & x^2+x-12 \\
 & x^2 \mp 3x \\
\hline
 & 4x \quad 12 \\
 & \pm 4x = 12 \\
\hline
 & \times
\end{array}
$$

$(x^2+x-12)\div(x-3)=(x-4)$

(ix) $(x^3+3x^2+x+3)\,by\,(x^2+1)$

$$
\begin{array}{r|l}
 & x+3 \\
\hline
x^2-1 & x^3+3x^2+x+3 \\
 & x^3 \quad \mp x \\
\hline
 & 3x^2 \mid 3 \\
 & \pm 3x^2 \pm 3 \\
\hline
 & \times
\end{array}
$$

$(x^3+3x^2+x+3)\div(x^2+1)$

$=(x \mid 3)$

(x) $(x^2-2x+2)\,by\,(x+2)$

$$
\begin{array}{r|l}
 & x+1 \\
\hline
x-2 & x^2+3x+2 \\
 & x^2 \pm 2x \\
\hline
 & x \mid 2 \\
 & \mp x \pm 2 \\
\hline
 & \times
\end{array}
$$

$(x^2+3x+2)\div(x+2)$

$(x \mid 1)$

UNIT-5 FINANCIAL ARITHMETIC

EXERCISE - 5.1

Q-1: If 4 men earn Rs, 5000 in 5 days, how much will 10 men earn in 8 days.

MEN	DAYS	RS.	
↑4	↑5	↑5000	More men more money
10	8	x	More days more money

$$\frac{x}{5000} = \frac{\cancel{8}^{2}}{\cancel{5}_{1}} \times \frac{\cancel{10}^{2}}{\cancel{4}_{1}}$$

$x=5000\times4=$Rs.20000

Q-2: 10 men earn Rs 3000 in 15 days, how much men will earn Rs 9600 in 20 days.

Sol: Let required no. of men = x

MEN	DAYS	RS.	
↑10	↓15	↑3000	More days less men.
x	20	9600	More money more men.

$$\frac{x}{10}=\frac{15}{20}\times\frac{9600}{3000}$$

$$\frac{15}{20}\times\frac{9600}{3000}\times 10=24 men$$

Q-3: If 45 kg of folder be sufficient for 9 days for 8 horses, for how much days 40 kg of folder will be enough for 4 horses.

Sol: Let the days = x

FODDER	HORSES	DAYS	
↑45kg	↓8	↑9	More fodder more days.
40kg	4	x	More horses less days.

$$\frac{x}{9}=\frac{8}{4}\times\frac{40}{45}$$

$$x=\frac{\cancel{8}^{2}}{\cancel{4}}\times\frac{{}^{8}\cancel{40}}{\cancel{45}_{5}}\times 9=16 days$$

Q-4: If 5 reams of paper are required for 600 copies of a pamphlet of 20 pages, how many reams will be required for 800 copies of 24 pages pamphlet.

Sol: Let required no. of reams = x

PAGES	COPIES	REAMS	
↑20	↑600	↑5	More pages more reams.
24	800	x	More copies more reams.

$$\frac{x}{5}=\frac{\cancel{800}}{\cancel{600}}\times\frac{\cancel{24}^{4}}{\cancel{20}_{5}}$$

$$x = \frac{8}{\cancel{3}} \times \cancel{3} = 8 \, reams$$

Q-5: 195 men working 10 hrs a day can finish job in 20 days. How many men are needed to finish the job in 15 days, if they work 13 hrs a day.

Sol: Let the men needed = x

HOURS	DAYS	MEN	
↓10	↓20	↑195	More hours Less men.
13	15	x	More days Less men.

$$\frac{x}{195} = \frac{20}{15} \times \frac{10}{13}$$

$$x = \frac{20}{15} \times \frac{10}{13} \times 195 = 200 \, Men.$$

Q-6: A soap factory makes 600 units in 9 days with help of 20 machines. How many units can be made in 12 days with the help of 18 machines.

Sol: Let the units made = x

DAYS	MACHINES	UNITS	
↑9	↑20	↑600	More machines more units.
12	18	x	More days more units.

$$\frac{x}{600} = \frac{\cancel{18}^{2}}{\cancel{20}_{5}} \times \frac{\cancel{12}^{3}}{\cancel{9}}$$

$$x = \frac{5}{8} \times \cancel{12}^{14} = 70m$$

Q-8: 6 men working 10 hrs a day can do a piece of work in 24 days, in how many days will 9 men working for 8 day to the same work.

Sol: Let the required days = x

MEN	DAYS	LENGTH	
↓6	↓10	↑24	More men less days.
9	8	x	More hours less days.

$$\frac{x}{24} = \frac{10}{8} \times \frac{6}{9}$$

$$x = \frac{10}{\cancel{8}} \times \frac{\cancel{6}^{2}}{\cancel{9}_{3}} \times \cancel{24}^{4} = 20 \text{ days.}$$

EXERCISE- 5.2

Q-1: Mr. X Mr. Y and Mr. Z started tranport business by investing Rs 10000 each. Mr X Left after 5 months from the commencement of business and Mr y Left 3 months later. At the end of year the business realized a profit of Rs 37,500 Find the share of profit of each partner.

Sol: Mr X share for 5 months = Rs 10000

Investment for 1 month = 10000×5

= Rs 50,000 ..... (i)

Mr Y share for 8 months = Rs 10000

Investment for 1 month = 10000×8 = Rs

= 80,000 ..... (ii)

Mr Z investment for 12 months = 10000×12

= Rs 1,20,000

Ration of shares 50,000 : 80,000 : 1,20,000

= 5 : 8 : 12

Sum of ratios = 5 + 8 + 12 = 25

Total profit = Rs 37500

Share of Mxx = $\frac{5}{25} \times 37500 = Rs\ 7,500$

Share of Mr. Y = $\frac{8}{25} \times 37500 = Rs\ 12,000$

Share of Mr. Z = $\frac{12}{25} \times 37500 = Rs\ 18,000$

Q-2: Three partners A,B and C invests Rs 5,000,000 Rs 7,500,000 Rs 6,000,000 respectively. How they should share a profit of Rs 2,220,000?

Sol: Investment of three partners Rs, 5,000,000 Rs, 7,500,000 Rs, 6,000,000

Ratio: 5,000,000 7,500,000 : 6,000,000

50 : 75 : 60

10 : 15 : 12

Sum of ratios = 10+15+12 = 37

Total profit = Rs 2,220,000

Share of A $= \frac{10}{37} \times 2220000 = Rs\ 600,000$

Share of B $= \frac{15}{37} \times 2,220,000 = Rs\ 9,00,000$

Share of C $= \frac{12}{37} \times 2220000 = Rs\ 720,000$

Q-3: Three men A,B and C,A subscribes Rs 550,000 B subscribes Rs 100,000 and C Rs 150,000 less How will they share a profit of Rs 70,000.

Sol: Investment

A = Rs 550,000

B = 550,000-100,000 = Rs 450,000

C = 550,000 - 150,000 = Rs 400,000

Ratio = 550,000 : 450,000 : 400,000

= 55 : 45 : 40

= 11 : 9 : 8

Sum of ratios = 11+9+8 = 28

Profit Rs 70,000

Share of A $= \frac{11}{28} \times 70,000 = Rs\ 27,500$

Share of B $= \frac{9}{28} \times 70,000 = Rs\ 22,500$

Share of C $= \frac{8}{28} \times 70,000 = Rs\ 20,000$

Q-4: A started a business by investing Rs 40,000, 4 months after commencement of business B joined as a partner investing Rs 60,000 and C joined one month after B by investing Rs 60,000 At the end of the year the partnership earned a profit of Rs 46,000. Find the sahre in profit of each partner.

Sol: Investment of A for 12 months = Rs 40,000

Investment for 1 month = 40,000×12 = Rs 480,000

Investment of B for 8 months = Rs 60,000

Investment for 1 month = 60,000×8 = Rs 480,000

Investment of C for 7 months = Rs 60,000

Investment for 1 month = 60,000×420,000

Investment ratio = 480,000 : 480,000 : 420,000

48 : 48 : 42

8 : 8 : 7

Sum of ratios = 8+8+7 = 23

Total profit = Rs 46,000

Share of A $= \frac{8}{23} \times 46000 = Rs\ 16,000$

Share of B $= \frac{8}{23} \times 46000 = Rs\ 16,000$

Share of C $= \frac{7}{23} \times 46000 = Rs\ 14,000$

Q-5: Mr Wajid and Mr. Javaid started business with a capital investment of Rs 55,000 and Rs 35,000 respectively. After five months. Mr. Wajid put in Rs 10,000 more as capital while Mr. Javaid with drew Rs 5000 from his existing capital. At end of year

profit was Rs 22300. Determine the proportionate distribution of the profit between two partners.

Sol: Mr Wajid's investment for 12 months = Rs 55,000

Investment for 1 month = 12×55000 = Rs 660,000

Extra investment for 7 months = Rs 10,000

For one month = Rs 7×10000 = Rs 70,000

Total investment for one month = 660000+70000

Rs 730,000

Mr javaid is investment for 5 months = Rs 35,000

For one month = 5×35000 = Rs 175000

Investment for 7 months = 35000-5000 = Rs 30,000

For one month = 7×30000 = Rs 210000

Total = 175000+210000 = Rs 385000

Ratio = 730,000 : 385000

730 : 385 = 146 : 77

Sum of ratios= 146+77 = 223

Total profit = Rs 22300

Share of wajid $= \frac{146}{223} \times 22300 = Rs\ 14600$

Share of Javaid $= \frac{77}{223} \times 22300 = Rs\ 7700$

Q-6: Shakir launched an animation company with certain capital. After six month Miraj joined the company. If the capital put in by the both partners in the company is the same and the profit of the company at end of the year was Rs 81,000 find the share of each partner.

Sol: Shakir's and Miraj's investment = x

Shakir's investment for one month = 12x

Miraj's investment for one month = 6x

Ratio $12x : 6x \rightarrow 2:1$

Sum of ratios = 2+1 = 3

Profit = 81,000

Shakir's share $= \frac{2}{3} \times 81000 = Rs\ 54000$

Miraj's share $= \frac{1}{3} \times 81000 = Rs\ 27000$

EXERCISE- 5.3

Q-1: Ahmad Ali when died left Rs 6,25,500 as his inheritance. He left behind 2 Sons and one daughter. Find the share of each inheritor that a son gets twice of his sister's share.

Sol: Total inheritance = Rs 6,25,500

heirs > *Son Son daughter*

Ratios > 2 : 2 : 1

Sum of ratios = 2+2+1=5

Share of each son $= \frac{2}{5} \times 6,25,500 = Rs\ 2,50,200$

Share of daughter $= \frac{1}{5} \times 625500 = Rs\ 1,25,100$

Q-2: Afzal left a wealth of Rs 9,60,000. His heir is a widow 2 sons and 6 daughters. Calculate the share of each one if funeral expenses are Rs 25,000 and loan of Rs 35,000 is due to him.

Sol: Total inheritance = Rs 9,60,000

Funeral expenses + loan = 25000+35000=Rs 60,000

Remaining amount = 9,60,000-60,000= Rs 9,00,000

Share of widow $= \frac{1}{8} \times 900000 = Rs\ 1,12,500$

Remaining amount = 900000-1,12,500= Rs 787500

Ratio of shares of 2 sons and 6 daughters

= 2 : 2 : 1 : 1 : 1 : 1 : 1 : 1

Sum of ratios = 2+2+1+1+1+1+1+1 = 10

Share of each son $= \frac{2}{10} \times 787500 = Rs\,1,57,500$

Share of each daughter $= \frac{1}{10} \times 787500 = Rs\ 78750$

Q-3: Mrs. Khalid died leaving behind a property of Rs 1,225,000 which was to be distributed among her husband, her mother, 2 sons and 4 daughters. The husband got $1/4$ mother, $1/6$, and son gets twice of his sisters. Rs 25,000 were spent on her burial.

Sol: Total inheritance = Rs 1225000

Burial expenses = Rs 25000

Remaining amount = 1225000-25000

= Rs 1200000

Husband, share $= \frac{1}{4} \times 1200000 = Rs\,3,00,000$

Mother's share $= \frac{1}{6} \times 1200000 = Rs\ 2,00000$

Total amount = 3,00,000+2,00,000 = Rs 5,00,000

Remaining amount = 1200000-500000= Rs 7,00,000

Ratio of sons and daughters shares

= 2 : 2 : 1 : 1 : 1 : 1

Sum of ratios = 2+2+1+1+1+1 = 8

Share of each son $= \frac{2}{8} \times 700,000 = Rs\,175000$

Share of each daughter $= \frac{1}{8} \times 700000 = Rs\ 87,500$

Q-4: A man died leaving a saving of Rs 2,16,000 in the bank. Find share of widow one son and one daughter.

Sol: Total inheritance = Rs 2,16,000

Share of widow = $\frac{1}{8} \times 216000 = Rs\ 27000$

Remaining amount = 216000-27000 = Rs 189000

Ratios of son and daughter = 2 : 1

Sum of ratios = 2 + 1 = 3

Share of son = $\frac{2}{3} \times 189000 = Rs\ 1,26,000$

Share of daughter= $\frac{1}{3} \times 189000 = Rs\ 63,000$

Q-5: Javaid left a property of Rs 7,75,000. He had to pay Rs 65,000 as debt. The remaining amount was divided among his 4 sons and 2 daughters. Find the share of each.

Sol: Total inheritance = Rs 7,75,000

Debt = Rs 65000

Remaining amount = 7,75,000-65,000

= Rs 7,10,000

Ratios of shares of sons and daughters

= 2 : 2 : 2 : 2 : 1 : 1

Sum of ratios = 2+2+2+2+1+1 = 10

Share of each son = $\frac{2}{10} \times 7,10,000 = Rs\ 1,42,000$

Share of daughter = $\frac{1}{10} \times 7,10,000 = Rs\ 71,000$

Q-6: Daud died leaving a property of Rs 1,650,000 He left a widow, two sons and one daughter Find share of each, if burial expenses were Rs 50,000.

Sol: Total inheritance = Rs 1,650,000

Burial expenses = Rs 50,000

Remaining amount = 1650000-50,000

= Rs 160,0000

Share of widow $= \frac{1}{8} \times 1,600,000 = Rs\ 200,000$

Remaining amount =1,600,000-200,000 = Rs 1400,000

Ratio of Shares of sons and daughters = 2 : 2 : 1

Sum of ratios = 2+2+1 = 5

Share of each sone $= \frac{2}{5} \times 1,400,000 = Rs\ 5,60,000$

Share of daughter $= \frac{1}{5} \times 1,400,000 = Rs\ 2,80,000$

Q-7: Abbas left Rs 7,25,000 as inheritance. His Loan was Rs 75,000 burial expenses Rs 20,000 and according to his will Rs 2,00,000 were given to S.O.S village. Divide the remaining amount among his 2 sons and 4 daughters.

Sol: Total inheritance = Rs 7,25,000

Loan = Rs 75000

Burial expenses = Rs 20,000

Amount to S.O.S = Rs 2,00,000

Total debits = 75,000+20,000+2,00,000 = Rs 295000

Remaining amount = 7,25,000-2,95,000 = Rs 4,30,000

Ratio of shares of 2 sons and 4 daughters

2 : 2 : 1 : 1 : 1 : 1

Sum of ratios = 2+2+1+1+1+1 = 8

Share of each son $= \frac{2}{8} \times 430000 = Rs\ 1,07,500$

Share of daughter $= \frac{1}{8} \times 430000 = Rs\ 53750$

EXERCISE- 5.4

Q-1: Find simple interest on Rs 660 at $4\frac{1}{4}\%$ per annum for 3 years and 4 months.

Sol: P = Rs 660, $r = 4\frac{1}{4}\% = \frac{17}{4}\%$

t = 3 yrs 4 months $= 3\frac{\cancel{4}}{\cancel{12}_3} = 3\frac{1}{3} = \frac{10}{3}\ yrs$

$$I = \frac{P \times r \times t}{100} = \frac{660 \times 17 \times 10}{4 \times 3 \times 100} = Rs\ 93.50$$

Q-2: In how much time Rs 600 will give Rs. 90 as simple interest at 5% per annum.

Sol: P = Rs. 600 I = Rs 90

r = 5% per annum t = ?

$$t = \frac{I \times 100}{P \times r} = \frac{90 \times 100}{600 \times 5} = 3\ years$$

Q-3: What principle amount will earn interest of Rs 130 at the rate of $3\frac{1}{4}\%$ in 5 years.

Sol: I = Rs 130 r = $3\frac{1}{4} = \frac{13}{4}\%$

t = 5 years P = ?

$$P = \frac{I \times 100}{r \times t} = \frac{130 \times 100}{5 \times 13/4} = \frac{130 \times 100 \times 4}{5 \times 13}$$

= Rs 800

Q-4: Find the rate percent per annum where Rs 700 give Rs 210 as simple interest in 3 years.

Sol: P = Rs 700 I = Rs. 210

t = 3 years r = ?

$$r = \frac{I \times 100}{P \times t} = \frac{210 \times 100}{700 \times 3} = 10\%$$

Q-5: Labeed buys a motorbike at Rs 1,25,000 For leasing it, he has to pay 10% as down payment and remaining on simple mark up of 5% per year for 2 years. Find (i) Monthly instalment

(ii) Total paid amount,

Sol: Price of motorbike = Rs 1,25,000

Down payment = $\frac{10}{100} \times 125000 = Rs\ 12500$

Remaining amount = 125000-12500= Rs 112,500

Now, P = 112500 r = 5% t = 2years

$$I = \frac{P \times r \times t}{100} = \frac{112500 \times 5 \times 2}{100} = Rs\ 11250$$

Payable amount = 112500+11250= Rs 123750

Monthly instalment = $\frac{123750}{24} = Rs\ 6875$

Total amount paid = 1,25,000+11,250 = Rs 1,36,250

Q-6: Find the interest to be paid by Mr. Hassan at the end of three years on Rs 4000, interest being 10% compounded annually.

Sol: P = Rs 4000 t = 3 years

r = 10% A = ?

$$A = P\left(1 + \frac{r}{100}\right)^t = 400\left(1 + \frac{10}{100}\right)^3$$

$$= 4000(1.1)^3 = (4000)(1.331) = Rs\ 5324$$

I = A - P = 5324 - 4000 = Rs 1324

Q-7: If the compound interest on a certain sum for 2 years at the rate of 3% is Rs 203. What would be the

simple interest of the same sum on the same rate and for same period.

Sol: Let P = x

r = 3% t = 2years I = Rs 203

A= P + I = x + 203

Formula for compound interest

$$A = P\left(1+\frac{r}{100}\right)^t$$

$$x-203 = x\left(1+\frac{3}{100}\right)^2$$

$$x-203 = x(1+0.03)^2$$

$$x-203 = x(1.03)^2$$

$$x-203 = 1.0609x$$

$$1.0609x - x = 203$$

$$0.0609x = 203$$

$$x = \frac{203}{0.0609} = Rs\ 3333.33$$

Now P = Rs 3333.33 r = 3% t = 2 years

$$I = \frac{3333.33\times 3\times 2}{100} = Rs\ 200$$

Simple interest = Rs 200

UNIT- 6 FACTORIZATION

EXERCISE- 6.1

Q-1: Find the squares with the help of formulas.

(i) 101 (ii) 997 (iii) 1007

(iv) 9999 (v) 107 (vi) 1002

Sol: (i) $(101)^2 = (100+1)^2$

$$\therefore\ (a-b)^2 = a^2+b^2+2ab$$

$(100+1)^2 = (100)^2 + (1)^2 + 2(100)(1)$

= 10000 + 1 + 200 = 10201

(ii) $(997)^2 = (1000-3)^2 (a-b)^2 = a^2 + b^2 - 2ab$

$(1000-3)^2 = (1000)^2 + (3)^2 - 2(1000)(3)$

= 1000000+9-600 = 994009

(iii) $(1007)^2 = (1000+7)^2$

$(1000+7)^2 = (1000)^2 + (7)^2 + 2(1000)(7)$

= 1000000+49+14000 = 1014049

(iv) $(9999)^2 = (10000-1)^2$

$(10000-1)^2 = (10000)^2 + (1)^2 - 2(10000)(1)$

= 100000000+1-20000 = 99920001

(v) $(107)^2 = (100+7)^2$

$(100+7)^2 = (100)^2 + (7)^2 + 2(100)(7)$

= 10000+49+1400

= 11449

(vi) $(1002)^2 = (1000+2)^2$

$(1000+2)^2 = (1000)^2 + (2)^2 + 2(1000)(2)$

= 1000000+4+4000

= 1004004

EXERCISE- 6.2

Q-1: Find the value of $x^2 + \frac{1}{x^2}$, when

(i) $x + \frac{1}{x} = 5$ (ii) $x - \frac{1}{x} = 7$

(iii) $x + \frac{1}{x} = 3$ (iv) $x - \frac{1}{x} = m$

Sol: **(i)** $x+\frac{1}{x}=5$

Squaring both sides

$$\left(x+\frac{1}{x}\right)^2=(2)$$

$$x^2+\frac{1}{x^2}+2(\cancel{x})\left(\frac{1}{\cancel{x}}\right) \quad 25 \quad \therefore (a+b)^2=a^2+b^2+2ab$$

$$x^3+\frac{1}{x^2}+2-25$$

$$x^3+\frac{1}{x^2}-25-2-23$$

(ii) $x-\frac{1}{x}=7$

Squaring both sides

$$\left(x-\frac{1}{x}\right)^2=(7)^2$$

$$x^2+\frac{1}{x^2}-2(\cancel{x})\left(\frac{1}{\cancel{x}}\right) \quad 49$$

$$x^3+\frac{1}{x^2}-2-49$$

$$x^3+\frac{1}{x^2}-49+2-51$$

(iii) $x+\frac{1}{x}=3$

Squaring both sides

$$\left(x+\frac{1}{x}\right)^2=(3)^2$$

$$x^2+\frac{1}{x^2}+2(\cancel{x})\left(\frac{1}{\cancel{x}}\right) \quad 9$$

$$x^3+\frac{1}{x^2}+2=9$$

$$x^3+\frac{1}{x^2}=9-2=7$$

(iv) $x-\frac{1}{x}=m$

Squaring both sides

$$\left(x-\frac{1}{x}\right)^2=(m)^2$$

$$x^2+\frac{1}{x^2}-2(x)\left(\frac{1}{x}\right)=m^2$$

$$x^3+\frac{1}{x^2}-2=m^2$$

$$x^3+\frac{1}{x^2}=m^2+2$$

Q-2: Find the value of $x^4+\frac{1}{x^4}$, when

(i) $x+\frac{1}{x}=4$ **(ii)** $x-\frac{1}{x}=1$

Sol: (i) $x+\frac{1}{x}=4$

Squaring both sides

$$\left(x+\frac{1}{x}\right)^2=(4)^2$$

$$x^2+\frac{1}{x^2}+2(x)\left(\frac{1}{x}\right)=16$$

$$x^3+\frac{1}{x^2}+2=16$$

$$x^3+\frac{1}{x^2}=16-2=14$$

Again squaring both sides.

$$\left(x^2+\frac{1}{x^2}\right)^2=(14)^2$$

$$(x^2)^2+\left(\frac{1}{x^2}\right)^2+2(\cancel{x^2})\left(\frac{1}{\cancel{x^2}}\right)=196$$

$$x^4+\frac{1}{x^4}+2=196$$

$$x^4+\frac{1}{x^4}=196-2=194$$

(ii) $x-\frac{1}{x}=1$

Squaring both sides

$$\left(x-\frac{1}{x}\right)^2=(1)^2$$

$$x^2+\frac{1}{x^2}-2(\cancel{x})\left(\frac{1}{\cancel{x}}\right)=1$$

$$x^2+\frac{1}{x^2}-2=1$$

$$x^2+\frac{1}{x^2}=1+2$$

$$x^2+\frac{1}{x^2}=3$$

Again squaring both sides

$$\left(x^2+\frac{1}{x^2}\right)^2=(3)^2$$

$$(x^2)^2+\left(\frac{1}{x^2}\right)^2+2(\cancel{x^2})\left(\frac{1}{\cancel{x^2}}\right)=9$$

$$x^4+\frac{1}{x^4}=7$$

Q-3: Find the value of $4a^2+\frac{1}{a^2}$ when $2a+\frac{1}{a}=4$

Sol: $2a+\frac{1}{a}=4$

Squaring both sides

$$\left(2a+\frac{1}{a}\right)^2=(4)^2$$

$$(2a)^2+\frac{1}{a^2}+2(2\cancel{a})\left(\frac{1}{\cancel{a}}\right)\quad 16$$

$$4a^2+\frac{1}{a^2}+4-16$$

$$4a^2+\frac{1}{a^2}-16-4$$

$$4a^2-\frac{1}{a^3}-12$$

Q-4: **Find the value of $x^2+\frac{1}{4x^2}$ when $x-\frac{1}{2x}=5$.**

Sol: $x-\frac{1}{2x}=5$

Squaring both sides

$$\left(x-\frac{1}{2x}\right)^2=(5)^2$$

$$x^2+\frac{1}{4x^2}-2(\cancel{x})\left(\frac{1}{2\cancel{x}}\right)\quad 25$$

$$x^3+\frac{1}{4x^2}-1-25$$

$$x^3+\frac{1}{4x^2}-25-1$$

$$x^3+\frac{1}{4x^2}-26$$

Q-5: **If $\frac{x}{y}-\frac{y}{x}=3$ then find the value of $\frac{x^2}{y^2}-\frac{y^2}{x^2}$.**

Sol: $\frac{x}{y}-\frac{y}{x}=3$

Squaring both sides

$$\left(\frac{x}{y}-\frac{y}{x}\right)^2=(3)^2$$

$$\frac{x^2}{y^2}+\frac{y^2}{x^2}-2\left(\frac{\cancel{x}}{\cancel{y}}\right)\left(\frac{\cancel{y}}{\cancel{x}}\right)=9$$

$$\frac{x^2}{y^2}+\frac{y^2}{x^2}-2=9$$

$$\frac{x^2}{y^2}+\frac{y^2}{x^2}=9+2$$

$$\frac{x^2}{y^2}+\frac{y^2}{x^2}=11$$

EXERCISE- 6.3

Q-1: $10xy-15x^2$ **Factorize the following.**

Sol: $10xy-15x^2 = 5x(2y-3x)$

Q-2: $x^4y^2-x^3y^5+x^2y^2$

Sol: $x^4y^2-x^3y^5+x^2y^2 = x^2y^2(x^2-xy^3+1)$

Q-3: p^2-pq

Sol: $p^2-pq = p(p-q)$

Q-4: $12m^3n-3mn^2$

Sol: $12m^3n-3mn^2 = 3mn(4m^2-n)$

Q-5: $a^3bc-a^2b^2c+ab^3c$

Sol: $a^3bc-a^2b^2c+ab^3c = abc(a^2-a^2b-b^2)$

Q-6: $ax^2y^2-axyz+a^2xz$

Sol: $ax^2y^2-axyz+a^2xz = ax(xy^2-yz+az)$

Q-7: $\mathbf{2a^3b^2 - 4a^2b^3 + 8ab^4}$

Sol: $2a^3b^2 - 4a^2b^3 + 8ab^4 = 2ab(a^2 - 2ab^2 + 4b^3)$

Q-8: $\mathbf{6P^2q^3r - 9P^2qr^3 + 12Pq^3r^2}$

Sol: $6P^2q^3r - 9P^2qr^3 - 12Pq^3r^2$

$= 3pqr(2pq^2 - 3pr^2 + 4q^2r)$

EXERCISE- 6.4

Resolve into factors.

Q-1: **ab+ay-3b-3y**

Sol: ab+ay-3b-3y

= a(b+y)-3(b+y)

= (a-3)(b+y)

Q-2: $\mathbf{1 - a^2 + b^2 - a^2b^2}$

Sol: $= 1 - a^2 - b^2 - a^2b^2$

$= 1(1 - a^2) + b^2(1 - a^2)$

$= (1 - a^2)(1 + b^2)$

Q-3: $\mathbf{c^2 - ac^2 + b - ab}$

Sol: $= c^2 - ac^2 + b - ab$

$= c^2(1 - a) + b(1 - a)$

$= (1 - a)(c^2 + b)$

Q-4: $\mathbf{6m^4 - 9m^2 - 4m^3 + 6m}$

Sol: $6m^4 - 9m^2 - 4m^3 + 6m$

$= 3m^2(2m^2 - 3) - 2m(2m^2 - 3)$

$= (3m^2 - 2m)(2m^2 - 3)$

Q-5: $\mathbf{x^2 - xz - 2xy + 2yz}$

Sol: $x^2 - xz - 2xy + 2yz$

$= x(x - z) - 2y(x - z)$

$= (x - 2y)(x - z)$

Q-6: $\mathbf{5x^3 + 10x - 5x^2 - 10}$

Sol: $5x^3 + 10x - 5x^2 - 10$

$= 5x(x^2 + 2) - 5(x^2 + 2)$

$= (x^2 + 2)(5x - 5)$

Q-7: $\mathbf{x^3 - 14x - 2x + 28}$

Sol: $x^3 - 14x - 2x + 28$

$= x(x \quad 14) \quad 2(x \quad 14)$

$= (x \quad 2)(x \quad 14)$

Q-8: $\mathbf{y^3 - 9y + 3y - 27}$

Sol: $y^3 - 9y + 3y - 27$

$= y(y \quad 9) \quad 3(y \quad 9)$

$= (y \quad 3)(y \quad 9)$

Q-9: $\mathbf{77x^2y - 33xy^2 - 55x^2y^2}$

Sol: $77x^2y - 33xy^2 - 55x^2y^2$

$= 11xy(7x \quad 3y \quad 5xy)$

$= 11xy(7x \quad 3y \quad 5xy)$

Q-10: $\mathbf{x^3 - 7x - 5x + 35}$

Sol: $x^3 - 7x - 5x + 35$

$= x(x \quad 7) \quad 5(x \quad 7)$

$= (x \quad 5)(x \quad 7)$

EXERCISE- 6.5

Resolve into factors, using formulas.

Q-1: $\mathbf{4x^2 + 12x + 9}$

Sol: $4x^2 + 12x + 9$

$= (2x)^2 + 2(2x)(3) + (3)^2 \qquad [a^2 + 2ab + b^2 = (a + b)^2]$

$= (2x + 3)^2$

Q-2: $\mathbf{4y^2 - 4y + 1}$

Sol: $4y^2 - 4y + 1$

$= (2y)^2 - 2(2y)(1) + (1)^2$ $\quad \left| a^2 - 2ab + b^2 = (a-b)^2 \right.$

$= (2y-1)^2$

Q-3: $\mathbf{9x^2 + 12x + 4}$

Sol: $9x^2 + 12x + 4$

$= (3x)^2 - 2(3x)(2) + (2)^2$

$= (3x+2)^2$

Q-4: $\mathbf{25y^2 + 10zy + z^2}$

Sol: $25y^2 + 10zy + z^2$

$= (5y)^2 + 2(5y)(z) + (z)^2$

$= (5y+z)^2$

Q-5: $\mathbf{4 - 20x + 25x^2}$

Sol: $4 - 20x + 25x^2$

$= (2)^2 - 2(2)(5x) + (5x)^2$

$= (2-5x)^2$

Q-6: $\mathbf{25x^2 - 30x + 9}$

Sol: $25x^2 - 30x + 9$

$= (5x)^2 - 2(5x)(3) + (3)^2$

$= (5x-3)^2$

Q-7: $\mathbf{64x^2 + 16xy + y^2}$

Sol: $64x^2 + 16xy + y^2$

$= (8x)^2 + 2(8x)(y) + (y)^2$

$= (8x+y)^2$

Q-8: $\mathbf{144x^2+24x+1}$

Sol: $144x^2+24x+1$

$= (12x)^2+2(12x)(1)+(1)^2$

$= (12x+1)^2$

Q-9: $\mathbf{36x^2+4-24x}$

Sol: $36x^2+4-24x$

$= 36x^2-24x+4$

$= (6x)^2-2(6x)+(2)^2$

$= (6x-2)^2$

Q-10: $\mathbf{49x^4+168x^2y^2+144y^4}$

Sol: $49x^4+168x^2y^2+144y^4$

$(7x^2)^2+2(7x^2)(12y^2)+(12y^2)^2 = (7x^2+12y^2)^2$

EXERCISE- 6.6

Q-1: **Solve the following**

(i) $\mathbf{(m+n)^3}$ **(ii)** $\mathbf{(2+c)^3}$ **(iii)** $\mathbf{(3a-2b)^3}$

Sol: **(i)** $\mathbf{(m+n)^3}$

$= m^3+n^3+3mn(m+n)$

$\left|\ (a+b)^3 = a^3+b^3+3ab(a+b)\ \right|$

(ii) $\mathbf{(2+c)^3}$

$= (2)^3+(c)^3+3(2)(c)(2+c)$

$= 8+c^3+6c(2+c)$

(iii) $\mathbf{(3a-2b)^3}$

$= (3a)^3-(2b)^3-3(3a)(2b)(3a-2b)$

$= \left|\ (a-b)^3 = a^3-b^3-3ab(a-b)\ \right|$

$= 27a^3-8b^3-18b(3a-2b)$

Q-2: Find the cubes of the following.

(i) 4-2n (ii) $x+\frac{1}{x}$ (iii) $\frac{x}{y}-\frac{y}{x}$

Sol: (i) 4-2n

$= (4)^3 - (2n)^3 - 3(4)(2n)(4-2n)$

$= 64 - 8n^3 - 24n(4-2n)$

$= 64 - 8n^3 - 96n + 48n^2$

$= -8n^3 + 48n^2 - 96n - 64$

(ii) $x+\frac{1}{x}$

$= (x)^3 + \left(\frac{1}{x}\right)^3 + 3(\cancel{x})\left(\frac{1}{\cancel{x}}\right)\left(x+\frac{1}{x}\right)$

$= x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right)$

(iii) $\frac{x}{y}-\frac{y}{x}$

$= \left(\frac{x}{y}\right)^3 - \left(\frac{y}{x}\right)^3 - 3\left(\frac{\cancel{x}}{\cancel{y}}\right)\left(\frac{\cancel{y}}{\cancel{x}}\right)\left(\frac{x}{y}-\frac{y}{x}\right)$

$= \frac{x^3}{y^3} - \frac{y^3}{x^3} - 3\left(\frac{x}{y}-\frac{y}{x}\right)$

Q-3: Find the value of $x^3+\frac{1}{x^3}$ when

(i) $x+\frac{1}{x}=3$ (ii) $x+\frac{1}{x}=5$

Sol: (i) $x + \frac{1}{x} = 3$

Taking cube of both sides.

$\left(x+\frac{1}{x}\right)^3 = (3)^3$

$$x^3 + \frac{1}{x^3} + 3(x)\left(\frac{1}{x}\right)\left(x + \frac{1}{x}\right) = 27$$

$$x^3 + \frac{1}{x^3} + 3(3) - 27 \quad = \quad x^3 + \frac{1}{x^3} + 9 - 27$$

$$x^3 + \frac{1}{x^3} - 27 - 9 \quad = \quad x^3 - \frac{1}{x^3} - 18$$

(ii) $x + \frac{1}{x} = 5$

Taking cube of both sides

$$\left(x + \frac{1}{x}\right)^3 = (5)^3$$

$$(x)^3 = \left(\frac{1}{x}\right)^3 + 3(\cancel{x})\left(\frac{1}{\cancel{x}}\right)\left(x + \frac{1}{x}\right) = 125$$

$$x^3 + \frac{1}{x^3} + 3(5) - 125 \quad = \quad \left(\therefore\ x + \frac{1}{x} = 3\right)$$

$$x^3 + \frac{1}{x^3} + 15 - 125$$

$$x^3 + \frac{1}{x^3} - 125 - 15 - 110$$

Q-4: Find the value of $x^3 + \frac{1}{x^3}$ when

(i) $x - \frac{1}{x} = 8$ **(ii)** $x - \frac{1}{x} = -4$

Sol: (i) $x - \frac{1}{x} = 8$

Taking cube of both sides

$$\left(x - \frac{1}{x}\right)^3 = (8)^3$$

$$(x)^3 - \left(\frac{1}{x}\right)^3 - 3(\cancel{x})\left(\frac{1}{\cancel{x}}\right)\left(x - \frac{1}{x}\right) \quad 512$$

$$x^3 - \frac{1}{x^3} - 3(8) - 512 \quad = \quad \left(\therefore \; x \quad \frac{1}{x} = 8\right)$$

$$x^3 - \frac{1}{x^3} - 24 - 512$$

$$x^3 - \frac{1}{x^3} - 512 + 24 - 536$$

(ii) $\boldsymbol{x - \frac{1}{x} = -4}$

Taking cube of both sides

$$\left(x - \frac{1}{x}\right)^3 = (-4)^3$$

$$(x^3) - \left(\frac{1}{x}\right)^3 - 3(\cancel{x})\left(\frac{1}{\cancel{x}}\right)\left(x - \frac{1}{x}\right) \quad -64$$

$$x^3 - \frac{1}{x^3} - 3(-4) - -64$$

$$x^3 - \frac{1}{x^3} + 12 - -64$$

$$x^3 - \frac{1}{x^3} - -64 - 12$$

$$x^3 - \frac{1}{x^3} - -76$$

Q-5: If $\boldsymbol{x + \frac{1}{x} = 2}$ prove that f $\boldsymbol{x^2 + \frac{1}{x^2} = x^3 + \frac{1}{x^3} = x^4 + \frac{1}{x^4}}$

Squaring both sides

Sol: $$\left(x + \frac{1}{x}\right)^2 = (2)^2$$

$$x^2 - \frac{1}{x^2} + 2(\cancel{x})\left(\frac{1}{\cancel{x}}\right) \quad 4$$

$$x^2 + \frac{1}{x^2} + 2 - 4$$

$$x^3 + \frac{1}{x^2} - 4 - 2$$

$$x^2 + \frac{1}{x^2} - 2$$

Squaring again

$$\left(x^2 + \frac{1}{x^2}\right)^2 = (2)^2$$

$$(x^2)^2 + \left(\frac{1}{x^2}\right)^2 + 2(x^2)\left(\frac{1}{x^2}\right) = 4$$

$$x^4 + \frac{1}{x^4} + 2 - 4$$

$$x^4 + \frac{1}{x^4} + 2 - 4$$

$$x^4 + \frac{1}{x^4} - 4 - 2 - 2$$

Taking cube

$$\left(x + \frac{1}{x}\right)^3 = (2)^3$$

$$x^3 + \frac{1}{x^3} + 3(\cancel{x})\left(\frac{1}{\cancel{x}}\right)\left(x + \frac{1}{x}\right) \quad 8$$

$$x^3 + \frac{1}{x^3} + 3(2) - 8$$

$$x^3 + \frac{1}{x^3} - 6 - 8$$

$$x^3 + \frac{1}{x^3} - 8 - 6 - 2$$

Hence proved

$$x^3 + \frac{1}{x^2} - x^3 - \frac{1}{x^3} - x^4 + \frac{1}{x^4}$$

UNIT- 7 FUNDAMENTALS OF GEOMETRY

EXRECISE- 7.1

Q-1: Define the following terms.

(i) Polygon

(ii) Characteristic of polygon

(iii) Regular pentagon

(iv) Regular hexagon.

Sol: (i) POLYGON

A polygon is a closed plane figure with three or more straight sides. Sides must be at least 3 upto infinite number of sides.

(ii) Characteristic of polygon

At least three line segments are the sides of a polygon. Polygons are named accordingly to the number of sides it possesses.

The polygon with minimum number of sides (3) is the triangle.

4 sided polygon is quadrilateral, 5 sided pentogon, 6 sided hexagon, 7 sided heptagon and so on.

(iii) Regular pentagon

A five sided polygon in which all the five sides and angles are of same size is called a regular pentagon. The size of each angle of a regular pentagon is 108°.

(iv) Regular hexagon.

A six sided polygon in which all the Six sides and angles are of same size is called a regular hexagon. The size of each angle of a regular pentagon is 120°

Q-2: Define parallelogram.

Sol: PARALLELOGRAM.

A parallelogram is a special type of gudrilateral whose

pair of opposite sides are parallel.

In a parallelogram 2 pairs of opposite sides are congruent and pairs of opposite angles are also congrcent. In parallelogram the consecutive angles are supplementry.

Q-3: Write down three properties of the parallelgrams.

Sol: PROPERTIES OF PARALLELOGRAMS:

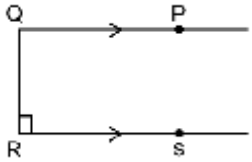
(i) In parallelogram both pairs of the opposite sides of quadrilateral are parallel.

(ii) In parallelogram, the 2 pairs of the opposite sides are congruent.

(iii) In parallelograms, the consecutive angles are supplimentary.

(iv) In a parallelogram, the two diagonals bisect each other.

Q-4: Find the measure of $\angle PQR$.



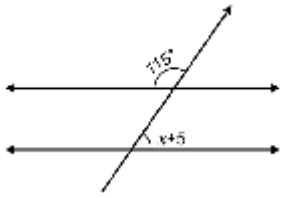
Sol: As $\overline{PQ}$ and $\overline{RS}$ are parallel

$\angle PQR \quad L\ QRS = 180^\circ$

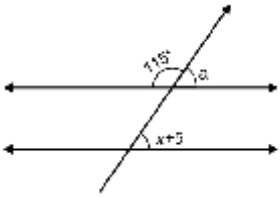
$\angle PQR \quad 90^\circ = 180^\circ$

$\angle PQR \quad 180^\circ \quad 90^\circ = 90^\circ$

Q-5: Find the value of x.



Sol:



As: $\angle a = \angle x + 5$ Corresponding angles

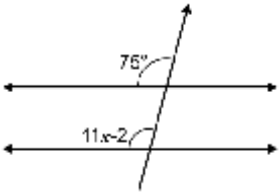
$115° + (x + 5) = 180$ Adjacent supplimentary angles

$115 + x + 5 = 180$

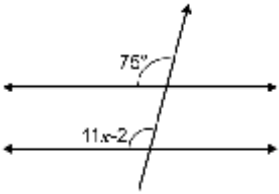
$x = 180 - 115 - 5$

= 60°

Q-6: Find the value of x. Also find the value of this angle.



Sol:



$11x - 2 = 75$ corresponding angle.

$11x = 75 + 2 = 77$

$x = \frac{77}{11} = 7$

Angle 11x-2

11×7-2 = 77-2 = 75°

EXERCISE- 7.2

Q-1: Define the following terms of a circle.

(a) Chord b) Sector

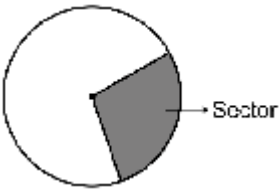
(c) Secant d) Tangent

Sol: (a) Chord

It is the line segment inside a circle whose endpoints lie on the circle.

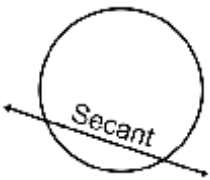
(b) Sector

In a circle a region bounded by two radii and an are between the radii.



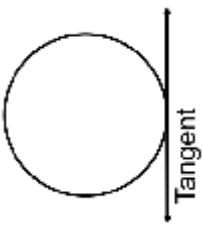
(c) Secant

It is a straight line cutting the circle at two points. It is an extended chord.



(d) Tangent

A straight line that touches the circle externally at a single point is called tangent.



Q-2: Find the radius of a circle if its diameter is 14cm.

Sol: As we know diameter is equal to two radii or radius

$= \frac{1}{2}$ diameter (14cm)

$\therefore \quad radius = \frac{14}{2} = 7cm$

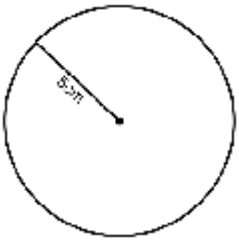
Q-3: The radius of circle is 3.5cm, what will be its diameter.

Sol: Diameter = 2 × radius

= 2 × 3.5 = 7cm

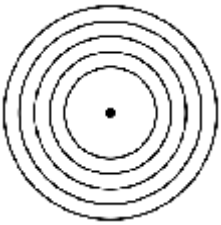
Q-4: Draw a circle of radius 5cm.

Sol:



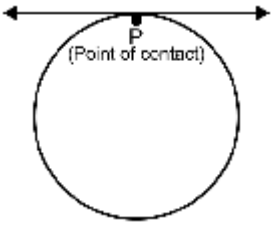
Q-5: Draw five concentric circless with radi 1.5cm, 2cm, 2.5cm, 3cm, 3.5cm

Sol:



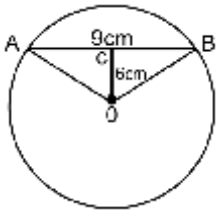
Q-6: What is point of contact of a tangent.

Sol: A line which touches a circle at exactly one point is called a tangent line and the point where it touches the circle is called the point of contact of that tangent.



Q-7: A chord of length 9cm is drawn at a distance of 6cm from the centre of the circle. Find the radius of the circle.

Sol: First of we draw a diagram with given measurments. Then we connect both ends of chord to centre of the circle.



In ΔAOC $\quad AC = \frac{9}{2} = 4.5cm \quad CO = 6cm$

It is a right angled triangle where

$(AO)^2 = (AC)^2 + (CO)^2$

$= (4.5)^2 + (6)^2$

= 20.25 + 36

$\sqrt{(AO)^2} = \sqrt{56.25}$

AO = 7.5cm

AS AO is radius so it is 7.5cm

Q-8: Find the circumference of the circle whose radius is 21 meters.

Sol: Formula to calculate circumference of circle $2\pi r$.

Here r = 21 meters $\quad \pi = \frac{22}{7}$

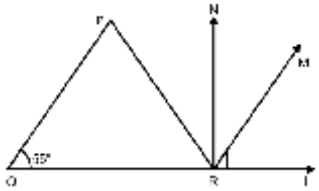
Circumference(c) $= 2\pi r = 2 \times \frac{22}{7} \times 21$

= 132 meters

UNIT- 8 DEMONSTRATIVE GEOMETRY

EXERCISE - 8.1

Q-1



In the figure $\angle PQR = 55°$ $\angle LRN = 90°$ and $PQ \parallel MR$

Which one of the following is the value o$\angle MRN$?

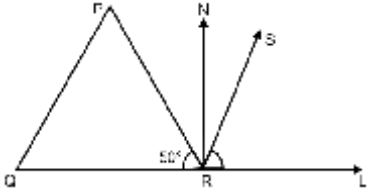
(a) 35° (b) 40° (c) 55° (d) 90°

Sol: $\angle MRL = \angle PQR = 55°$ (corresponding angles)

$\angle LRN - 90° - \angle MRL - \angle MRN$

$\angle MRN - 90° - \angle MRL - 90° - 55° - 35°$

Q-2:



In the figure $PQ \parallel SR, PQ = PR$ and $\angle PRQ = 50°$

what is the measure of$\angle LRS$.

a) 40° b) 50° c) 55° d) 75°

Sol: Both sides $\overline{PQ}$ and PR are equal so their opposite angle will also be equal.

$\angle PRQ = \angle PQR = 50°$

(opposite angles of congruent sides)

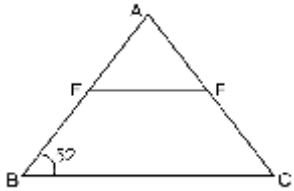
And $\angle PQR$ and $\angle LRS$ are corresponding angles

$\therefore \quad \angle LRS - 50°$

Q-3: In the isoceles triangle ABC, the line EF parallel to the base BC and intersects AB and AC at

points E and F respectively If $\angle B = 52°$. which one of the following is the value of $\angle A + \angle AFE$.

a) 76° b) 104° c) 128° d) 156°



Sol: Triangle is isosceles

$\therefore \quad \angle ABC = \angle ACB = 52°$

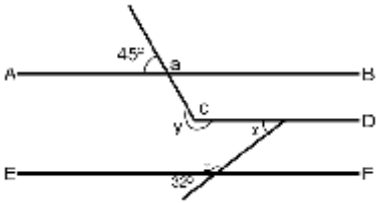
(opposite angles of isoceles triangle)

$\angle ACB - \angle AFE - 52°$ (Corresponding angle)

$\angle - 180 - 52 - 52 - 76°$

$\angle A + \angle AFE - 76° + 52 - 128°$

Q-4



In the figure $AB \parallel CD \parallel EF$

i) Which one of following is correct value of $\angle x$

a) 28° b) 32° c) 45° d) 58°

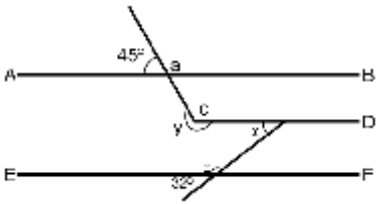
ii) Which of the following is the value of $\angle z$.

a) 58° b) 103° c) 112° d) 148°

iii) Which is correct value of $\angle y - \angle z$.

a) 58° b) 77° c) 103° d) 122°

Sol:



i) $\angle x - 32°$ (Corresponding angles)

ii) $\angle z + 32° - 180°$ (Supplimentry angles)

$\angle Z - 180 - 32 - 148°$

iii) $\angle a - 180° - 45° - 135°$

$\angle c - 135° - \angle a$ (Corresponding angles)

$\angle y = 360 \quad 135 = 225°$

$y \quad z = 225° \quad 148° = 77°$

Q-5: (i) Two adjacent angles laying on the same line can be equal to one-another.

(ii) The bisectors of the vertically opposite angles lie on the same straight line.

(iii) Many parallel lines can be drawn through an external point of it.

On the basis of above information, which one of the following is correct.

(a) (i) and (ii) b) (i) and (iii)

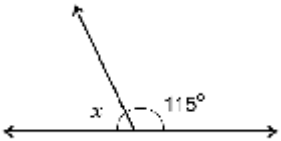
(c) (ii) abd (iii0 d) (i),(ii) and (iii)

Sol: Statement (i) and (ii) are correct so (a) answer is correct.

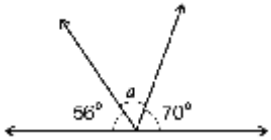
EXERCISE- 8.2

Q-1 Find the measures of angles marked with letters.

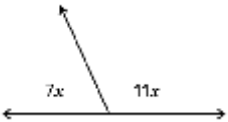
(i)



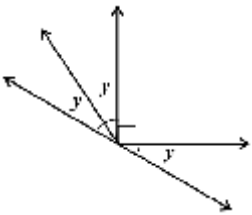
(ii)



(iii)

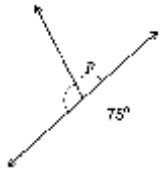


(iv)



(v)

(vi)



Sol: **(i)** $x+115^\circ-180^\circ$ (Supplimentary angles)

$x-180^\circ-115^\circ-65^\circ$

(ii) $56^\circ+70^\circ+a-180^\circ$ (Straight angle)

$a-180^\circ-56^\circ-70^\circ-54^\circ$

(iii) $7x+11x-180^\circ$ (Supplimentary angles)

$18x-180^\circ$

$x=\frac{180}{18}=10^\circ$

First angle $=7x-7\times10-70^\circ$

Second angles $=11x-11\times10-110^\circ$

(iv) $90^\circ+y \quad y+y=180^\circ$ (Straight angle)

3y = 180° - 90° = 90°

$y=\frac{90^\circ}{3}=30^\circ$

(v) 25°+m = 180° (Supplimentary angles)

m = 180° - 25° = 155°

(vi) 75°+P = 180° (Supplimentary angles)

P = 180° - 75° = 105°

Q-2: If a straight line makes an angles of 75° on another straight line, then prove that other angle is of 105°.

Sol:

$m\angle ADC+m\angle BDC-180^\circ$ (Supplimentary angles)

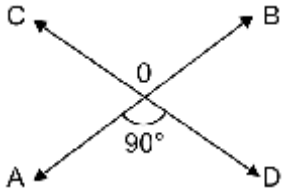
$m\angle ADC-75^\circ-180^\circ$

$m\angle ADC - 180° - 75° - 105°$

Hence proved

Q-3: If two straight lines AB and CD intersect each other at a point O and $\angle AOD = 90°$ Prove that remaining angles will also be right angles.

Sol:



$\angle BOD + \angle AOD - 180°$ (Supplimentary angles)

$\angle BOD + 90° - 180°$

$\angle BOD - 180° - 90° - 90°$

$\angle BOC - \angle AOD - 90°$ (Vertical angles)

$\angle AOC - \angle BOD - 90°$ (Vertical angles)

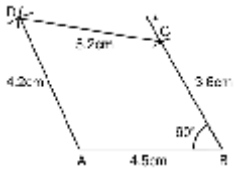
$\therefore \angle AOD = \angle BOD = \angle BOC = \angle AOC = 90$ (Proved)

UNIT- 9 PRACTICAL GEOMETRY

EXERCISE- 9.1

Q-1 The four sides of a quadrilateral are respectively 4.2cm, 4.5cm, 3.6cm, and 5.6cm. Angle between sides of 4.5cm and 3.6cm is 60°. Construct the quadritataral.

Sol:



STEPS:

(i) Draw a line segment AB=4.5cm

(ii) At B angle $\angle ABC$ = 60° is drawn.

(iii) With the help of compass $\overline{BC}$ =3.6cm is cut at point C.

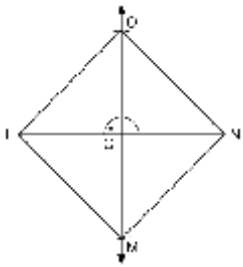
(iv) With A and C two arcs of radii 4.2cm and 5.2cm are drawn which intersect at D.

(v) AD and CD are drawn ABCD is the required quadrilateral.

Q-2: Construct a square LMNO, when its diagonal is 5.4cm,

Sol:

STEPS:(i) Draw m LN = 5.4cm



(ii) Draw the perpendicular bisector o LN cutting it at point C such tha mMC=mOC = 2.7cm.

(ii) With O as centre and radius equa to mCL draw two arcs cutting the perpendicular at points o and M.

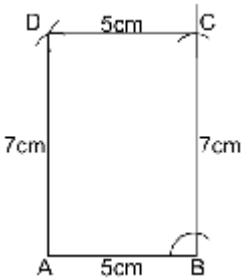
(iv) Join O with L and N and M with L and N. LMNO is required square.

Q-3: Construct rectangle ABCD when $m\overrightarrow{AB} = 5cm$

$m\overrightarrow{BC} = 7cm$.

Sol:

STEPS: (i) Draw measure AB= 5cm.



(ii) With the help of compass drav $m\angle A - \angle B - 90°$.

(iii) Draw an arc with centre at B of radius 7cm which intersects the perpendicular line at C.

(iv) Draw an arc with centre A of radius 7cm which cuts the perpendicular at D.

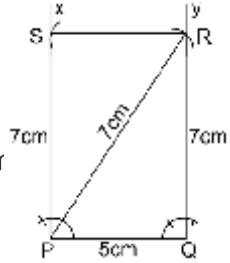
(v) Join C with D.

Hence ABCD is the required rectangle.

Q-4: Construct a rectangle PQRS, when $mPQ = 5cm$

$mPR = 7cm$.

STEPS: (i) Draw $\overline{PQ} = 5cm$



(ii) Construct $m\angle P = m\angle Q = 90°$ Draw PX and QY.

(iii) With centre at P and radius 7cm draw an arc which intersects QY at point R.

(iv) With centre at R and radius 5cm draw and arc which intersects Px at S.

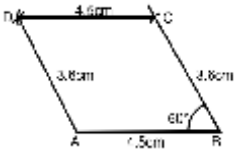
(v) Join R and S.

Hence PQRS is the required rectangle.

Q-5: Construct a parallelogram ABCD whose adjacent sides AB and BC are of lenghts 4.2cm and 3.6cm respectively and inculded angle is of 60°.

Sol:

STEPS: (i) Draw a line segment AB = 4.2cm



(ii) Construct $\angle ABC - 60°$ at point.

(iii) Draw an arc with centre at B and radius 3.6cm which intersects BX at C.

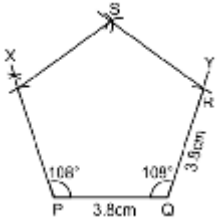
(iv) Draw an arc with centre at c and radius 4.2cm, and an arc with centre A and radius 3.6cm, which intersects first arc at D.

(v) Join D with A and C.

ABCD is the required parallelogram.

Q-6: Construct a regular pentagon PQRST where measure $PQ = 3.8cm$

Sol:



STEPS:

Each interior angle of a pentagon = 108°

(i) Draw $m\overline{PQ} = 3.8cm$

(ii) Construct $m\angle P = m\angle Q = 108°$

(iii) Draw an arc with centre at PX and radius 3.8cm which intersects PX at point T.

(iv) Draw an arc with centre at Q and radius 3.8cm which intersects QY at R.

(v) Draw an arc with centre at R and a radius = 3.8cm

(vi) Draw an arc with centre T radius = 3.8cm which cuts first are at S.

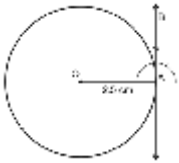
(vii) Join S with R and T.

Hence PQRST is required regular pentagon.

Q-7: Draw a circle of radius 2.5cm. Draw a tangent to circle from a point A on the circle.

STEPS: (i) A circle of 2.5cm radius is drawn.

(ii) The given point A at which the tangent is to be drawn and centre of circle O are joined.



(iii) At A, $\overline{AB}$ is drawn perpendicular to OA. AB is then the required tangent to the circle at the given point A.

UNIT- 10 PERIMETER AND AREA

EXERCISE- 10.1

Q-1: Find the circumference of the following rectangles *l*, lengths and b breadths are given.

(i) ***l*** **=7cm, b= 4.5** **(ii)** ***l*** **= 5dm, b = 3.25dm**

(iii) ***l*** **= 11.75cm, b=9.98cm** **(iv)** ***l*** **=37mm, b = 23mm**

Sol: (i) ***l*** **=7cm, b= 4.5** Circumference = 2(l+b)

= 2(7+4.5)=2×11.5=23cm

(ii) ***l*** **= 5dm, b = 3.25dm** Circumference = 2(l+b)

= 2(5+3.25)=2×8.25= 16.5dm

(iii) l **= 11.75cm, b=9.98cm** Circumference = 2(l+b)

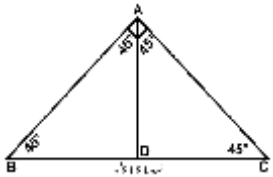
= 2(11.75+9.98)=2×21.73= 43.46cm

(iv) l **=37mm, b = 23mm** Circumference = 2(l+b)

= 2(37+23)=2×60= 120mm

Q-2: Find the lengths of sides of an isosceles right angled triangle whose hypotenuse is $\sqrt{84.64cm^2}$.

Sol:



$(Hypotenuse)^2 = 84.64cm^2$

$(BC)^2 = 84.64cm^2$

$BC = \sqrt{84.64cm^2}$

9.92cm

$BD = \frac{9.2}{2} = 4.6cm$

$In\ \Delta ABD$

$m\angle B = 45^\circ \qquad m\angle BAD = 45^\circ$

So BD = AD = 4.6cm

$Side\ AB^2 = AD^2 + BD^2$

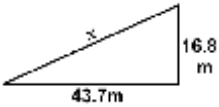
$(4.6)^2 + (4.6)^2$

$AB^2 \quad 21.61 + 21.16$

$AB = \sqrt{42.32} = 6.51cm$

Q-3: If the shadow of a tower is 43.7m long and height of tower is 16.8m. Find distance from tip of shadow to tip of the tower.

Sol: Let distance is x



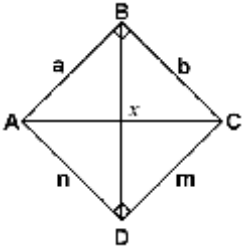
$x^2 = (43.7)^2 + (16.8)^2$

= 1909.69+282.24=2191.93

$x = \sqrt{2191.93} = 46.82m$

Q-4: In the given figure prove that $a^2+b^2=m^2+n^2$

Sol: $In\ \Delta ABC$



$AC^2 \quad AB^2 + BC^2$

$x^2 \quad a^2 + b^2$ _____(i)

$In\ \Delta ACD$

$AC^2 \quad AD^2 + DC^2$

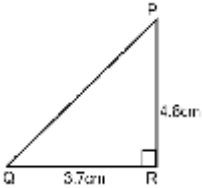
$X^2 \quad m^2 + n^2$ _____(ii)

Comparing (i)and (ii)

$a^2 + b^2 \quad m^2 + n^2$ (Proved)

Q-5: In triangle PQR, right angle is at point R $mQR = 3.7cm$ and $mPR = 4.8cm$. What is the length of PQ.

Sol: According to Pathagoras theorem



= $(PQ)^2 = (PR)^2 + (QR)^2$

= $(4.8)^2 + (3.7)^2$

= 23.04 + 13.69

= $\sqrt{(PQ)^2} = \sqrt{36.73}$

= PQ = 6.06cm

Q-5: If a,b,c are the lengths of the three sides of a triangle. A,B or C may be a right angle. Tell which triangles are right angled and which are not.

(i) a = 6 b = 5 c = 7

(ii)	a = 8	b = 9	$c = \sqrt{145}$
(iii)	a = 12	b = 5	c = 13
(iv)	a = 17	b = 13	c = 23
(v)	a = 2.5	b = 6	c = 6.5

Sol: According to Pathagoras theorem, in a right angled triangle the sum of the squares of two small sides squares.

(i) $7^2 = (6)^2 + 5^2$

49 = 64 + 25

49 ≠ 61 So triangle is not right angled.

(ii) $\left(\sqrt{(145)}\right)^2 = 8^2 + 9^2$

145 = 64 + 81

145 = 145 So it is a right angled triangle

(iii) $(13)^2 = (5)^2 + (12)^2$

169 = 25 + 144

169 = 169 So it is also right angled.

(iv) $(23)^2 = (17)^2 + (13)^2$

529 = 289 + 169

529 ≠ 458 So it is not right angled triangle.

(v) $(6.5)^2 = (6)^2 + (2.5)^2$

42.25 = 36 + 6.25

42.25 = 42.25 So Triangle is right angled.

EXERCISE- 10.2

Q-1: Using Hero's Formula, find the area of triangles whose three sides have the following lengths.

(i) 25cm, 56cm, 39cm **(ii) 14cm, 15cm, 16cm**

(iii) 225m, 125, 160m **(iv) 17cm, 22cm, 31cm**

(v) 21mm, 13mm, 20mm

Sol: (i) a = 25cm b = 56cm d = 39cm

By Hero's formula

$$S = \frac{a+b+c}{2} = \frac{25-56+39}{2} = \frac{120}{2} = 60$$

$$\Delta = \sqrt{s = (s-a)(s-b)(s-c)}$$

$$= \sqrt{60(60-25)(60-56)(60-39)} = \sqrt{60 \times 35 \times 4 \times 21}$$

$$= \sqrt{176400} = 420cm^2$$

(ii) a = 14cm b =15cm, c = 16cm

By Hero's formula

$$S = \frac{a+b+c}{2} = \frac{14+15+16}{2} = \frac{45}{2} = 22.5$$

$$\Delta = \sqrt{S(s-a)(s-b)(s-c)}$$

$$= \sqrt{22.5(22.5-14)(22.5-15)(22.5-16)}$$

$$= \sqrt{22.5 \times 8.5 \times 7.5 \times 6.5}$$

$$= \sqrt{9323.4375}$$

$$96.56cm^2$$

(iii) a = 225m b = 125 c = 160m

By Hero's formula

$$S = \frac{a+b+c}{2} = \frac{225+125+160}{2} = \frac{512}{2} = 255$$

$$\Delta = \sqrt{S(s-a)(s-b)(s-c)}$$

$$= \sqrt{255(255-225)(255-125)(255-160)}$$

$$= \sqrt{255 \times 30 \times 130 \times 95}$$

$$= \sqrt{83362500}$$

$$9130.3m^3$$

(iv) a = 17cm b = 22cm c = 31cm

$$S = \frac{a+b+c}{2} = \frac{17+22+31}{2} = \frac{70}{2} = 35$$

$$\Delta = \sqrt{S(s-a)(s-b)(s-c)}$$

$$= \sqrt{35(35-17)(35-22)(35-31)}$$

$$= \sqrt{35 \times 18 \times 13 \times 4}$$

$$= \sqrt{3270}$$

$$181cm^2$$

(v) a = 21mm b = 13mm c = 20mm

$$S = \frac{a+b+c}{2} = \frac{21+13+20}{2} = \frac{54}{2} = 27$$

$$\Delta = \sqrt{S(s-a)(s-b)(s-c)}$$

$$= \sqrt{27(27-21)(27-13)(27-20)}$$

$$= \sqrt{27 \times 6 \times 14 \times 7}$$

$$= \sqrt{15876} = 126mm^2$$

Q-2: The breadth of a rectangle field is half of its length. If its area is 512m² find the length of its perimeter.

Sol: Let breadth = x length = 2x

$$x \times 2x \quad 512m^2$$

$$2x^2 \quad 512m^2$$

$$x^2 = \frac{512}{2} = 256$$

$$x = \sqrt{256} = 16m$$

breadth = x = 16m length = 2x=2×16=32m

Perimeter = 2 (length + breadth)

= 2(16+32)

= 2×48

= 96m

Q-3: The lengths of the sides of a triangle are 153cm,

111cm, and 60cm. Find area of triangle.

Sol: a = 153cm b = 111cm c = 60cm

By Hero's formula

$$S = \frac{a+b+c}{2} = \frac{153+111+60}{2} = \frac{324}{2} = 162$$

$$\Delta = \sqrt{S(s-a)(s-b)(s-c)}$$

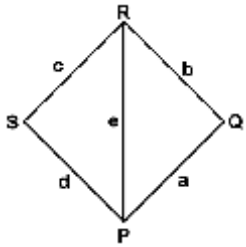
$$= \sqrt{162(162-153)(162-111)(162-60)}$$

$$= \sqrt{162 \times 9 \times 51 \times 102}$$

$$= \sqrt{7584516}$$

$$2754cm^2$$

Q-4: Find the areas of the quadrilateral regions PQRS. All measurments are in meters.



(i) a = 2.5 b = 2.8 c = 3 d = 2 e = 3.5

(ii) a = 15 b = 12 c = 13 d = 13 e = 21

(iii) a = 12 b = 14 c = 19 d = 17 e = 24

(iv) a = 1.7 b = 1 c = 1.4 d = 1.3 e = 1.9

Sol: All quadrilaterals are composed of two triangles. For every case we will find out the area of two triangles and then we will add it to get the area quadrilateral.

(i) In triangle PQRa = 2.5 b = 2.8 e = 3.5

$$S = \frac{2.5+2.8+3.5}{2} = \frac{8.8}{2} = 4.4$$

$$\Delta = \sqrt{4.4(4.4-2.5)(4.4-2.8)(4.4-3.5)}$$

$$= \sqrt{4.4\times1.9\times1.6\times0.9}$$

$$= \sqrt{12.0384} = 3.47m^2$$

In triangle PSR a = 3 d = 2 e = 3.5

$$S = \frac{3+2-3.5}{2} = \frac{8.5}{2} = 4.25$$

$$\Delta = \sqrt{4.25(4.25-3)(4.25-2)(4.25-3.5)}$$

$$= \sqrt{4.25\times1.25\times2.25\times0.75}$$

$$= \sqrt{8.9648} = 2.99m^2$$

Total area of quadrilateral = 3.47+2.99=6.46m²

(ii) In triangle PQR a = 15 b = 12 e = 21

$$S = \frac{15+12-21}{2} = \frac{48}{2} = 24$$

$$\Delta = \sqrt{24(24-15)(24-12)(24-21)}$$

$$= \sqrt{24\times9\times12\times3}$$

$$= \sqrt{7776} = 88.18m^2$$

In Δ PSR a = 13 b = 13 e = 21

$$S = \frac{13+13+21}{2} = \frac{47}{2} = 23.5$$

$$\Delta = \sqrt{23.5(23.5-13)(23.5-13)(23.5-21)}$$

$$= \sqrt{23.5\times10.5\times10.5\times2.5}$$

$$= \sqrt{6477.6875} = 80.48m^2$$

Total area = 88.18+80.48 = 168.66m²

(iii) In triangle PQR a = 12 b = 14 e = 24

$$S = \frac{12-14+24}{2} = \frac{50}{2} = 25$$

$$\Delta = \sqrt{25(25-12)(25-14)(25-24)}$$

$$= \sqrt{25 \times 13 \times 11 \times 1}$$

$$= \sqrt{3575} = 59.8m^2$$

In triangle PSRc = 19 b = 17 e = 24

$$S = \frac{19-17+24}{2} = \frac{60}{2} = 30$$

$$\Delta = \sqrt{30(30-11)(30-17)(30-24)}$$

$$= \sqrt{30 \times 19 \times 13 \times 6}$$

$$= \sqrt{44460} = 210.86m^2$$

Total area of quadrilateral = 59.8+210.86 = 270.66m²

(iv) In triangle PQR a = 1.7 b = 1 e = 1.9

$$S = \frac{1.7+1+1.9}{2} = \frac{4.6}{2} = 2.3$$

$$\Delta = \sqrt{2.3(2.3-1.7)(2.3-1)(2.3-1.9)}$$

$$= \sqrt{2.3 \times 0.6 \times 1.3 \times 0.4}$$

$$= \sqrt{0.7176} = 0.85m^2$$

In triangle PSRc = 1.4 d = 1.3 e = 1.9

$$S = \frac{1.4+1.3+1.9}{2} = \frac{4.6}{2} = 2.3m^2$$

$$\Delta = \sqrt{2.3(2.3-1.4)(2.3-1.3)(2.3-1.9)}$$

$$A = \sqrt{2.3 \times 0.9 \times 1 \times 0.4}$$

$$0.91m^2$$

Total area of quadrilateral = 0.85+0.91 = 1.76m²

Q-5: 60m, 80m and 100m are the lengths of the sides of a triangle shaped garden. Find its area and cost of repairing it at the rate of Rs 50 per m².

Sol: In this triangle

a = 60m b = 80m c = 100m

By Hero's formula

$$S = \frac{a+b+c}{2} = \frac{60+80+100}{2} = \frac{240}{2} = 120$$

$$\Delta = \sqrt{120(120-60)(120-80)(120-100)}$$

$$= \sqrt{120 \times 60 \times 40 \times 20}$$

$$= \sqrt{5760000} = 2400m^2$$

Rate of repairing = Rs 50 per m²

Total cost = 2400×50 = Rs 120000

UNIT- 11 SURFACE AREA AND VOLUME

EXRECISE- 11.1

Q-1: Find the curved surface areas of spheres whose radii are given below.

(i) Polygon
(ii) Characteristic of polygon
(iii) Regular pentagon
(iv) Regular hexagon.

Sol: (i) POLYGON

A polygon is a closed plane figure with three or more straight sides. Sides must be at least 3 upto infinite number of sides.

(ii) Characteristic of polygon

At least three line segments are the sides of a polygon. Polygons are named accordingly to the number of

sides it possesses.

The polygon with minimum number of sides (3) is the triangle.

4 sided polygon is quadrilateral, 5 sided pentogon, 6 sided hexagon, 7 sided heptagon and so on.

(iii) Regular pentagon

A five sided polygon in which all the five sides and angles are of same size is called a regular pentagon. The size of each angle of a regular pentagon is 108°.

(iv) Regular hexagon.

A six sided polygon in which all the Six sides and angles are of same size is called a regular hexagon. The size of each angle of a regular pentagon is 120°

Q-2: Define parallelogram.

Sol: PARALLELOGRAM.

A parallelogram is a special type of gudrilateral whose pair of opposite sides are parallel.

In a parallelogram 2 pairs of opposite sides are congruent and pairs of opposite angles are also congrcent. In parallelogram the consecutive angles are supplementry.

Q-3: Write down three properties of the parallelgrams.

Sol: PROPERTIES OF PARALLELOGRAMS:

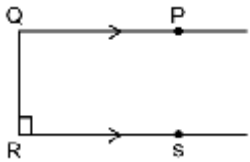
(i) In parallelogram both pairs of the opposite sides of quadrilateral are parallel.

(ii) In parallelogram, the 2 pairs of the opposite sides are congruent.

(iii) In parallelograms, the consecutive angles are supplimentary.

(iv) In a parallelogram, the two diagonals bisect each other.

Q-4: Find the measure of $\angle PQR$.



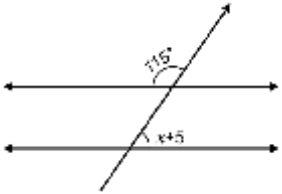
Sol: As $\overline{PQ}$ and $\overline{RS}$ are parallel

$\angle PQR + \angle QRS = 180°$

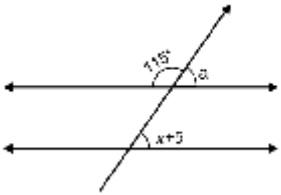
$\angle PQR + 90° = 180°$

$\angle PQR + 180° - 90° = 90°$

Q-5: Find the value of x.



Sol:



As: $\angle a = \angle x + 5$ Corresponding angles

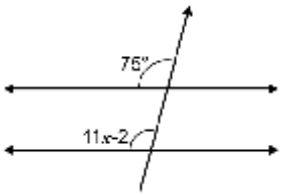
$115° + (x + 5) = 180$ Adjacent supplimentary angles

$115 + x + 5 = 180$

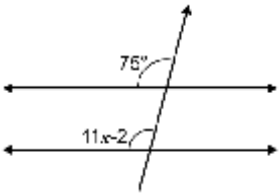
$x = 180 - 115 - 5$

$= 60°$

Q-6: Find the value of x. Also find the value of this angle.



Sol:



$11x-2-75$ corresponding angle.

$11x-75+2-77$

$x=\frac{77}{11}=7$

Angle $11x$-2

11×7-2 = 77-2 = 75°