MATHEMATICS

Unit 1

SET

EXERCISE 1.1

1. Write the following sets in descriptive form,

(i)   A-{1,2, 3, 4, 5, 6, 7, 8, 9, 10}
(ii)   B = [a, b, c, d, e, f}
(iii)   C = {2, 4, 6, 8, 10}
(iv)   D = {2, 3,5, 7, 11, 13, 17,19}
(v)   E = {3,6,9,12,15}

Ans.

(i)   A is a set of first ten natural numbers.
(ii)   B is a set of first six English alphabets.
(iii)   C is a set of first five positive even numbers.
(iv)   D is a set of prime numbers less than 20.
(v)   E is a set of first five multiples of 3.

2. Write the following sets in tabular form.

(i)   A is a set of the first five multiples of 5.
(ii)   Set of natural numbers between 10 and 20.
(iii)   Set of the names of the days in a week.
(iv)   Set of positive even numbers less than 10.
(v)   Set of the first five English alphabets.

Ans.

(i)   A -{5, 10, 15, 20, 25}
(ii)   {11,12,13,14,15,16,17,18,19}
(iii)   {Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday}
(iv)   {2, 4, 6, 8}
(v)   {a, b, c, d, e}

3. Write the following sets in set builder form.

(i)   A = {1,2,3,... 20}
(ii)   B = {a, e, i, o, u}
(iii)   C = (Peshawar, Lahore, Karachi, Quetta)
(iv)   D is a set of the odd numbers.
(v)   E is a set of the even numbers.

Ans.

(i) $A = \{ x \mid x$ is a natural number $\leq 20\}$
(ii) $B - \{ x \mid x$ is a vowel$\}$
(iii) $C = \{ x \mid x$ is a capital of provinces$\}$
(iv) $D - [x \mid x$ is an odd number$\}$
(v) $E = \{ x \mid x$ is an even number$\}$

EXERCISE 1.2

1. Find union and intersection of the following sets.

i.   A = {1,2, 3, 4}, fl = {3, 4, 5}
ii.   A = {-1,-2, -3}, B = {-2,-3,-4, -5}
iii.   A = {1, 2,3,...10}, B = {1, 3,5,7}
iv.   A = {1,3,5, 7,11,13}, B = {5, 6, 7, 8, 9,10, 11}
v.   A = Set of first 10 natural numbers B = set of first 5 positive even numbers

2. If
A = {0,1,2,3,4,5}
B = {1, 3, 5}   C = {3,4,5}
then find and

(i)   (A∪B)∪C
(ii)   A∩(B∪C)
(iii)   (A∩B)∩C
(iv)   A∪(B∩C)
(v)   (A∪B)∩(A∪C)

A = {0,1,2,3,4,5},
B = {1,3,5}, C = {3,4,5}

Sol:

(i)   (A∪B)∪C
(A∪B) = {0,1,2,3,45} ∪ {1,3,5}
(A∪B) = {0,1,2,3,4,5}
(A∪B)∪C= {0,1,2,3,4,5} ∪ {1,3,5}
   = {0,1,2,3,4,5}

(ii)   A∩(B∪C)
(B∪C)   = {1,3,5} ∪ {3,4,5}
(B∪C)   = {1,3,4,5}
A∩(B∪C) = {0,1,2,3,4,5} ∩ {1,3,4,5}
   = {1,3,4,5}

(iii)   (A∩B)∪C
(A∩B) = {0,1,2,3,4,5} ∩ {1,3,5}
   = {1,3,5}
(A∩B)∪C = {1,3,5} ∩ {3,4,5}

Left column:

$= \{1,3,4,5\}$

(iv)   AU(B∩C)

$(B∩C) = \{1,3,5\} ∩ \{3,4,5\}$

$= \{3,5\}$

$AU(B∩C) = \{0,1,2,3,4,5\} U \{3,5\}$

$= \{0,1,2,3,4,5\}$

(v)   (AUB) ∩ (AUC)

$(AUB) = \{0,1,2,3,4,5\} U \{1,3,5\}$

$= \{0,1,2,3,4,5\}$

$AUC = \{0,1,2,3,4,5\} U \{3,4,5\}$

$= \{0,1,2,3,4,5\}$

$(AUB)∩ (AUC) = \{0,1,2,3,4,5\}$

$∩ \{0, 1, 2,3,4,5\}$

$= \{0,1,2,3,4,5\}$

3.   If

$A = \{0,1,2,3,4,5,6,7,8,9,10\}$

$B = \{2,4,6,8,10\}$

then find

    B\A and A\B

Sol: $A = \{1,2,3,4,5,6,7,8,9,10\}$

$B = \{2,4,6,8,10\}$

(i) $A\backslash B = \{1,2,3,4,5,6,7,8,9,10\} \backslash$

$\{2,4,6,8,10\}$

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

(ii) $B\backslash A = \{2,4,6,8,10\} \backslash$

$\{0,1,2,3,4,5,6,7,8,9,10\}$

$= \{ \}$

4.   If

$D = \{a,e,i,o,u\}$ اور $C = \{a,b,c,....x,y,z\}$

then find

    D\C and C\D

Sol:

(i) $C\backslash D = \{a,b,c,.....x,y,z\} \backslash \{a,e,i,o,u\}$

$= \{b,c,d,f,g,h,j,k,l,m,n,p,q,r,s,t,u, v, w, x$

$y, z\}$

(ii) $D\backslash C = \{a,e,i,o,u\} \backslash \{a,b,c,....x,y,z\}$

$= \{ \}$

Solution Exercise 1.3

1.   If

(1)   B={3,6,9,12,18}, A={1,2,3,4,6,12}

then find A\B, B\A and check whether

A\B = B\A

Sol: $A = \{1,2,3,4,6,8\},$

Right column:

$B = \{3,6,9,12,18\}$

(i) $A\backslash B = \{1,2,3,4,6,8\}\backslash\{3,6,9,12,18\}$

$= \{1, 2, 4, 8\}$

$B\backslash A = \{3,6,9,12,18\} \backslash \{1,2,3,4,6,8\}$

$= \{9,12,18\}$

$A\backslash B = \{1, 2, 4, 8\}, B\backslash A = \{9, 12,18\}$

then A\B ≠ B\A

2.   If

$U = \{1,2,3,.....20\}$

(i) $A = \{2,4,6,.....20\}$

(ii) $B = \{1,3,5,....19\}$

then find the complements of the following sets:

$A^{'} = \{1,2,3,.....20\} \backslash \{2,4,6,....20\}$

$= \{1,3,5,.....19\}$

$B^{'} = \{1,2,3,....20\} \backslash \{1,3,5,.....19\}$

$= \{2,4,6,.....20\}$

(iii) $C = \{3,6,9,12,15,18\}$

$C^{'} = \{1,2,3,4,....20\}$

$\backslash \{3,6,9,12,15,18\}$

$= \{1,2,4,5,7,8,10,11,13,14,16,17,19,20\}$

(iv) $D = \{4,8,16,20\}$

$D^{'} = \{1,2,3,4,....20\} \backslash \{4,8,16,20\}$

$= \{1,2,3,5,6,7,9,10,11,13,14,15,17,18,19\}$

3.   If U={4,8,12,16,20} then find

$\phi^{'}$ and $U^{'}$

Sol:

$U^{'} = \{4,8,12,16,20\} \backslash \{4,8,12,16,20\}$

$U^{'} = \{ \}$

$\phi^{'} = \{ \} \backslash \{4,8,12,16,20\}$

$= \{ \} = \phi$

4.   If B = {c,d,e} A = {a,b,c},

U = {a,b,c,d,e,f}

then find and check AUA$^{'}$ & A∩A$^{'}$

AUA$^{'}$ and A∩A$^{'}$ = ϕ

Sol: U = {a,b,c,d,e,f} A = {a,b,c,},

B = {c,d,e}

(i)   AUA$^{'}$

$A^{'} = \{a,b,c,d,e,f\} \backslash \{a,b,c\}$

$= \{d,e,f\}$

$AUA^{'} = \{a,b,c,\} U \{d,e,f\}$

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

(ii) $A∩A^{'} = \{a,b,c\} ∩ \{d,e,f\}$

$= \{\}$

A∩A' = {} అ'AUA' = {a,b,c,d,e,f}

    A∩A' ≠ AUA'

5.   If U = {1,2,3,........10}

     A = {1,3,5,7,9} B = {2,4,6,8,10}

     then find

(i)   (AUB)'   (ii)   (A∩B)'

(iii)   A'∩ B')   (iv)   (A'UB')

(v)   A∩B')   (vi)   B∩A'

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

     B = {2,4,6,8,10}

(i)   (AUB)'

(AUB) = {1,3,5,7,9} U {2,4,6,8,10}

     = {1,2,3,4,5,6,7,8,9,10}

(AUB)' = {1,2,3,......10} \{1,2,3,....10}

     = { }

(ii)   (A∩B)'

(A∩B) = {1,3,5,7,9} ∩ {2,4,6,8,10}

     = { }

(A∩B)'   = {1,2,3,4,..... 10} \ { .}

     = {1,2,3,......10}

(iii)   A'∩B'

     A' = {1,2,3,....10} \ {1,3,5,7,9}

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

     B' = {1,2,3,....10} \ {2,4,6,8,10}

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

A'∩B' = {2,4,6,8,10} ∩ {1,3,5,7,9}

     = {}

(iv)   A'UB' =

     A' = {2,4,6,8,10}

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

A'UB' = {1,2,3,4,5,6,7,8,9,10}

(v)   A∩B' =

     A = {1,3,5,7,9}, B/ = {1,3,5,7,9}

A∩B' = {1,3,5,7,9} ∩= {1,3,5,7,9}

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

(vi)   B∩A'

     B = {2,4,6,8,10}

     A' = {2,4,6,8,10}

B∩A/ = {2,4,6,8,10} ∩ {2,4,6,8,10}

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

6.   **Find whether sets panel Q are overlaping sets of disjoint**

     P   = Natural numbers between 35 and 60

     = {36, 37, 38, 37, ... 59}

Q   = Nautral numbes between 50 and 80

     = {51, 52, 53, 54, ...}

common numbers between P and Q

     = [51, 52, 53, 54, ... 59}

P and Q are overlaping sets

(ii)   P = Lstters in the word Moon = {M,O,N}

     Q = Letters in the wods STAR = {S,T,A,R}

   common word betwen P and Q = { }

     P and Q are disjoint sets

EXERCISE 1.4

1.   **If U = {1, 2, 3, ...10), then find A ∪ B and A∩B in each of the following cases and draw their Venn diagrams:**

(i)   A = {2,3,4}, B = {1,2,3,4,5}

Sol: U = {1,2,3,10}, A = {2,3,4}

     B = {1,2,3,4,5}

AUB = {2,3,4} U {1,2,3,4,5}
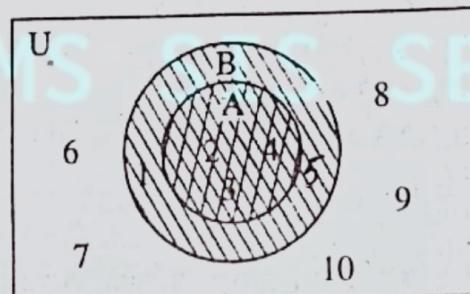
     = {1,2,3,4,5}

$$A \cup B = \{1, 2, 3, 4, 5\}$$

$$A \cap B = \{2, 3, 4\}$$

A∩B = {2,3,4} ∩ {1,2,3,4,5}
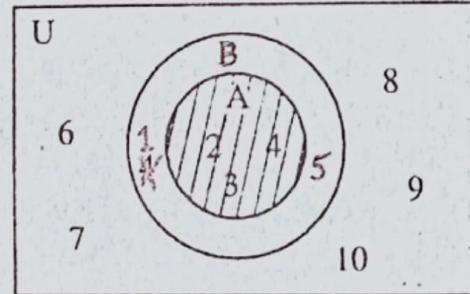
A∩B = {2,3,4}

(ii)   A = {2,4,6,8,10}, B = {6,8}

AUB = {2,4,6,8,10} U {6,8}

     = {2,4,6,8,10}
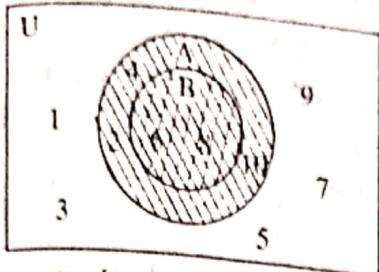
$A \cap B = \{2,4,6,8,10\} \cap \{6,8\}$
$= \{6,8\}$

$A \cup B = \{2, 4, 6, 8, 10\}$
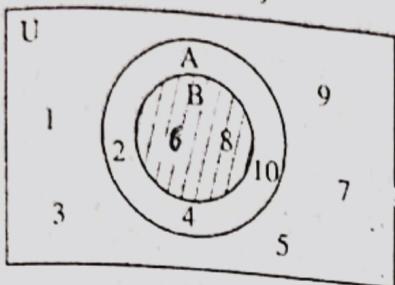
$A \cap B = \{6, 8\}$

(iii) $A = \{1,3,5,7,9\}$ $B = \{2,3,5,7\}$

$A \cup B = \{1,3,5,7,9\} \cup \{2,3,5,7\}$

$A \cup B = \{1,2,3,5,7,9\}$

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

$B = \{2,3,5,7\}$

$A \cap B = \{3,5,7\}$
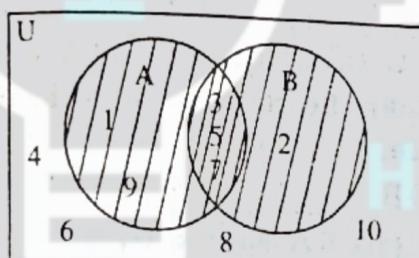
$A \cup B = \{1, 2, 3, 5, 7, 9\}$
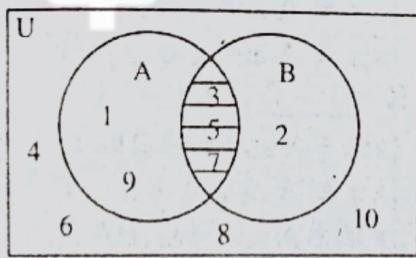
$A \cap B = \{3, 5, 7\}$

(iv) $A = \{1,5,6\}$ $B = \{2,4,7\}$

$A \cup B = \{1,5,6\} \cup \{2,4,7\}$
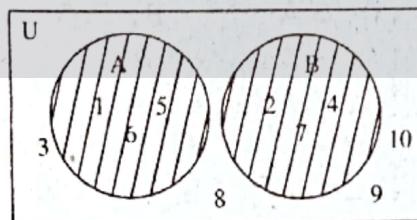
$A \cup B = \{1, 2, 4, 5, 6, 7\}$
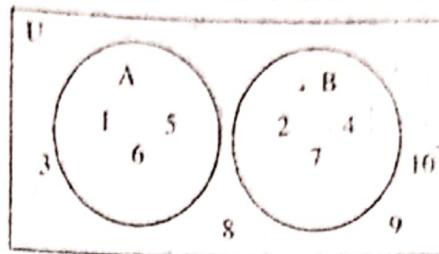
$A \cap B = \{ \ \}$

$= \{1,2,4,5,6,7\}$

$A \cap B = \{1,5,6\} \ \{2,4,7\}$

$= \{ \ \}$

2.   **If U = {a, b, c, d, e} then find B\A, A'\B'**

Sol: $U = \{a,b,c,d,e\}$

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

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

$= \{ \ \}$

(ii) $U = \{a,b,c,d,e\}$ $A = \{a,b\}$

$A' = \{a,b,c,d,e\} \backslash \{a,b\}$

$= \{c,d,e\}$
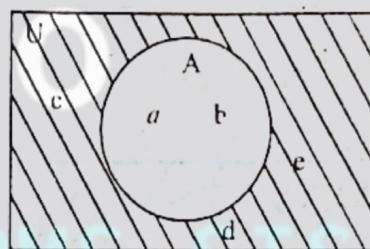
$A' = \{c, d, e\}$

$B' = \{a,b,c,d,e\} \backslash \{a,b,c\}$

$= \{d,e\}$
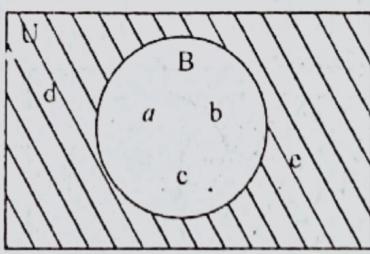
$B' = \{d, e\}$

(iv) $B = \{a,b,c\}$, $A = \{a,b\}$ $B \backslash A = \{c\}$

(2) $U = \{a,b,c,d,e\}$

$A \backslash B = \{ \ \}$

$A = \{b,c,d\}$, $B = \{c,e\}$

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

$B\backslash A = \{c\}$
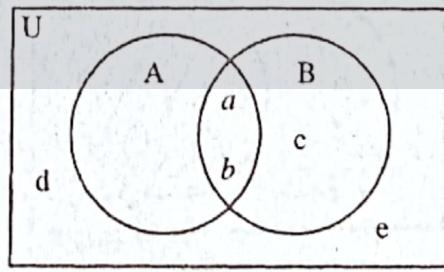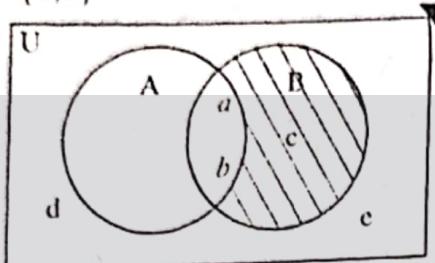
ii) $A' = \{a,b,c,d,e\} \backslash \{b,c,d\}$
= $\{a,e\}$

(iii) $B' = \{a,b,c,d,e\} - \{c,e\}$
= $\{a,b,d\}$

$A' = \{a, e\}$
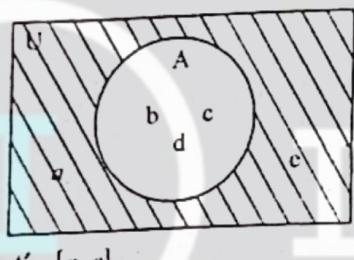
(iv) $B\backslash A = \{c,e\} \backslash \{b,c,d\}$
= $\{b,d\}$

$B' = \{a, b, d\}$
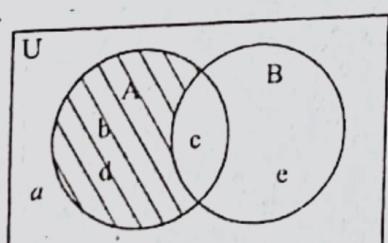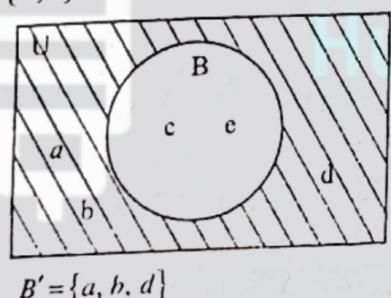
$A\backslash B = \{b, d\}$
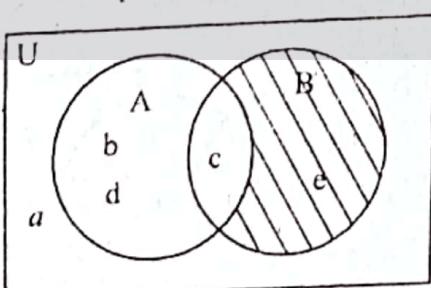
$B\backslash A = \{e\}$

Review Exercise 1
(Objective type)

1. Read the following statements carefully and encircle 'T' in case of true statement and 'F' in case of false statement.

(i) A collection of well-defined and distinct objects is called a set. (T)

(ii) In descriptive form members of a set are written within braces. (F)

(iii) If $A \cap B = \varphi$ then set A and set B are called overlapping sets. (F)

(iv) Difference of two sets A - B consists of all those elements of set A which are not in B. (T)

(v) $\cap$ - A is called complement of A. (T)

2. Fill in the blanks,

(i) $A \cup A' = .$ (ii) $\varphi = $ _____

(iii) $A \cap A = $ _____

(iv) $(A')' = $ _____

(v) If A and B are disjoint sets then $A \cap B$ = _____

Sol. (i) U (ii) U (iii) φ (iv) A (v) φ

3. Colour the correct option in the box given.

(i) $A \cup B = $ _____
   a. $\{x|x \in A$ and $x \in B\}$
   b. $\{x|x \in A$ or $x \in B\}$
   c. $\{x|x \in A$ and $x \notin B\}$
   d. $\{x|x \notin A$ and $x \in B\}$

(ii) $A - B = $ _____
   a. $\{x|x \in A$ and $x \in B\}$
   b. $\{x|x \in A$ or $x \in B\}$
   c. $\{x|x \in A$ and $x \notin B\}$
   d. $\{x|x \notin A$ and $x \in B\}$

(iii) $B - A = $ _____
   a. $\{x|x \in A$ and $x \in B\}$
   b. $\{x|x \in A$ or $x \in B\}$
   c. $\{x|x \in A$ and $x \notin B\}$
   d. $\{x|x \notin A$ and $x \in B\}$

(iv) $(A')' = $ _____
   a. U   b. φ
   c. A   d. A'

(v) $A \cup A' = $ _____

a. U   b. φ

c. A   d. A′

(vi) A ∩ A′ = _____

a. U   b. φ

c. A   d. A′

(vii) U′ = _____

a. U   b. φ

c. U − A   d. U − A

(viii) φ′ = _____

a. U   b. φ

c. U′ − A   d. U − A

(ix) If A ∩ B = φ then A and B are

a. Overlapping sets

b. Disjoint sets   c. Equal sets

d. None of these

(x) If A = {1, 2, 3}, B = {3, 4, 5} then A ∩ B = _____

a. {2,3}   b. {1,3}

c. {3}   d. {1,2,3,4,5}

Sol. (i) (b)   (ii) (c)   (iii) (d)   (iv) (c)

(v) (a)   (vi) (b)   (vii) (b)   (viii) (a)

(ix) (b)   (x) (c)

4. If A = {1,2, 4,6}, B −{1,2, 3, ...10}, then find

(i) A ∪ B

(ii) A ∩ B

Sol:

(i) A ∪ B

A = {1,2,4,6}

B = {1,2,3,....10}

A ∪ B = {1,2,4,6} ∪ {1,2,3,....10}

= {1,2,3,......10}

(ii) A ∩ B

A ∩ B = {1,2,4,6} ∩ {1,2,3,....10}

= {1,2,4,6}

5. If A = {0,1,2,3,4}, B = {2, 4, 6}, then find

(i) A\B   (ii) B\A

Sol:

A\B

A = {0,1,2,3,4} , B = {2,4,6}

A\B = {0,1,2,3,4} \ {2,4,6}

= {0, 1, 3}

ii) B\A

B\A = {2,4,6} \ {0,1,2,3,4}

{ 6}

6. If U = {a, b, c, d, e, f} , A = {a,c,e} and B = {b, d, f}, then find

(i) A′   (ii) B′

(iii) (A ∪ B)′   (iv) (A ∩ B)′

(v) A′ ∪ B′   (vi) A′ ∩ B′

Sol: U = {a,b,c,d,e,f}

A = {a,b,c}

B = {b,d,f}

(i) A′

A′ = U\A = {a,b,c,d,e,f} \ {a,b,c}

= {d,e,f}
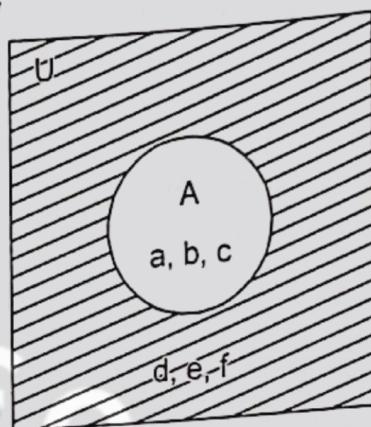
ii) B′

B′ = U − B

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

= {a,c,e}

(iii) (A ∪ B)′

Sol: A ∪ B = {a, b, c, d, f}

(A ∪ B)′ = U \ (A ∪ B)

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

= {e}

(iv) (A ∩ B)′

Sol: (A ∩ B)′

(A ∩ B)′ = U\(A ∩ B)

(A ∩ B) = {a,c,e} {b,d,f}

= {}
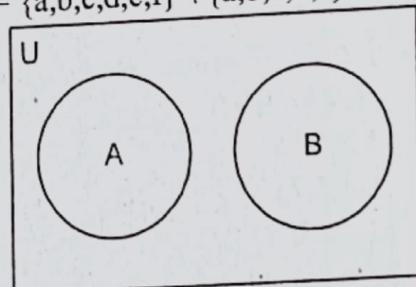
(A ∩ B)′ = U − (A ∩ B)′

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

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

(v) $A' \cap B$

$A' = U \setminus A$

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

$= \{e,d,f\}$

$B' = \{a,b,c,d,e,f\} \setminus \{b,d,f\}$

$= \{a,c,e\}$

$A' \cap B' = \{e,d,f\} \cap \{a,c,b\}$

$= \{\}$

(AUB)/

$= U - (AUB)/$

$(AUB) = \{a,e,c\} \cup \{b,d,f\}$

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

$(AUB)' = \{a,b,c,d,e,f\} \setminus \{a,b,c,d,e,f\}$

$= \phi$

(vi)   A\B

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

7.   If $U = \{1, 2, 3, 4, 5, 6\}$, $A = \{2,3,4\}$ then show that $A \cup A' = U$ and $A \cap A' = \varphi$

Sol. $U = \{1, 2, 3, 4, 5, 6\}$

$A = \{2, 3, 4\}$

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

$A' = \{1, 5, 6\}$

$A \cup A' = \{2, 3, 4\} \cup \{1, 5, 6\}$

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

$A \cup A' = U$

$A \cap A' = \{2, 3, 4\} \cap \{1, 5, 6\}$

$= \phi$

8.   **If A is the set of factors of 15**

   B is the set of prime numbes less than 10 then what is (AUB)UC

Sol: $A = \{1,3,5,15\}$

$B = \{1,3,5,7,0\}$

$C = \{2, 4, 6, 8\}$

$AUB = \{1,3,5,15\} \cup \{1,3,5,7,9\}$

$= \{1,3,5,7,9,15\}$

$(AUB)UC = \{1,3,5,7,9,15\}$

$U = \{2,4,6,8\}$

$(AUB)UC = \{1,2,3,4,5,6,7,8,9,15\}$

9.   If $= \{a, b, c, e, f\}$, $A = \{a, b, c\}$ and B = $\{c, d, e\}$ then draw Venn diagrams of

(i)   A'   (ii)   B'
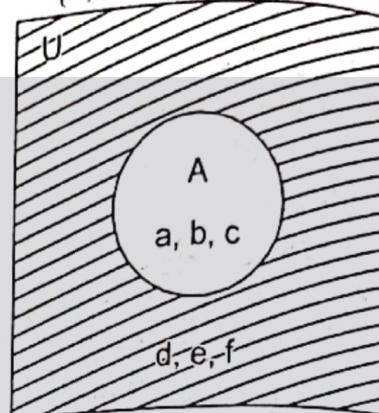
(iii) $A \cup B$ (iv) $A \cap B$

(v)   A\B   (vi)   B\A

Sol.   (i)

$A' = \{1, b, c, d, e, f\} / \{a, b, c\}$

$= \{d, e, f\}$

(ii) $B' = \{a, b, c, d, e, f\} / \{c, d, e\}$

$= \{a, b, f\}$

(iii) $AUB = \{a, b, c\} \cup \{c, d, e\}$

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

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

$= \{c\}$

(v)   A/B $= \{a, b, c\} / \{c, d, e\}$

= {a, b}

(vi)
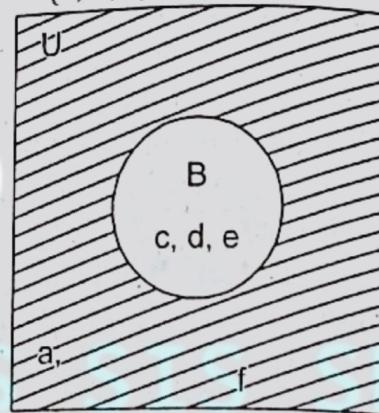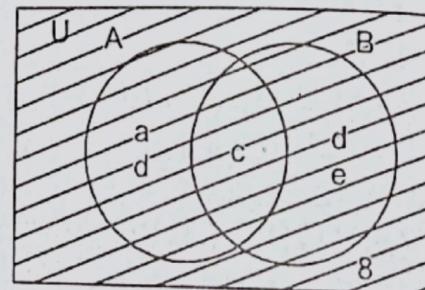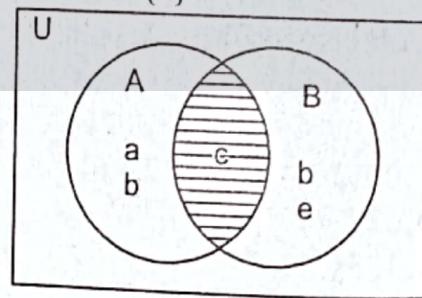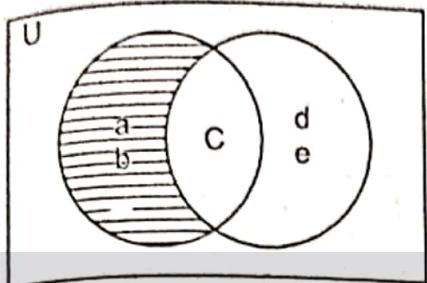
B – A = {c, d, e} / {a, b, c}
    = {d, e}

10. Find whether the sets P and Q are overlapping sets or disjoint sets:

Sol: P={1,2,3,4,6,8,12,24}
      Q=[1,3,11,33}
      common numbers = 1, 3
      P,Q are overlapping sets

(ii)
Sol:
      P={7,14,21,28,35,42,49}
      Q=[11,22,33,44}
      P and Q are disjoint
      ======

Unit 2

RATIONAL NUMBERS

EXERCISE 2.1

1. Read the following statements carefully and write 'T' in front of true statement and 'F' in front of false statement.

(i) Any integer can be expressed in the

form of - where $\frac{p}{q}$. q ≠ 0.

(ii) Zero is not a rational number.

(iii) All integers are rational numbers.

(iv) Rational numbers may be positive or negative.

(v) In any rational number $\frac{p}{q}$. may be zero.

Ans.

(i)	True	(ii)	False	(iii)	True
(iv)	True	(v)	False		

2. Show the following rational numbers on a number line.

(i) $-2\frac{1}{2}, -\frac{3}{2}, -5, \frac{1}{2}, \frac{5}{2}, 3\frac{1}{2}$
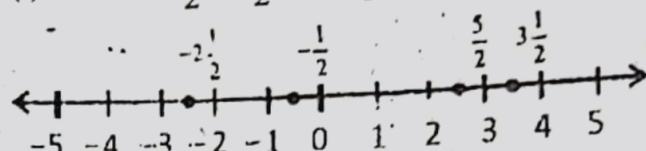
(ii) $-\frac{7}{2}, -\frac{5}{2}, 2, \frac{3}{2}, 2\frac{3}{4}$
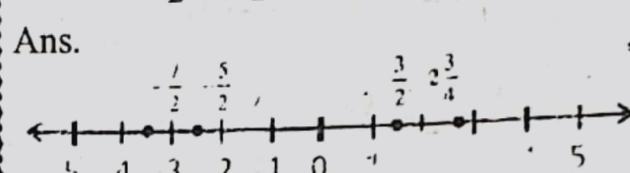
Ans.

EXERCISE 2.2

Solve:

(i) $\frac{1}{2} + \frac{5}{8}$

Sol: $\frac{1}{2} + \frac{5}{8}$

$= \frac{1 \times 4 + 5 \times 1}{8} = \frac{4 + 5}{8}$

$= \frac{9}{8} = 1\frac{1}{8}$ **Ans.**

(ii) $3\frac{1}{4} + 2$

Sol: $3\frac{1}{4} + 2$

$= \frac{13}{4} + 2 = \frac{13 + 4 \times 2}{4} = \frac{13 + 8}{4} = \frac{21}{4}$

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

(iii) $\frac{3}{7} + \left(-\frac{5}{2}\right)$

Sol: $\frac{3}{7} + \left(-\frac{5}{2}\right)$

$$= \frac{3}{7} - \frac{5}{2}$$

$$= \frac{3 \times 2 - 5 \times 7}{14} = \frac{6 - 35}{14}$$

$$= -\frac{29}{14} = -2\frac{1}{14} \text{ Ans.}$$

(iv) $\frac{5}{6} - \left(-\frac{3}{8}\right)$

Sol: $\frac{5}{6} - \left(-\frac{3}{8}\right)$

$$= \frac{5}{6} + \frac{3}{8}$$

$$= \frac{5 \times 4 + 3 \times 3}{24} = \frac{20 + 9}{24}$$

$$= \frac{29}{24} = 1\frac{5}{24} \text{ Ans.}$$

(v) Find the additivie inverse of 1/7

Sol: Addictive inverse of 1/7

$$= \frac{1}{7} - \frac{1}{7} = 0$$

$$= -\frac{1}{7}$$

(vi) Find the additive inverse of −10

Sol: Additive inverse of −10

$$-10 + 10 = 0$$

$$= 10 \text{ Ans.}$$

(vii) Find the sum of $4\frac{1}{8}$ and $1\frac{1}{2}$

Sol: $4\frac{1}{8}, 1\frac{1}{2}$

$$= 4\frac{1}{8} + 1\frac{1}{2} = \frac{33}{2} + \frac{3}{2}$$

$$= \frac{33}{8} + \frac{3}{2}$$

$$= \frac{33 + 12}{8} = \frac{45}{8} = 5\frac{5}{8} \text{ Ans.}$$

(viii) Evaluate x+y if x = 2 and y = $8\frac{4}{9}$

Sol: $x + y = 2 + 8\frac{4}{9}$

$$= 2 + 8\frac{4}{9} = 2 + \frac{76}{9}$$

$$= 2 + \frac{76}{9}$$

$$= \frac{(2 \times 9) + (1 \times 76)}{9} = \frac{18 + 76}{9} = \frac{94}{9}$$

$$= \frac{94}{9} = 10\frac{4}{9} \text{ Ans.}$$

(ix) Nadeem was $62\frac{1}{8}$ inches tall

Sol:

size in June = $62\frac{1}{8}$ inches

size in September = $63\frac{1}{8}$ inches

Difference in size = $63\frac{1}{8} - 62\frac{1}{8}$

$$= \frac{505}{8} - \frac{497}{8}$$

$$= \frac{505 - 497}{8} = \frac{8}{8} = 1 \text{ inc Ans.}$$

EXERCISE 2.3

1. Find the additive and multiplicative inverse of the following:

(i) −5

$$-5 \times -\frac{1}{5} = 1$$

Multiplicative inverse $-\frac{1}{5}$ Ans.

5 = Additive inverse

(ii) $-2\frac{1}{11}$

Multiplicative inverse

$$= -\frac{23}{11} = -\frac{23}{11} \times -\frac{11}{23} = 1.$$

Multiplication inverse $= \dfrac{-11}{23}$

$-\dfrac{11}{23}$ Ans. $\dfrac{23}{11}$ = Additive inverse

(iii) $\dfrac{4}{15}$

$= \dfrac{4}{15} \times \dfrac{15}{4} = 1$

$\dfrac{15}{4}$ Ans. $-\dfrac{4}{15}$ = Additive inverse

(iv) $\dfrac{105}{200}$

$= \dfrac{105}{200} \times \dfrac{200}{105} = 1$

Multiplication $\dfrac{200}{105}$ **Ans.**

$-\dfrac{105}{200}$ Additive inverse

(v) $\dfrac{6}{7} \times \dfrac{7}{6} = 1$

$\dfrac{7}{6}, \; -\dfrac{6}{7}$

i. $\dfrac{2}{3} \times \dfrac{7}{8}$

Sol: $\dfrac{2}{3} \times \dfrac{7}{8} =$

$= \dfrac{1}{3} \times \dfrac{7}{4} = \dfrac{7}{12}$ Ans.

(ii) $\left(\dfrac{-2}{3}\right) \times -7$

Sol: $\dfrac{-2}{3} \times -7$

$= \dfrac{2 \times 7}{3} = \dfrac{14}{3} = 4\dfrac{2}{3}$ Ans.

(iii) $2\dfrac{5}{8} \times 3\dfrac{4}{5}$

Sol: $2\dfrac{5}{8} \times 3\dfrac{4}{5} = \dfrac{21}{8} \times \dfrac{19}{5}$

$= \dfrac{21 \times 19}{8 \times 5} = \dfrac{399}{40} = 9\dfrac{39}{40}$ Ans.

(iv) $(-3) \times \dfrac{3}{17}$

Sol: $(-3) \times \dfrac{3}{17}$

$= -\dfrac{9}{17}$

(v) $\dfrac{-2}{3} + \dfrac{-2}{3}$

Sol: $\dfrac{-2}{3} + \dfrac{-2}{3}$

$= \dfrac{(-2) + (-2)}{3} = \dfrac{-4}{3} = 1\dfrac{1}{3}$ Ans.

(vi) $\left(-\dfrac{1}{2}\right) \div \dfrac{3}{16}$

Sol: $\left(-\dfrac{1}{2}\right) \div \dfrac{3}{16}$

$= -\dfrac{1}{2} \times \dfrac{16}{3} = -\dfrac{8}{3}$

$= -2\dfrac{2}{3}$ Ans.

(vii) $(-5) \div \dfrac{10}{9}$

Sol: $(-5) \div \dfrac{10}{9}$

$= -\dfrac{5}{1} \times \dfrac{9}{10} = -\dfrac{9}{2}$

$= -4\dfrac{1}{2}$ Ans.

(viii) $1\dfrac{3}{5} \div \dfrac{1}{10}$

Sol: $1\dfrac{3}{5} \div \dfrac{1}{10}$

$= \dfrac{8}{5} \div \dfrac{1}{10} = \dfrac{8}{5} \times \dfrac{10}{1}$

$= 8 \times 2 = 16$ **Ans.**

(ix) $\dfrac{30}{7} \times \dfrac{14}{6}$

Sol: $\dfrac{30}{7} \times \dfrac{14}{6}$

= 10 Ans.

EXERICSE 2.4

1. Name the property used in each of the following and also verify them.

(i) $\dfrac{1}{4} + 5 = 5 + \dfrac{1}{4}$

Sol: LHS $\dfrac{1}{4} + 5$

$= \dfrac{1 \times 1 + 4 \times 5}{4} = \dfrac{1 + 20}{4}$

$= \dfrac{21}{4} = 5\dfrac{1}{4}$

RHS $5 + \dfrac{1}{4}$

$= \dfrac{5 \times 4 + 1 \times 1}{4} = \dfrac{20 + 1}{4}$

$= \dfrac{21}{4} = 5\dfrac{1}{4}$

So LHS = RHS

$\dfrac{1}{4} + 5 = 5 + \dfrac{1}{4}$

Commutative property.

(ii) $-\dfrac{2}{5} + \left(\dfrac{3}{4} + \dfrac{1}{5}\right) = \left(-\dfrac{2}{5} + \dfrac{3}{4}\right) + \dfrac{1}{5}$

Sol: $-\dfrac{2}{5} + \left(\dfrac{3}{4} + \dfrac{1}{5}\right) = \left(-\dfrac{2}{5} + \dfrac{3}{4}\right) + \dfrac{1}{5}$

LHS $-\dfrac{2}{5} + \left(\dfrac{3}{4} + \dfrac{1}{5}\right)$

$= \dfrac{3 \times 5 + 1 \times 4}{20}$

$= \dfrac{15 + 4}{20} = \dfrac{19}{20}$

$= -\dfrac{2}{5} + \dfrac{19}{20}$

$= \dfrac{-2 \times 4 + 19 \times 1}{20}$

$= \dfrac{-8 + 19}{20} = \dfrac{11}{20}$

RHS

$\left(-\dfrac{2}{5} + \dfrac{3}{4}\right) + \dfrac{1}{5}$

$= \dfrac{-2 \times 4 + 3 \times 5}{20}$

$= \dfrac{-8 + 15}{20} = \dfrac{7}{20}$

$\dfrac{1}{5} + \dfrac{7}{20}$

$\dfrac{1 \times 4 + 7 \times 1}{20} = \dfrac{4 + 7}{20} = \dfrac{11}{20}$

So, LHS = RHS then

$-\dfrac{2}{5} + \left(\dfrac{3}{4} + \dfrac{1}{5}\right) = \left(-\dfrac{2}{5} + \dfrac{3}{4}\right) + \dfrac{1}{5}$

Associative property w.r.t. addition.

(iii) $\dfrac{3}{6} \times \dfrac{4}{7} = \dfrac{4}{7} \times \dfrac{3}{6}$

Sol: $\dfrac{3}{6} \times \dfrac{4}{7} = \dfrac{4}{7} \times \dfrac{3}{6}$

LHS

$= \dfrac{3 \times 4}{6 \times 7} = \dfrac{12}{42}$

$= \dfrac{2}{7}$

RHS $= \dfrac{4 \times 3}{6 \times 7} = \dfrac{12}{42}$

$= \dfrac{2}{7}$

LHS = RHS

So, $\dfrac{3}{6} \times \dfrac{4}{7} = \dfrac{4}{7} \times \dfrac{3}{6}$

Commutative property multiplication.

(iv) $\dfrac{2}{7} \times \left(\dfrac{4}{5} - \dfrac{3}{7}\right) = \dfrac{2}{7} \times \dfrac{4}{5} - \dfrac{2}{7} \times \dfrac{3}{7}$

Sol: $\dfrac{2}{7} \times \left(\dfrac{4}{5} - \dfrac{3}{7}\right) = \dfrac{2}{7} \times \dfrac{4}{5} - \dfrac{2}{7} \times \dfrac{3}{7}$

LHS

$\dfrac{4}{5} - \dfrac{3}{7}$

$\dfrac{4 \times 7 - 3 \times 5}{35} = \dfrac{28 - 15}{35} = \dfrac{13}{35}$

$\dfrac{2}{7} \times \dfrac{13}{35} = \dfrac{26}{245}$

RHS

$\dfrac{2}{7} \times \dfrac{4}{5} - \dfrac{2}{7} \times \dfrac{3}{7}$

$\dfrac{8}{35} - \dfrac{6}{49}$

$\dfrac{8 \times 7 - 6 \times 5}{245} = \dfrac{56 - 30}{245} = \dfrac{26}{245}$

$\dfrac{2}{7} \times \left(\dfrac{4}{5} - \dfrac{3}{7}\right) = \dfrac{2}{7} \times \dfrac{4}{5} - \dfrac{2}{7} \times \dfrac{3}{7}$

Distributive property of multiplication over subtraction.

(v) $\dfrac{1}{3} \times \left(\dfrac{2}{3} \times \dfrac{3}{8}\right) = \left(\dfrac{1}{3} \times \dfrac{2}{5}\right) \times \dfrac{3}{8}$

Sol:

LHS   RHS

$\dfrac{1}{3} \times \left(\dfrac{2}{3} \times \dfrac{3}{8}\right) = \left(\dfrac{1}{3} \times \dfrac{2}{5}\right) \times \dfrac{3}{8}$

$= \dfrac{1}{3} \times \dfrac{6}{40} = \dfrac{1}{20}$

RHS

$\left(\dfrac{1}{3} \times \dfrac{2}{5}\right) \times \dfrac{3}{8}$

$= \dfrac{2}{15} \times \dfrac{3}{8}$

$\dfrac{1}{5} \times \dfrac{1}{4} = \dfrac{1}{20}$

$\dfrac{1}{3} \times \left(\dfrac{2}{3} \times \dfrac{3}{8}\right) = \left(\dfrac{1}{3} \times \dfrac{2}{5}\right) \times \dfrac{3}{8}$

Commutative property w.r.t. multiplication.

(vi) $\dfrac{3}{8} \times \left(\dfrac{1}{2} + \dfrac{3}{5}\right) = \dfrac{3}{8} \times \dfrac{1}{2} + \dfrac{3}{8} \times \dfrac{3}{5}$

Sol:

LHS   RHS

$\dfrac{3}{8} \times \left(\dfrac{1}{2} + \dfrac{3}{5}\right) = \dfrac{3}{8} \times \dfrac{1}{2} + \dfrac{3}{8} \times \dfrac{3}{5}$

$\dfrac{3}{8} \times \left(\dfrac{5 + 6}{10}\right)$

$\dfrac{3}{8} \times \dfrac{11}{10}$

$= \dfrac{33}{80}$

RHS

$\dfrac{3}{8} \times \dfrac{1}{2} + \dfrac{3}{8} \times \dfrac{3}{5}$

$= \dfrac{3}{16} + \dfrac{9}{40}$

$\dfrac{3 \times 5 + 2 \times 9}{80}$

$= \dfrac{15 + 18}{80} = \dfrac{33}{80}$

So,

$\dfrac{3}{8} \times \left(\dfrac{1}{2} + \dfrac{3}{5}\right) = \dfrac{3}{8} \times \dfrac{1}{2} + \dfrac{3}{8} \times \dfrac{3}{5}$

Distributive property of multiplication over subtraction.

2. **Find each sum or difference**

(i) $\dfrac{x}{8} + \dfrac{4x}{8}$

Sol: $\dfrac{x}{8} + \dfrac{4x}{8}$

$= \dfrac{x + 4x}{8} = \dfrac{5x}{8}$

(ii) $-2\dfrac{1}{6}y + 8\dfrac{5}{8}y$

Sol: $-2\dfrac{1}{6}y + 8\dfrac{5}{8}y$

$= -2\dfrac{1}{6}y + 8\dfrac{5}{8}y$

$$= \frac{13}{6}y + \frac{69}{8}y$$

$$= \frac{4 \times 13y + 3 \times 39y}{24}$$

$$= \frac{52y + 117y}{24}$$

$$= \frac{169y}{24}$$

$$= 7\frac{1}{24}y$$

(iii) $\frac{12}{m} - \frac{9}{m}$

Sol: $\frac{12}{m} - \frac{9}{m}$

$$= \frac{12 \times 1 - 1 \times 9}{m}$$

$$= \frac{12 - 9}{m} = \frac{3}{m}$$

EXERCISE 2.5

1. Compare the following rational numbers by substituting $<, >$ or $=$

(i) $\frac{3}{7}, \frac{5}{21}$

Sol: $\frac{3}{7}, \frac{5}{21}$

$$= \frac{3}{7} > \frac{5}{21}$$

$$= \frac{3 \times 3 > 5 \times 1}{21}$$

$$= \frac{9 > 5}{21}$$

$$\frac{9}{21} > \frac{5}{21}$$

$$\frac{3}{7} > \frac{5}{21}$$

(ii) $-\frac{2}{5}, \frac{3}{5}$

Sol:

$-\frac{2}{5}, \frac{3}{5}$

$-2 < 3$

So, $-\frac{2}{5} < \frac{3}{5}$

(iii) $+\frac{7}{11}, -\frac{3}{5}$

Sol:

$+\frac{7}{11}, -\frac{3}{5}$

$= \frac{35, -21}{55}$

$35 > -21$

$\frac{7}{11} > -\frac{3}{5}$

(iv) $\frac{5}{6}, \frac{10}{12}$

Sol:

$\frac{5}{6}, \frac{10}{12}$

$= \frac{5 \times 2, 10 \times 1}{12}$

$\frac{10, 10}{12}$

$\frac{10}{12} = \frac{10}{12}$

$\frac{5}{6} = \frac{10}{12}$

(v) $\frac{6}{7}, \frac{8}{15}$

Sol:

$\frac{6}{7}, \frac{8}{15}$

$\frac{6 \times 15, 8 \times 7}{105}$

$90, 56$

$90 > 50$

$\frac{6}{7} > \frac{8}{15}$

2. Arrange the following rational numbers in descrnding order:

$$1\frac{1}{3}, \frac{3}{5}, -5\frac{7}{6}, 4\frac{2}{5}$$

Sol:

$$1\frac{1}{3}, \frac{3}{5}, -5\frac{7}{6}, 4\frac{2}{5}$$

$$= \frac{4}{3}, \frac{3}{5}, -\frac{37}{6}, \frac{22}{5}$$

$$= \frac{10 \times 4, 6 \times 3, -37 \times 5, 6 \times 22}{30}$$

$$= 40, 18, -185, 132$$

$$= \frac{132, 40, 18, -185}{30}$$

$$= 4\frac{2}{5}, 1\frac{1}{3}, \frac{3}{5}, -5\frac{7}{6} \text{ Ans.}$$

3. Arrange the following rational numbers in descending order:

$$3\frac{7}{8}, 3\frac{7}{25}, -5\frac{5}{3}, -5\frac{7}{5}$$

Sol: $$3\frac{7}{8}, 3\frac{7}{25}, -5\frac{5}{3}, -5\frac{7}{5}$$

$$= \frac{31}{8}, \frac{82}{25} - \frac{20}{3} - \frac{47}{3}$$

$$= \frac{31 \times 75, 24 \times 82, 200 \times 20 - 120 \times 47}{600}$$

$$= 325, 1968, 4000, -5640$$

$$= 3\frac{7}{8}, 3\frac{7}{25}, -5\frac{7}{12} = 5\frac{5}{3} \text{ Ans.}$$

REVIEW EXERCISE 2

1. Fill in the blanks

(i) The additive inverse of $\frac{-1}{2}$ is _____.

Sol: $\frac{1}{2}$

(ii) All integes are _____ numbers.

Sol: Rational

(iii) 0 has _____ reciprocal.

Sol: no

(iv) _____ is the reciprocal of itself.

Sol: 1

2. Choose the correct answe.

(i) What is $\frac{3}{10}$ _____ divided by $1\frac{4}{5}$?

(a) $\frac{1}{2}$ (b) $\frac{3}{8}$

(c) $\frac{1}{6}$ (d) $\frac{27}{50}$

(ii) The multiplicative inverse of $\frac{1}{4}$ is:

(a) 4   (b) -4

(c) $-\frac{1}{4}$ (d) 0

(iii) Find $\frac{13}{20} - \frac{7}{20}$. Write it in simplest form.

(a) $\frac{6}{10}$ (b) $\frac{3}{5}$

(c) $\frac{6}{20}$ (d) $\frac{3}{10}$

(iv) For any three rational numbers $\frac{a}{b}, \frac{c}{d}$ and $\frac{e}{f}$ we have . This shows which property?

(a) Associative property w.r.t multiplication

(b) Distributive property of multiplication over subtraction.

(c) Distributive property of addition over multiplication.

(d) Associative property w.r.t addition.

3. Solve the following

(i) $\frac{4}{5} + \frac{3}{7}$

Sol:

$$\frac{4}{5} + \frac{3}{7}$$

$$= \frac{4 \times 7 + 3 \times 5}{35}$$

$$= \frac{28 + 15}{35} = \frac{43}{35}$$

$$= 1\frac{8}{35} \text{ Ans.}$$

(ii) $\quad 1\frac{3}{5} - \frac{6}{11}$

Sol: $\quad 1\frac{3}{5} - \frac{6}{11}$

$$= \frac{8}{5} - \frac{6}{11}$$

$$= \frac{8 \times 11 - 6 \times 5}{55}$$

$$= \frac{88 - 30}{55} = \frac{58}{55}$$

$$= 1\frac{3}{55} \text{ Ans.}$$

(iii) $\quad 4\frac{1}{8} \times \frac{6}{11}$

Sol: $\quad 4\frac{1}{8} \times \frac{6}{11}$

$$= \frac{33}{8} \times \frac{6}{11}$$

$$\frac{3}{4} \times \frac{3}{1} = \frac{9}{4} = 2\frac{1}{4} \text{ Ans.}$$

(iv) $\quad -\frac{1}{2} \div \frac{3}{18}$

Sol: $\quad -\frac{1}{2} \div \frac{3}{18}$

$$= -\frac{1}{2} \times \frac{18}{3} = -3 \text{ Ans.}$$

4. Arrange the following rational numbers in ascending and desending order.

$$-\frac{1}{5}, \frac{6}{7}, -\frac{3}{10}, \frac{4}{7}$$

Sol: $\quad -\frac{1}{5}, \frac{6}{7}, -\frac{3}{10}, \frac{4}{7}$

$$\frac{-14, 42, -21, 40}{70}$$

$$-\frac{14}{70}, \frac{42}{70}, -\frac{21}{70}, \frac{40}{70}$$

Descending order

$$= \frac{42}{70}, \frac{40}{70}, -\frac{14}{70}, -\frac{21}{70}$$

$$= \frac{6}{7}, \frac{4}{7}, -\frac{1}{5}, -\frac{3}{10}$$

Ascending order $= -\frac{3}{10}, -\frac{1}{5}, \frac{4}{7}, \frac{6}{7}$

5. Evaluate each expession ix $x = \frac{8}{15}$, $y = 2\frac{1}{15}$ and $z = \frac{11}{15}$

(i) $\quad x + y$ (ii) $\quad z+y$
(iii) $\quad z-x$ (iv) $\quad y-z$

Sol:
(i) $\quad x + y$

$$= \frac{8}{15} + 2\frac{1}{15}$$

$$= \frac{8}{15} + \frac{31}{15}$$

$$\frac{8+31}{15} = \frac{39}{15}$$

$$= 2\frac{9}{15} = 2\frac{9}{15}$$

(ii) $\quad z + y$

$$= \frac{11}{15} + 2\frac{1}{15}$$

$$= \frac{11}{15} + \frac{31}{15}$$

$$= \frac{42}{15} = 2\frac{11}{15}$$

(iii) $\quad z - x$

$$= \frac{11}{15} - \frac{8}{15} = \frac{11-8}{15}$$

$$= \frac{3}{15}$$

(iv) $\quad y - z$

$$= 2\frac{1}{15} - \frac{11}{15} = \frac{31}{15} - \frac{11}{15}$$

$$= \frac{20}{15} = \frac{3}{4}$$

DECIMALS

EXERCISE 3.1

1. Convert the following decimals into rational numbers and also simplify where possible.

(i) 0.45

Sol: $0.45 = \dfrac{45}{100} = \dfrac{9}{20}$

(ii) 0.774

Sol: $0.774 = \dfrac{774}{1000} = \dfrac{387}{500}$

(iii) 7.2

Sol: $7.2 = \dfrac{72}{10} = \dfrac{36}{5}$

(iv) 1.5771

Sol: $1.5771 = \dfrac{15771}{1000}$

(v) 192.14

Sol: 192.14

$= \dfrac{12914}{100} = \dfrac{9607}{50}$

2. Which of the following rational numbers are non-terminating and recurring decimals?(Divide upto five decimal places)

(i) $\dfrac{5}{3}$

Sol: $\dfrac{5}{3}$

$$
\begin{array}{r}
1.66666 \\
3\overline{)5} \\
\underline{3} \\
20 \\
\underline{18} \\
20 \\
\underline{18} \\
20 \\
\underline{18} \\
20 \\
\end{array}
$$

$$
\begin{array}{r}
18 \\
\underline{20} \\
18 \\
\underline{20} \\
2 \\
\end{array}
$$

$\dfrac{5}{3} = 1.66666$

Non-Recurring   *non-terminating recurring*

(ii) $\dfrac{9}{7}$

Sol: $\dfrac{9}{7}$

$$
\begin{array}{r}
1.28571 \\
7\overline{)9} \\
\underline{7} \\
20 \\
\underline{14} \\
60 \\
\underline{56} \\
40 \\
\underline{35} \\
50 \\
\underline{49} \\
10 \\
\underline{7} \\
3 \\
\end{array}
$$

$\dfrac{9}{7} = 1.28571$

Non-Recurring

(iii) $\dfrac{16}{6}$

Sol: $\dfrac{16}{6}$

$$
\begin{array}{r}
2.66 \\
6\overline{)16} \\
\underline{12} \\
40 \\
\underline{36} \\
40 \\
\underline{36} \\
\end{array}
$$

$$\frac{16}{6} = 2.66666$$

Non-Recurring

(iv) $\frac{57}{13}$

Sol: $\frac{57}{13}$

$$
\begin{array}{r}
4.38461 \\
13\overline{)57} \\
52 \\
\hline
50 \\
39 \\
\hline
110 \\
104 \\
\hline
60 \\
52 \\
\hline
80 \\
78 \\
\hline
20 \\
13 \\
\hline
7 \\
\end{array}
$$

$$\frac{57}{13} = 4.38461$$

Non-Terminating   non recurring

(v) $\frac{342}{169}$

Sol: $\frac{342}{169}$

$$
\begin{array}{r}
2.02360 \\
169\overline{)342} \\
338 \\
\hline
400 \\
339 \\
\hline
610 \\
507 \\
\hline
1030 \\
1014 \\
\hline
160 \\
\end{array}
$$

$$\frac{342}{169} = 2.02360$$

Non-Terminating   non recurring

---

3. Which of the following are terminating and non-terminating decimals (using division method upto 5 points)?

(i) $\frac{17}{3}$

Sol: $\frac{17}{3} = 5.66666.....$Non-recurring

(ii) $\frac{135}{72}$

Sol: $\frac{135}{72}$

$$
\begin{array}{r}
1.875 \\
72\overline{)135} \\
72 \\
\hline
630 \\
576 \\
\hline
540 \\
504 \\
\hline
360 \\
360 \\
\hline
X \\
\end{array}
$$

$$\frac{135}{72} = \text{Terminating}$$

(iii) $\frac{63}{11}$

Sol: $\frac{63}{11}$

$$
\begin{array}{r}
5.72727\;---- \\
11\overline{)63} \\
55 \\
\hline
80 \\
77 \\
\hline
30 \\
22 \\
\hline
80 \\
77 \\
\hline
30 \\
22 \\
\hline
80 \\
\end{array}
$$

77

$$\frac{63}{11} = 5.72727\text{------}$$

Non-Terminating

4. Which of the following are terminating and non-terminating decimals? (without using division method).

(i) $\dfrac{21}{6}$

Sol: $\dfrac{21}{6}$ Terminating

(ii) $\dfrac{66}{16}$

Sol: $\dfrac{66}{16}$ =   Terminating

(iii) $\dfrac{8}{26}$ **Non-Terminating**

(iv) $\dfrac{25}{10}$ **Terminating**

(v) $\dfrac{6}{20}$

Sol: $\dfrac{6}{20}$ = Terminating

EXERCISE 3.2

1. Round off the following numbers upto the decimal values mentioned for each question.

(i) 5.277 (upto 2 decimal places)

Sol: 5.277 = 5.28

(ii) 262.5332 (upto 3 decimal places)

Sol: 262.5332
262.5332 = 262.533

(iii) 1.35

Sol: 1.35.5 = 1.4

(iv) 0.223

Sol: 0.223
0.223 = 0.22

(v) 0.917 (upto 2 decimal places)
0.917

Sol: 0.917 = 0.92

(vi) 72.1688 (upto 3 decimal places)

72.1688

Sol: 72.1688 = 72.169

(vii) 6.66 to the nearest lenth

Sol: 6.66 = 6.7

(viii) 53.64

Sol: 53.64 = 53.6

Review Exercise 3

1. Colour the correct answer:

(i) The ratio between the cirum- ference of a circle and its radius is a:

(a) terminating decimal
✔ (b) non-terminating recurring decimal
(c) non-terminating decimal
(d) terminating-recurring decimal

(ii) 5.36, after rounding off to nearest tenth will become

(a) 5.37   (b) 5.46
✔ (c) 5.4   (d) 5.47

(iii) 0.2727 when round off to thousandth becomes

(a) 0.2728   (b) 0.273 ✔
(c) 0.282   (d) .0.3000

(iv) If the rod is cut as shown, how many inches long will each piece be?

✔ (a) 0.625 ft   (b) 1.875
(c) 5.2 ft   (d) 7.5 ft

(v) Which decimal is equivalent to $\dfrac{1}{100}$?

(a) 0.001   (b) 0.01 ✔
(c) 0.1   (d) −0.1

2. Convert the following decimals into rational numbers and simplify:

(i) 0.63

Sol: $0.63 = \dfrac{63}{100}$

(ii) 4.26

Sol: $4.26 = \dfrac{426}{100} = \dfrac{213}{50}$

(iii) 148.47

Sol: $148.47 = \dfrac{14847}{100}$

3. Using long division, separate the terminating and non-terminating

decimals, (divide upto 5 decimal places)

(i) $\dfrac{25}{35}$

Sol: $\dfrac{25}{35}$

```
        0.71428
    35) 250      |
        245
        ---
         50
         35
        ---
        150
        140
        ---
        100
         70
        ---
        300
        280
        ---
         20
```

$\dfrac{25}{35} = 0.71428$　　　Non-terminating

(ii) $\dfrac{135}{37}$

Sol: $\dfrac{135}{37}$

```
        3.64864
    37) 135      |
        111
        ---
        240
        222
        ---
        180
        148
        ---
        320
        296
        ---
        240
        222
        ---
        180
        148
        ---
         32
```

$\dfrac{135}{37} =$ Non-recurring

(iii) $\dfrac{185}{111}$

Sol: $\dfrac{185}{111}$

```
         1.66666
    111) 185        | ----
         111
         ---
         740
         666
         ---
         740
         666
         ---
         740
         666
         ---
         740
```

$\dfrac{185}{111} = 1.66666$

Non-recurring

(iv) $\dfrac{69}{20}$

Sol: $\dfrac{69}{20}$

```
        3.45
    20) 69    |
        60
        ---
        90
        80
        ---
        100
        100
```

$\dfrac{69}{20} = 3.45$ Recurring

(v) $\dfrac{92}{21}$

Sol: $\dfrac{92}{21}$

```
        4.38142
    21) 92      |
        84
        ---
        80
        63
        ---
        170
```

$$\frac{168}{40}$$

$$\frac{21}{90}$$

$$\frac{84}{60}$$

$$\frac{92}{20} = 4.38142$$

Non-recurring

4. Without division, using the rule separate the terminating and non-terminating decimals:

(i) $\frac{47}{40}$

Sol: $\frac{47}{40} = ?$

```
      1.175
  40) 47    |
      40
      ──
      70
      40
      ───
      300
      280
      ───
      200
      200
      ───
```

$\frac{47}{40} = 1.175$ Terminating

(ii) $\frac{104}{36}$

Sol: $\frac{104}{36} = ?$

```
      2.8888
  36) 104    |
      72
      ───
      320
      288
      ───
      320
      288
      ───
      320
      288
      ───
      320
```

$$\frac{104}{36} = \frac{2 \times 2 \times 2 \times 13}{2 \times 2 \times 3 \times 3}$$

$$\frac{104}{36} = \text{Non-Terminating}$$

(iii) $\frac{84}{105}$

Sol: $\frac{84}{105}$

$$\frac{84}{105} = \frac{2 \times 2 \times 3 \times 7}{3 \times 5 \times 7}$$

$$= \frac{12}{5} \quad \text{Terminating}$$

(iv) $\frac{27}{93}$

Sol: $\frac{27}{93}$

$$\frac{27}{93} = \frac{3 \times 3 \times 3}{3 \times 31}$$

$$= \frac{9}{31} \quad \text{Non-Terminating}$$

(v) $\frac{37}{21}$

Sol: $\frac{37}{21}$ Non-Terminating

(vi) $\frac{49}{71}$

Sol: $\frac{49}{71}$

$$\frac{7 \times 7}{71} \quad \text{Non-Terminating}$$

(vii) $\frac{21}{63}$

Sol: $\frac{21}{63} = \frac{3 \times 7}{3 \times 3 \times 7} = \frac{1}{3}$

Non-Terminating

5. Divide the following fractions and determine the non-termi- nating and non-terminating recurring decimal, (carry out division upto 5 decimal places)

(i) $\dfrac{3}{7}$

Sol: $\dfrac{3}{7} =$

$\dfrac{3}{7} = 0.42857$ Non-Terminating

(ii) $\dfrac{1}{27}$

Sol: $\dfrac{1}{27}$

$$27 \overline{)100}\ (0.037007$$
$$\underline{89}$$
$$190$$
$$\underline{189}$$
$$100$$
$$\underline{189}$$
$$1$$

Non-Terminating

$\dfrac{1}{27} = 0.37007\ldots$

(iii) $\dfrac{2}{26}$

Sol: $\dfrac{2}{26} = \dfrac{1}{13}$

$$13 \overline{)100}\ (0.076919$$
$$\underline{91}$$
$$90$$
$$\underline{78}$$
$$120$$
$$\underline{117}$$
$$30$$
$$\underline{17}$$
$$130$$
$$\underline{117}$$
$$130$$

$\dfrac{2}{26} = 0.076919\text{-------}$

Non-Terminating

(iv) $\dfrac{2}{7}$

Sol: $\dfrac{2}{7} = ?$

$$7 \overline{)20}\ (0.28571$$
$$\underline{14}$$
$$60$$
$$\underline{56}$$
$$40$$
$$\underline{35}$$
$$50$$
$$\underline{49}$$
$$10$$
$$\underline{7}$$
$$3$$

$\dfrac{2}{7} = 0.28571\ldots$

Non-Terminating

(v) $\dfrac{1}{81}$

Sol: $\dfrac{1}{81} = ?$

$$81 \overline{)100}\ (0.012345$$
$$\underline{81}$$
$$190$$
$$\underline{162}$$
$$280$$
$$\underline{243}$$
$$370$$
$$\underline{324}$$
$$460$$
$$\underline{405}$$
$$55$$

$\dfrac{1}{81} = 0.012345\ldots$

Non-Terminating

6. **Round off the following to the desired decimal place as mentioned against each question.**

(i) 5.72 Sol: 5.72

5.72 = 5.7

(ii) 0.092   Sol: 0.092   0.09 Ans.

(iii) 4.79   Sol: 4.79

           4.79 = 4.8

(iv) 13.9345   Sol: 13.9345

    13.935 = 1.4 Ans.

☆☆☆

Unit 4

EXPONENTS

EXERCISE 4.1

1. Write the base and exponent in each of the following:

(i) 2^5

Sol:
Base	Exponent
2	5
-5	7

(ii) -5^7

Sol: -5   7

(iii) $\left(\dfrac{8}{5}\right)^{25}$

Sol: $\dfrac{8}{5}$ 25

(iv) $(100)^{10}$

Sol: 100   10

(v) $\left(\dfrac{125}{32}\right)^{-12}$

Sol: $\dfrac{125}{32}$ -12

(vi) $(115)^{-20}$

Sol: +115   20

2. Find the value in each of the following:

(i) 2^4 Sol: $24 = 2\times2\times2\times2 = 16$

(ii) $(-3)^5$

Sol: $= -3-\times3\times-3\times-3\times-3 = -343$

(iii) $(15)^2$ Sol: $= 15 \times 15 = 225$

3. Simplify

(i) $3^2 \times 3^2$

Sol: $3^2 \times 3^2$

     $= 3^{2+2} = 3^4$

$3^4 = 3\times3\times3\times3 = 81$

(ii) $5^{-4} \times 5^6$

Sol: $5^{-4} \times 5^6$

   $= 5^{-4+6}$

   $= 5^2$

   $= 5 \times 5 = 25$ Ans.

(iii) $\left(\dfrac{2}{7}\right)^2 \times \left(\dfrac{2}{7}\right)^{-5} \times \left(\dfrac{2}{7}\right)^7$

Sol: $\left(\dfrac{2}{7}\right)^2 \times \left(\dfrac{2}{7}\right)^{-5} \times \left(\dfrac{2}{7}\right)^7 = \left(\dfrac{2}{7}\right)^{2+7-5}$

   $= \left(\dfrac{2}{7}\right)^4 = \dfrac{2}{7} \times \dfrac{2}{7} \times \dfrac{2}{7} \times \dfrac{2}{7}$

   $= \dfrac{16}{2401}$ Ans.

(iv) $\left(\dfrac{2}{7}\right)^3 \times 3^3$

Sol: $\left(\dfrac{2}{7}\right)^3 \times 3^3 = \left(\dfrac{6}{7}\right)^3$

(v) $\left(\dfrac{5}{8}\right)^4 \times \left(\dfrac{16}{5}\right)^4$

Sol: $\left(\dfrac{5}{8}\right)^4 \times \left(\dfrac{16}{5}\right)^4$

   $= \left(\dfrac{80}{40}\right)^4 = 2^4 = 16$ Ans.

(vi) $3^2 \times 8^2$

Sol: $3^2 \times 8^2 = (24)^2$

   $= 3 \times 3 \times 8 \times 8$

   $= 9 \times 64 = 576$ Ans.

(vii) $(-4)^3 \times (-5)^3$

Sol: $(-4)^3 \times (-5)^3$

   $= 20^3$

(viii) $6^4 \times 6^7$

Sol: $= 6^4 \times 6^7$

   $= 6^{4+7} = (6)^{11}$ Ans.

4. Express the area of each figure as a monomial

(i) $5f^4g^3, 3fg^2$

Sol: $5f^4g^3, 3fg^2$

$= 5 \times 3 \; f^{4+1} \; g^{3+2}$

$= 15f^5 g^5$ **Ans.**

(ii) a^2b^2, a^2b^2

Sol: a^2b^2, a^2b^2

$(a^2b)^2$

$= a^{2+2} b^2 = a^4b^2$

5. **Express the value of each solid**

(i) $4k^3, 4k^3, 4k^3$

Sol: $(4k^3)^3$

$= 4^3 k^{3\times3} \qquad = 64k^9$

(ii) xy^3, x^3y

Sol: $xy^3 \times y \times x^3y$

$= xy^3 \times y \times x^3y$

$= x^{1+3} y^{3+1+1}$

$= x^4y^5$

(iii) $2n, 4n^3$

Sol: $(2n)^2\pi \times 4n^3$

$= 4n^2\pi \times 4n^3$

$= 16n^{2+3}\pi$

$= 16n^5\pi$

EXERCISE 4.2

1. **Simplify the following:**

(i) $\dfrac{3^8}{3^5}$

$3^8 \cdot 3^{-5} = 3^{8+(-5)}$

Sol: $= \dfrac{3^8}{3^5} = 3^{8-5} = 3^3 = 27$

(ii) $\dfrac{4^7}{4^3}$

Sol: $\dfrac{4^7}{4^3} = 4^{7-3} = 4^4 = 256$

(iii) $\dfrac{(-7)^{10}}{(-7)^5}$

$= (-7)^{10} \cdot (-7)^{-5}$

$= (-7)^{10+(-5)}$

Sol: $\dfrac{(-7)^{10}}{(-7)^5} = (-7)^{10-5} = (-7)^5$

(iv) $\dfrac{8^{13}}{8^5}$

Sol: $\dfrac{8^{13}}{8^5} = 8^{13-5} = 8^8$

(v) $\dfrac{6^5}{3^5}$

Sol: $\dfrac{6^5}{3^5}$

$= \left(\dfrac{6}{3}\right)^5 = (2)^5$

(vi) $\dfrac{(-8)^3}{(-3)^3}$

Sol: $\dfrac{(-8)^3}{(-3)^3} = -8^3 \div (3)^3$

$= \left(\dfrac{8}{3}\right)^3$

(vii) $\dfrac{(15)^2}{(7)^2}$

Sol: $\dfrac{(15)^2}{(7)^2} = (15)^2 \div (7)^2 = \left(\dfrac{15}{7}\right)^2$

(viii) $\dfrac{(-5)^{10}}{(-2)^{10}}$

Sol: $\dfrac{(-5)^{10}}{(-2)^{10}} = -5^{10} \div 2^{10} = \left(\dfrac{-5}{2}\right)^{10}$

2. **The area of rectangle is ......**

Sol: Area $= 24x^5y^2$

one side $= 3x^3y^2$

Length $= 24x^5y^3 \div 8x^3y^2$

$= \dfrac{24}{8} x^{5-3} y^{3-2} = 3x^2y$

3. **The area of the triangle is 100a2b square units. Find the height of ....**

Sol: Area $= 100a^3b$

Height $= 100a^3b \div 20a^2$

Classic Middle Guide   107   Math-7

(handwritten notes at top)

height = h
base = 20a

Area of triangle = ½bh

$\frac{100 \times 2}{20} a^{3-2}b$

$100a^3b = \frac{1}{2} \times 20a^2 \times h$

$= 10ab$ $100a^3b = 100a^2 \times h$

$h = \frac{100a^3b}{100a^2}$

$h = 10ab$

EXERCISE 4.3

Simplify the following:

1.
(i) $(34)^0$ Sol: $(34)^0 = 1$

(ii) $51 \times (200)^0$

Sol: $51 \times (200)^0$
$= 51 \times 1 = 51$

(iii) $\left(\frac{7}{2}\right)^{-3}$

Sol: $\left(\frac{7}{2}\right)^{-3}$

$= \left(\frac{7}{2}\right)^{-3} = \left(\frac{7^{-3}}{2^{-3}}\right) = \frac{343}{8}$

2. **Simplify the following:**

(i) $(3^4)^2$

Sol: $(34)^2 = 3^{4 \times 2} = 3^8$

(ii) $\left[(5)^{-4}\right]^2$

Sol: $\left[(5)^{-4}\right]^2 = 5^{-4 \times 2} = 5^{-8} = \left(\frac{1}{5}\right)^8$

(iii) $\left[(-7)^3\right]^5$

Sol: $\left[(-7)^3\right]^5 = -7^{3 \times 5} = -7^{15}$

(iv) $[a^2 b^3]^4$

Sol: $(a^2 b^3)^4$
$= a^{2 \times 4} b^{3 \times 4}$
$= a^8 b^{12}$

(v) $\left[\left(\frac{6}{5}\right)^2\right]^3$

Sol: $\left[\left(\frac{6}{5}\right)^2\right]^3 = \left(\frac{6}{5}\right)^{2 \times 3} = \left(\frac{6}{5}\right)^6$

(vi) $\left[\left(\frac{3}{8}\right)^2\right]^5$

Sol: $\left[\left(\frac{3}{8}\right)^2\right]^5$

$= \left(\frac{3}{8}\right)^{2 \times 5} = \left(\frac{3}{8}\right)^{10}$

(vii) $\left[\left(\frac{4}{7}\right)^{-5}\right]^2$

Sol: $\left[\left(\frac{4}{7}\right)^{-5}\right]^2 = \left(\frac{4}{7}\right)^{-5 \times 2}$

$= \left(\frac{4}{7}\right)^{-10} = \left(\frac{7}{4}\right)^{10}$

(viii) $\left[\left(+\frac{18}{5}\right)^{-2}\right]^7$

Sol: $\left[\left(+\frac{18}{5}\right)^{-2}\right]^7 = \left(\frac{18}{5}\right)^{-2 \times 7} = \left(\frac{5}{18}\right)^{14}$

(x) $\left[\left(-\frac{5}{11}\right)^3\right]^6$

Sol: $\left[\left(-\frac{5}{11}\right)^3\right]^6 = \left(\frac{5}{11}\right)^{3 \times 6} = \left(\frac{5}{11}\right)^{18}$

EXERCISE 4.4

Simplify:

(i) $(-4)^4$ Sol: $(-4)^4 = 4^4 = 256$

(ii) $(-3)^5$

Sol: $(-3)^5 = -3 \times -3 \times -3 \times -3 \times -3 = -243$

(iii) $\dfrac{-2^2 \times 6^{-4}}{2^{-2} \times 4^{-3}}$

Sol: $\dfrac{-2^2 \times 6^{-4}}{2^{-2} \times 4^{-3}} = \dfrac{2^2 \times 6^{-4}}{x^{-2} \times 4^{-3}}$

$= \dfrac{2^2 \times 2^2 \times 4^3}{6^4}$

$= \dfrac{2^2 \times 2^2 \times 2^3 \times 2^3}{2^4 \times 3^4}$

Scanned with CamScanner

$$= \frac{2^{2+2+3+3-4}}{3^4} = \frac{2^6}{3^4} = \frac{64}{81}$$

(iv) $\left(\frac{7}{2}\right)^{-3} \times 49$

Sol: $\left(\frac{7}{2}\right)^{-3} \times 49$

$$= \frac{7^{-3}}{2^{-3}} \times \frac{7^2}{1} = \frac{7^{-3+2}}{2^{-3}} = \frac{-7}{2^{-3}}$$

$$= \frac{7}{8} = \frac{8}{7}$$

(v) $\dfrac{4 \times 3^3}{9 \times (-8)^2}$

Sol: $\dfrac{4 \times 3^3}{9 \times (-8)^2} = \dfrac{4 \times 3^3}{3^2 \times (-8)^2}$

$$= \frac{4 \times 3^{3-2}}{-8^2} = \frac{2^2 \times 3}{-(2)^{3\times2}}$$

$$= \frac{3}{-(2)^{6-2}} = \frac{3}{-(2)^4} = \frac{3}{16}$$

(vi) $\left(\frac{4}{5}\right)^{-6} \times \left(\frac{-4}{5}\right)^0$

Sol: $\left(\frac{4}{5}\right)^{-6} \times \left(\frac{-4}{5}\right)^0 = \left(\frac{4}{5}\right)^{-6} \times 1$

$$= \frac{4^{-6}}{5^{-6}} = \frac{5^6}{4^6} = \frac{15625}{4096}$$

(vii) $\dfrac{3^6 \times 7^4}{(-7)^3 \times (-3)^4}$

Sol: $\dfrac{3^6 \times 7^4}{(-7)^3 \times (-3)^4} = 3^6 \times 7^4 \times 7^{-3} \times 3^{-4}$

$$= 3^{6-4} \times 7^{4-3} = 3^2 \times 7^{-1}$$

$$= 9 \times -7 = -63$$

(viii) $\left(\frac{1}{4}\right)^{-6} \div (-2)^3$

Sol: $\left(\frac{1}{4}\right)^{-6} \div (-2)^3$

$$= \frac{\left(\frac{1}{4}\right)^{-6}}{(-2)^3} = \frac{4^6}{-2^3} = \frac{4096}{-8} = -512$$

(ix) $(-2)^5 \div \frac{1}{2}$

Sol: $(-2)^5 \div \frac{1}{2} = -2^5 \times 2 = -32 \times 2 = -64$

(x) $\dfrac{2^2 \times (-3)^5 \times 4^3 \times 5^2}{8 \times 9 \times 6^2 \times (-5)^4}$

Sol: $\dfrac{2^2 \times (-3)^5 \times 4^3 \times 5^2}{8 \times 9 \times 6^2 \times (-5)^4}$

$$= \frac{2^2 \times -35 \times 23 \times 23 \times 5^2}{2^3 \times 3^2 \times 2^2 \times 3^2 \times -5^4} = -\frac{24}{25}$$

REVIEW EXERCISE 4

1. Read the following statements and encircle 'T' for a true statement and 'F' for a false statement.

(i)	In 2^3, base is 3.	T/F
(ii)	In $(-5)^3$ exponent is 2.	T/F
(iii)	$2^3 \times 2^{-3} = 2^6$	T/F
(iv)	$4^2 \div 4 = 4^3$.	T/F
(v)	$\dfrac{a^m}{a^m} = a^{2m}$	T/F

Ans. (i) False (ii) False (iii) False
(iv) False (v) False

2. Fill in the blanks:

(i) $(-50)^2$ has base _____

(ii) $(a^m)^n =$ _____

(iii) $a^0 =$ _____

(iv) $2^{-3} =$ _____

(v) $2^3 \times 3^2 =$ _____

Ans.

(i)	-50	(ii)	a^{mn}	(iii)	1
(iv)	1/8	(v)	72		

Colour the correct answer:

1.

(i) $[(-2)2]^3 = $ _____

(a) 32   (b) -32

(c) 64   (d) -64

(ii) $4^{-3} = $ _____

(a) 64   (b) $\dfrac{1}{64}$

(c) -12   (d) $-\dfrac{1}{12}$

(iii) $2^0 = $ _____ .

(a) 1   (b) 0

(c) 2   (d) $\dfrac{1}{2}$

(iv) Write 4 4 4 c c c c using exponents.

(a) $3^4 4^c$ (b) $4^3 c^4$

(c) $(4c)^7$ (d) $4c$

(v) $4^2 \times 4^5 = ?$

(a) 16^7 (b) 8^7

(c) 4^{10} (d) 4^7

(vi) What is the value of $\dfrac{2^2 \times 2^3}{2^{-2} \times 2^{-3}}$?

(a) 2^{10} (b) 2

(c) 1^{10} (d) $\dfrac{1}{2}$

(vii) Which of the following expression represents the volume of the cube?

(a) $15x^3$ (b) $25x^2$

(c) $25x^3$ (d) $125x^3$

(viii) Find the ratio of the volume of the cylinder to the volume of the sphere.

(a) $\dfrac{1}{2}$ (b) 1

(c) $\dfrac{3}{2}$ (d) $\dfrac{3\pi}{2}$

Ans.

(i)	(c)	(ii)	(b)	(iii)	(a)
(iv)	(b)	(v)	(d)	(vi)	(a)
(vii)	(d)	(viii)	(c)		

4. Write base, exponant and the value in each.

(i) 2^5

Sol: base 2,   exponent = 5

value = 2^5 = 32 Ans.

(ii) $(-3)^4$

Sol: base= -3   Exponent = 4

value = $-3^4 = = 81$

5. Simplify

(i) $(-5)^3 \times (-5)^2$

Sol: $(-5)^3 \times (-5)^2$

$= (-5)^{3+2}$

$= (-5)^5$

$(-5)^5 = -3125$ **Ans.**

(ii) $\left(\dfrac{1}{2}\right)^4 \div \left(\dfrac{1}{2}\right)^2$

Sol: $\left(\dfrac{1}{2}\right)^4 \div \left(\dfrac{1}{2}\right)^2 = \dfrac{\left(\dfrac{1}{2}\right)^4}{\left(\dfrac{1}{2}\right)^2}$

$= \left(\dfrac{1}{2}\right)^{4-2}$

$= \left(\dfrac{1}{2}\right)^2 = \dfrac{1}{4}$ Ans.

(iii) $\left(\dfrac{3}{4}\right)^2 \times \left(\dfrac{4}{3}\right)^2$

Sol: $\left(\dfrac{3}{4}\right)^2 \times \left(\dfrac{4}{3}\right)^2 = \left(\dfrac{3}{4}\right)^2 \div \left(\dfrac{3}{4}\right)^2$

$= \left(\dfrac{3}{4}\right)^{2-2} = \left(\dfrac{3}{4}\right)^0 = 1$

(iv) $(1000)^0 \times 500$

Sol: $(1000)^0 \times 500 = 1 \times 500 = 500$

(v) $(-6)^4 \div (-6)^2$

Sol: $(-6)^4 \div (-6)^2$

$= -6^{4-2} = (-6)^2$

$= -6^2$

$6^2 = 36$

(vi) $\left[(-5)^4\right]^5$

Sol: $\left[(-5)^4\right]^5 = (-5)^{4 \times 5}$

$= -5^{20} = 5^{20}$

(vii) $\dfrac{3^2 \times 5^3 \times 7^3}{15 \times 49}$

Sol: $\dfrac{3^2 \times 5^3 \times 7^3}{15 \times 49} = \dfrac{3^2 \times 5^3 \times 7^3}{3 \times 5 \times 7^2}$

$= 3^{2-1} \times 5^{3-1} \times 7^{3-2}$

$= 3 \times 5^2 \times 7 = 525$ Ans.

(viii) $(-2v^3 w^4)^3 (-3 vw^3)^2$

Sol: $(-2v^3 w^4)^3 (-3 vw^3)^2$

$= (-2 v^{3 \times 3} w^{4 \times 3}) (-3^2 v^2 w^{3 \times 2})$

$= (-2^3 v^9 w^{12}) (-3^2 v^2 w^6)$

$= -8 \times 9 \, v^{9+2} \, w^{12+6}$

$= -72 \, v^{11} \, w^{18}$

=====

Unit 5

SQUARE ROOT OF POSITIVE NUMBERS

EXERCISE 5.1

1.   Check the following numbes, whether they are perfect squares o not.

16, 18, 25, 33, 200

Ans.   16, 25 are perfect square and 18, 33, 200 are not perfect square.

2.   Find square of the following numbers.

(i) 35   (ii) 911   (iii) 2170 (iv) 1.25

Ans.   (i) $(35)^2 = 1225$

(ii) $(911)^2 = 829921$

(iii) $(2170)^2 = 4708900$

(iv) $(1.25)^2 = 1.5625$

3.   Do not take square and tell whether the square of following numbers will be even or odd.

(i)   34   Ans.   even

(ii)   751   Ans.   odd

(iii)   1060   Ans.   even

(iv)   32507 Ans.   odd

EXERCISE 5.2

1.   Find the square root of the following

(i)   3481

Sol: $\sqrt{3481}$ = ?

	59
5	3481
	25
109	981
	981

$\sqrt{3481} = 59$ Ans.

(ii)   2116

Sol: $\sqrt{2116}$ = ?

	46
4	2116
	16
86	516
	516

$\sqrt{2116} = 46$ Ans.

(iii)   15129

Sol: $\sqrt{15129}$ = ?

	123
1	15129
	1
22	51
	44
243	729
	729

$\sqrt{15129} = 123$ Ans.

(iv) $\dfrac{17161}{169}$

Sol: $\sqrt{\dfrac{17161}{169}}$ = ?

```
      131
   ┌─────────
 1 │ 17161
   │ 1
   ├─────────
23 │  71
   │  69
   ├─────────
261│ 261
   │ 261
```

$$\sqrt{\frac{17161}{169}} = \frac{131}{13} = 10\frac{1}{13} \text{ Ans.}$$

(v) $\dfrac{31329}{841}$

Sol: $\sqrt{\dfrac{31329}{841}} = ?$

```
      177
   ┌─────────
 1 │ 31329
   │ 1
   ├─────────
27 │  213
   │  189
   ├─────────
347│ 2429
   │ 2429
```

```
      29
   ┌────────
 4 │ 841
   │ 4
   ├────────
49 │ 441
   │ 441
```

$$\sqrt{\frac{31329}{841}} = \frac{177}{29} = 6\frac{3}{29} \text{ Ans.}$$

$$\sqrt{\frac{6561}{16}} = \frac{81}{4} = 20\frac{1}{4} \text{ Ans.}$$

(vi) $410\dfrac{1}{16}$

Sol: $\sqrt{410\dfrac{1}{16}} = \sqrt{\dfrac{6561}{16}} = ?$

```
      81
   ┌────────
 8 │ 6561
   │ 64
   ├────────
161│ 161
   │ 161
```

(vii) **50.253921**

Sol: $= \sqrt{50.253921} = ?$

```
        7.089
      ┌──────────────
   7  │ 50.253921
      │ 49
      ├──────────────
 1408 │  12539
      │  11264
      ├──────────────
14169 │  127521
      │  127521
```

$$\sqrt{50.253921} = 7.089 \text{ Ans.}$$

(viii) **0.0676**

Sol: $\sqrt{0.0676} = ?$

```
      0.026
   ┌──────────
 4 │ 0.0676
   │ 4
   ├──────────
46 │  276
   │  276
```

$$\sqrt{0.0676} = 0.26 \text{ Ans.}$$

(ix) **152.7690**

Sol: $\sqrt{152.7690} = ?$

```
       12.36
    ┌──────────────
 1  │ 152.7690
    │ 1
    ├──────────────
22  │  52
    │  44
    ├──────────────
243 │  876
    │  729
    ├──────────────
2466│  14790
    │  14790
```

$$\sqrt{152.7690} = 12.36 \text{ Ans.}$$

(x) **1.2769**

Sol: $\sqrt{1.2769} = ?$

```
       1.13
    ┌──────────
 1  │ 1.2769
    │ 1
    ├──────────
21  │  27
    │  27
    ├──────────
223 │  669
    │  669
```

$$\sqrt{1.2769} = 1.13 \text{ Ans.}$$

EXERCISE 5.3

(1) Find the square root of the following by factorization method:

(i) 169

Sol: $\sqrt{169}$

$$13 \mid \underline{169}$$
$$ 13$$

$\sqrt{13 \times 13} = 13$ Ans.

(ii) 1764

Sol: $\sqrt{1764} = ?$

$$
\begin{array}{r|l}
2 & 1764 \\ \hline
2 & 882 \\ \hline
21 & 441 \\ \hline
& 21
\end{array}
$$

$\sqrt{1764} = \sqrt{2 \times 2 \times 21 \times 21}$

$\sqrt{2^2 \times 21^2} = 2 \times 21 = 42$ Ans.

(iii) 1024

Sol: $\sqrt{1024} = ?$

$$
\begin{array}{r|l}
2 & 1024 \\ \hline
2 & 512 \\ \hline
2 & 256 \\ \hline
2 & 128 \\ \hline
8 & 64 \\ \hline
& 8
\end{array}
$$

$\sqrt{1024} = \sqrt{2 \times 2 \times 2 \times 2 \times 8 \times 8}$

$= \sqrt{2^2 \times 2^2 \times 8^2}$

$2 \times 2 \times 8 = 32$ Ans.

(iv) $\dfrac{36}{25}$

Sol: $\sqrt{\dfrac{36}{25}} =$

$\sqrt{\dfrac{6 \times 6}{5 \times 5}} = \sqrt{\dfrac{6^2}{5^2}}$

$\dfrac{6}{5} = 1\dfrac{1}{5}$ Ans.

(v) $10\dfrac{9}{16}$

Sol: $10\dfrac{9}{16} = \sqrt{\dfrac{169}{16}} = \sqrt{\dfrac{13 \times 13}{4 \times 4}}$

$\sqrt{\dfrac{13^2}{4^2}} = \dfrac{13}{4} = 3\dfrac{1}{4}$ Ans.

(vi) $\dfrac{22500}{324}$

Sol: $\dfrac{22500}{324} = \sqrt{\dfrac{22500}{324}} = ?$

$$
\begin{array}{r|l}
5 & 22500 \\ \hline
5 & 4500 \\ \hline
3 & 900 \\ \hline
3 & 300 \\ \hline
10 & 100 \\ \hline
& 10
\end{array}
$$

$\sqrt{\dfrac{22500}{324}} = \sqrt{\dfrac{5 \times 5 \times 3 \times 3 \times 10 \times 10}{18 \times 18}}$

$\sqrt{\dfrac{5^2 \times 3^2 \times 10^2}{18^2}} = \dfrac{5 \times 3 \times 10}{18}$

$\dfrac{150}{18} = 8\dfrac{6}{18} = 8\dfrac{1}{3}$ Ans.

(vii) 1.44

Sol: $\sqrt{1.44} =$

$\sqrt{1.2 \times 1.2} = \sqrt{(1.2)^2} = 1.2$ Ans.

(viii) 19.36

Sol: $\sqrt{19.36} = \sqrt{\dfrac{1936}{100}} =$

$$
\begin{array}{r|l}
4 & 1936 \\ \hline
4 & 484 \\ \hline
11 & 121 \\ \hline
& 11
\end{array}
$$

$\sqrt{\dfrac{1936}{100}} = \sqrt{\dfrac{4 \times 4 \times 11 \times 11}{10 \times 10}}$

$\dfrac{4 \times 11}{10} = \dfrac{44}{10} = 4.4$ Ans.

(ix) 10.24

Sol: $\sqrt{10.24} = \sqrt{\dfrac{1024}{100}} = ?$

$$
\begin{array}{r|l}
4 & 1024 \\ \hline
4 & 256 \\ \hline
8 & 164 \\ \hline
& 8
\end{array}
$$

$\sqrt{\dfrac{1024}{100}} = \sqrt{\dfrac{4 \times 4 \times 8 \times 8}{10 \times 10}}$

$$\frac{4 \times 8}{10} = \frac{32}{10} = 3.2 \text{ Ans.}$$

1030.41

Sol:
$$\sqrt{1030.41} = \sqrt{\frac{103041}{100}} = ?$$

$$\sqrt{\frac{103041}{100}} = \sqrt{\frac{3 \times 3 \times 107 \times 107}{10 \times 10}}$$

$$\frac{3 \times 107}{10} = \frac{321}{10} = 32.1 \text{ Ans.}$$

EXERCISE 5.4

1. The area of a squared region is 31.36m . Find the length of its side.

Sol:

Area $= 31.36 \text{ cm}^2$

Length of side $= \sqrt{31.36} = ?$

4	3136
4	784
14	196
	14

$$\sqrt{31.36} = \sqrt{\frac{3136}{100}}$$

$$\sqrt{\frac{3136}{100}} = \sqrt{\frac{4 \times 4 \times 14 \times 14}{10 \times 10}} = \frac{4 \times 14}{10}$$

$$= \frac{56}{10} = 5.6 \text{ m}^2 \text{ Ans.}$$

2. The Area of a squared filed is 4624 square kilometers. Find the length of its side.

Sol:

Area $= 4624 \text{ m}^2$

Length of 1 side $= \sqrt{4624}$

68

6	4624
	36
128	1024
	1024

$\sqrt{4624} = 68 \text{ m}^2$

3. In a garden, 676 trees are planted in rows in such a way that the number of rows equal to the number of trees in a row. How many trees are there in each row?

Sol:
$$\sqrt{676} = \sqrt{26 \times 26}$$
$$= 26 \text{ Ans.}$$

4. The area of a square shaped farm is 6400m . Find the perimeter of the farm.

Sol:
$$\sqrt{6400} = \sqrt{80 \times 80} = 80$$
Length of 1 side = 80 m
Perimeter = 80 × 4 = 320 meter Ans.
Perimeter of square = 40 × 4 = 160 m

5.

Sol: 121 yd²

length of one side $= \sqrt{121}$
$= 11$ yds

EXERCISE 5.5

3. Find the squares of:
(i) 30
Sol: $(30)^2 = 30 \times 30 = 900$
(ii) 65
Sol: $65 \times 65 = 4225$

4. Find the square root of the following by division method:
(i)   7921
Sol: $\sqrt{7921}$

89

8	7921
	64
169	1521
	1521

$\sqrt{7921} = 89$

(ii) $\frac{3136}{4225}$

Sol: $\sqrt{\frac{3136}{4225}}$

65

6	4225
	36
125	625
	625

56

5	3136
	25

$$106\, \boxed{\begin{array}{c} 636 \\ 636 \end{array}}$$

$$\sqrt{\frac{3136}{4225}} = \frac{56}{65} \text{ Ans.}$$

(iii) 5.5225

Sol: $\sqrt{5.5225} = \sqrt{\frac{55225}{10000}}$

$$\begin{array}{r|l}
 & 235 \\
2 & 55225 \\
 & 4 \\
\hline
43 & 152 \\
 & 152 \\
\hline
465 & 2325 \\
 & 2325 \\
\end{array}$$

$$\sqrt{\frac{55225}{10000}} = \sqrt{\frac{235 \times 235}{100 \times 100}}$$

$$\frac{235}{100} = 2.35 \text{ Ans.}$$

5. Find square root of the following by factorization method:

(i) 1764

Sol: 1764?

$$\begin{array}{r|r}
2 & 1764 \\
2 & 882 \\
3 & 441 \\
3 & 147 \\
7 & 49 \\
 & 7 \\
\end{array}$$

$$1764 = \sqrt{2 \times 2 \times 3 \times 3 \times 7 \times 7}$$
$$= 2 \times 3 \times 7 = 42$$

(ii) $\frac{4624}{1444}$ Sol: $\sqrt{\frac{4624}{1444}}$

$$\begin{array}{r|r}
2 & 4624 \\
2 & 2312 \\
2 & 1156 \\
2 & 578 \\
17 & 289 \\
 & 17 \\
\end{array}$$

$$\sqrt{\frac{4624}{1444}} = \sqrt{\frac{2 \times 2 \times 2 \times 2 \times 17 \times 17}{2 \times 2 \times 19 \times 19}}$$

$$\frac{2 \times 2 \times 17}{2 \times 19} = \frac{68}{38} = \frac{34}{19}$$

$$= 1\frac{15}{19} \text{ Ans.}$$

(iii) 77.44

Sol: $\sqrt{77.44} = \sqrt{\frac{7744}{100}}$

$$\begin{array}{r|r}
2 & 7744 \\
2 & 3872 \\
2 & 1936 \\
2 & 968 \\
2 & 484 \\
2 & 242 \\
11 & 121 \\
 & 11 \\
\end{array}$$

$$\sqrt{\frac{7744}{100}} = \sqrt{\frac{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11}{10 \times 10}}$$

$$= \frac{2 \times 2 \times 2 \times 11}{10} = \frac{88}{10} = 8.8 \text{ Ans.}$$

6. Area of a square shaped garden is 30.25m. Find its perimeter.

Sol:

$$\begin{array}{r|l}
 & 55 \\
5 & 30.25 \\
 & 25 \\
\hline
105 & 525 \\
 & 525 \\
\end{array}$$

Area of garden = 30.25 m²

1 side of garden = $\sqrt{30.25}$ = 5.5 m

Perimeter = 5.5 × 4 = 22 m

7. Arrange 64 students of 10th class in rows in such a way that the number of rows and number of students are equal. Find the number of students in each row.

Sol: Total students = 64

Number of rows = $\sqrt{64} = \sqrt{8 \times 8} = 8$

Number of students in 1 row = 8 **Ans.**

8.

Sol: Area = 1600m^2

$\sqrt{1600}$ = 40m

wire = 40 × 4 = 160 m

REVIEW EXERCISE 5
(Objective Type)

Fill in the blanks.

1. The square of an even number is _____ number.

(ii) The square of a proper fraction is _____ than itself.

(iii) The square of and odd number is _____ number.

(iv) The square root of 121 is _____.

(v) 625 is the perfect square of _____.

Ans. (i) an even (ii) less (iii) an odd (iv) 11 (v) 25

Choose the correct answer.

2.
(i) 169 is the perfect square of
   (a) 9   (b) 13 ✓
   (c) 19   (d) 23

(ii) 28 is the square root of
   (a) 144   (b) 742
   (c) 784 ✓   (d) 169

(iii) The square of any even number is
   (a) even ✓   (b) odd
   (c) integer (d) fraction

(iv) The symbol '$\sqrt{}$' is called.
   (a) index   (b) radical ✓
   (c) radicand (d) square root

(v) The area of a square whose length of one side is 8m is _____
   (a) 16m^2 (b) 36m^2
   (c) 32m^2 (d) 64m^2 ✓

(vi) Which of the following is a rational number.
   (a) $-\sqrt{361}$ (b) $\sqrt{125}$ ✓
   (c) $\sqrt{200}$ (d) $\sqrt{325}$

(vii) Which of the following is not a perfect square.
   (a) 18ft^2 ✓ (b) 36f^2
   (c) 9ft^2 (d) 6ft^2

3. Find the square of

(i) 30   (ii) 65
(i) 30   Sol. 30 = (30)^2 = 900
(ii) 65   Sol. 65 = (65)^2 = 42.25

Q.4. Find the square root of the following:

(i) 7921, (ii) $\dfrac{3136}{4225}$ (iii) 5.525

(i) 7921

Sol.

```
        89
   8) 7921
      64
      ___
  169) 1521
       1521
       ____
        0
```

$\sqrt{7221}$ = 89 Ans.

(ii) $\dfrac{3136}{4225}$

Sol.
```
        56
   5) 3136
      35
      ___
  106) 636
       636
       ___
        0
```

$\sqrt{\dfrac{3136}{4225}} = \dfrac{56}{65}$ Ans.

(iii) 5.525

Sol.
```
        2.35
   2) 5.5225
      4
      ___
  43) 152
      129
      ___
 465) 2325
      2325
      ____
        0
```

$\sqrt{5.5225}$ = 2.35 Ans.

Q.5. Find the square root of the following by factorization method.

(i) 1764, (ii) $\dfrac{4625}{1444}$ (iii) 77.44

(i) 1764

Sol.

```
2 | 1 7 64
2 | 8 8 2
3 | 3 4 1
3 | 1 4 7
7 | 4 9
  | 7
```

$\sqrt{1764} = 2 \times 2 \times 3 \times 3 \times 7 \times 7$

$= 2 \times 3 \times 7 = 42$ Ans.

(ii) $\dfrac{4625}{1444}$

Sol.

```
2 | 4 6 2 4
2 | 2 3 1 2
2 | 1 5 6
2 | 5 7 8
17 | 2 8 9
   | 17
```

$\sqrt{4624} = \sqrt{2 \times 2 \times 2 \times 2 \times 17 \times 17}$

$= \dfrac{2 \times 2 \times 17}{2 \times 19}$

$\sqrt{1444} = \sqrt{2 \times 2 \times 19 \times 19}$

$= \dfrac{68}{38}$ Ans.

(iii) 77.44

Sol.

```
2 | 77.44
2 | 38.72
2 | 19.36
2 | 9.68
2 | 484
```

```
2 | 242
11 | 121
   | 11
```

$\sqrt{7744} = \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11}$

$= 2 \times 2 \times 2 \times 11$

$\sqrt{7744} = 88, \sqrt{77.44} = 8.8$ Ans.

Q.6. Area of a square shaped garden is 30.25 m². Find its perimeter.

Sol. Area = 30.25 25m²

One side of square = $\sqrt{30.25}$ = 5.5m

Perimeter of square = 5.5 × 4

= 22m Ans.

Q.7. Arrange 64 students of 10th class in rows in such a way that the numbers of rows and number of students are equal. Find the number of students in each row?

Sol. Total number of students = 64

Number of students in each row = ?

$\sqrt{64}$ = 8 students.

Q. 8. Area of a squre field is 1600 m². How much long wire is required for its boundries?

Sol. Area of square field = 1600m2

One side of square field

= $\sqrt{1600}$ = 40m

Wire required for boundry

= 400 × 4 = 160m

======

Unit 6

DIRECT AND INVERSE VARIATION

EXERCISE 6.1

1. Find "x" in the following proportions.

(i) 5:x = 15:60

Sol: 5:x = 15 : 60

15 × 5 = 5 × 60

15x = 300

$x = \dfrac{300}{15} = 20$

$7 : 14 = 15 : x$

i) $7 : 14 = 15 : x$

Sol: $7 \times x = 14 \times 15$

$7x = 14 \times 15$

$x = \dfrac{14 \times 15}{7}$

$x = 2 \times 15 = 30$

iii) $12 : x = 8 : 14$

Sol: $12 : x = 8 : 14$

$8 \times x = 12 \times 14$

$x = \dfrac{12 \times 14}{8} = 21$

iv) $x : 3 = 2.5 : 1.5$

Sol: $x : 3 = 2.5 : 1.5$

$x \times 1.5 = 3 \times 2.5$

$x = \dfrac{3 \times 2.5}{1.5} = 5$

2. **Check weather 4,16 and 64 are in proportion.**

Sol: $4 \times 4 = 16 \times 4 = 64$

yes   4, 16 and 64 are in proportion

3. **Find x if 6, 16 and x one in continued proportion.**

Sol: 8, 16 and x

$8 \times 2 = 16 \times 2 = 32$

$x = 32$

4. **A survay showed that the colour of cars chosen by people silver, white and black were in teh ratio of 7 : 4 : 2 respectively. If a dealer has sold 1300 cars in a year. How many cars of each colour did he sell?**

Sol: Silver : white : black

    7   : 4   : 2

sum of ratio = 7+4+2 = 13.

    Total cars sold = 1300

silver cars sold = $\dfrac{1300 \times 7}{13} = 700$

white cars sold = $\dfrac{1300 \times 4}{13} = 400$

black cars sold = $\dfrac{1300 \times 2}{13} = 200$

5. **Jamil earns Rs. 18000 per month and** spends Rs. 16000. Find the ratio in rupees of

(i) his income to expenditue

(ii) his savings to his earnings

Sol: Jamil's earning = Rs 18000

    Jamil's expenditure = Rs 16000

    Jamil's saving = Rs. 18000 - Rs16000

    = Rs. 2000

    Income = expenditure = 18000 : 16000

    = 18 : 16

    = 9 : 8

saving = earning = 2000 : 18000

    = 2 : 18

    = 1 : 9

6. **In an examination hall the ratio of invigilators to the students is 1:30. How many invigilators will be requied for 210 students?**

Sol: invigilators : students = 1 : 30

    $30 : 1 :: 210 : x$

    $30x = 210 \times 1$

    $x = \dfrac{210 \times 1}{30}$

    = 7 invigilatos

7. **The ratio between the measue of three angles in a triangle is 1:2:3. Find the measure of each angle.**

Ratio = 1:2: 3

sum of ratio = 1+2+3 = 6

sum of angels of triangle = 180°

measure of 1st angle = $\dfrac{180^{\circ}}{6} \times 1 = 30^{\circ}$

measure of 2nd angle = $\dfrac{180^{\circ}}{6} \times 2 = 60^{\circ}$

measure of 3rd angle = $\dfrac{180^{\circ}}{6} \times 3 = 90^{\circ}$

8. **A printer can print 450 pages in 30 minutes whereas a photocopier can print 30 pages per minute which one is speedy?**

Sol: 30 minutes work = 450 pages

printer = 1 munute work = $\dfrac{450}{30}$ = 15

photo copier = 1 minute = 30 pages printer is speedy

EXERCISE 6.2

1. A machine can fill 300 bottles in 4 hours. How much time will be required for six such machines to fill 9000 bottles?

Sol.

Time in filling 300 bottles	=	400 hours
Time in filling 9000 bottles	=	$\dfrac{900}{300}$ × 40 × 30 = 120 hrs.

2. A tubewell can suck 100 litres per minute. How much water can it draw per hour?

Sol.

Water sucked in 1 minute	=	100 ltr.
Water sucked in 60 minutes	=	60 × 100 = 600 ltr.

3. A jet fighter is flying at 594 m/s. Show its speed in km/h.

Sol.

Speed in 1 second	=	594 m
Speed in 60 × 60 seconds	=	$\dfrac{594 \times 60 \times 60}{1000}$
	=	$\dfrac{21384}{10}$
	=	2138.4 km/ sec.

4. The speed of sound at 25C° is about 340 m/s. Convert this speed in km/h.

Sol.

Travel in 60×60 seconds	=	450km
Travel in 1 second	=	$\dfrac{450}{60 \times 60} = \dfrac{450}{360}$
	=	$\dfrac{45}{36} \times \dfrac{5}{8}$ km/sec
	or	$\dfrac{5 \times 1000}{8}$
	=	625 m/sec

5. A bullet train travels at a speed of 450 km/h. Convert this speed into m/s.

Sol.

60 minutes travel	=	450 × 1000
1 minute travel	=	$\dfrac{450000}{60}$
	=	75000 m/s

6. When a paratrooper jumps from the aircraft before opening the parachute, its speed becomes 50 m/s in 5 seconds. Wru.; will be this speed in km/h.

Sol.

Speed in m/s	=	50m in 5 seconds
Speed in kh/hr.	=	$\dfrac{50 \times 60 \times 60}{5 \times 1000}$
	=	180 km/hr.

7. The fastest bowling speed of Shoaib Akhtar is 160 km/h. show this speed in m/s.

Sol.

Speed in 60×60 seconds	=	1000 × 160
Speed in 1	=	$\dfrac{160000}{36000} = \dfrac{400}{9}$
	=	1250 m Ans.

8. A cheetah runs at 90 km/h for 50 seconds. How much distance will it cover?

Sol.

Race made in 60×60	=	90 km
Race made in 5 seconds	=	$\dfrac{90 \times 1000}{3600}$
	=	1250 m Ans.

Review Exercise 6

1. Choose the correct answer.

(i) If a : b = 3 : 6 and b : c = 9 : 12 then a : b : c will be

   (a) 3 : 6 : 12   (b) 3 : 6 : 8
   (c) 54:27:72   (d) 27:54:72 ✔

(ii) 27 : 54 can also be written as

   (a) 1:2 ✔   (b) 2 : 1
   (c) 54 × 27   (d) none of these

(ii) The ratio of an hour to a minute is

(a) 1:60 ✔   (b) 60 : 1

(c) 1 : 3600   (d) none of these

(iv) On a line two supplementary angles are in the ratio of 5: 1. The two angles will be

(a) 20° & 70° ✔   (b) 150° & 30°

(c) 1200 & 60°   (d) none of these

(v) If one quantity increases and other decreases then the two quantities are in

(a) direct proportion

(b) inverse proportion ✔

(c) continued proportion

(d) no proportion

2. Express the following ratios as continued ratios

(a) $a : b = 7 : 9$ and $b : c = 6 : 13$

Sol.

a	:	b	:	c
7	:	9		
		6	:	13
42	:	54	:	117
14	:	18	:	39

(b) $x : y = 2.7 : 5.4$

$y : z = 6.3 : 9.9$

Sol.

x	:	y	:	z
2.7		5.4		
		6.3		9.8
17.01	:	34.02	:	52.82

3. A typist can type 60 words per minute. How many typists will be required to type a book of 43,200 words in 6 hours?

Words	Time	Typist
60	1 minute =	1
43200	60 minutes =	x
1	:	60 minute

$1 : x \quad :: \quad 60 \text{ words} : 43200$

$\dfrac{43200}{360 \times 60} = 2 \text{ typists}$

4. It is estimated that a building is constructed by 10 masons in 9 months. If 4 new masons join them, how long the same building will take to complete.

Sol.

Time for 10 masons	=	9 months
Time for 14 masons	=	$\dfrac{9 \times 10}{14} = \dfrac{45}{7}$
	=	$6\dfrac{2}{7}$

Unit 7

FINANCIAL ARITHMATIC

EXERCISE 7.1

1. Naeem has $2\dfrac{1}{2}$ kanal house in Hayatabad. How much property tax he will have to pay per year. If the recorded value per marla is 3 lac rupees.

Sol.

Total area	=	$2\dfrac{1}{2}$ kanals
	=	$\dfrac{5}{2} \times 20$
	=	50 marla
Rate of 1 marla	=	3 lac
Rate of 50 marlas	=	50 × 3 = 150 lac
Tax	=	$\dfrac{2}{100} \times 15000000$
	=	3 lac

2. Ajab Khan is living in a flat of 7 marla in Army flats. The property tax is not paid for five years. How much tax is due if the value of property is not recorded (one marla = 272 sq. feet).

Sol.

Total area	=	7 marlas
Area in feet	=	7 × 272
	=	1904 F2
Tax	=	$\dfrac{60 \times 1904}{9} = \dfrac{114240}{9}$
	=	Rs. 12693.33

3. A sugar mill is making sugar at the cost of Rs. 50 per kg. What will be its sales price after including GST at 16.5%?

Sol.

Cost	=	Rs. 50
Increase	=	16.5%
Sale price including GST	=	$\dfrac{50 \times 165}{100 \times 10}$
	=	8.25
Increase rate	=	50 + 8.25
	=	Rs. 58.25

4. The airfare from Peshawar to Karachi of an airline is Rs. 5700. What will be the selling price of this ticket if Rs. 1500 airport tax and GST at the rate of 16.5% are included?

Sol.

Air fare	=	Rs. 5700
GST	=	$\dfrac{5700 \times 165}{100 \times 10}$
Increase in tax	=	940.5
Airport tax	=	Rs. 1500
Sale rate	=	5700 + 940.5
	=	1500

5. Sales price of a sewing machine is Rs. 4248. (including 16.5% GST). What will be its price without GST?

Sol.

Let amount with tax	=	Rs. 100
Rate of tax	=	16.5%
Price without GST	=	100 – 16.5
	=	Rs. 83.5
If the sale price is Rs. 100 then without GST	=	83.5
If the sale price is Rs. 4258 then without GST	=	$\dfrac{83.5 \times 4248}{10 \times 100}$
	=	$\dfrac{3547280}{1000}$
	=	Rs. 3547.28

6. The sales price of a computer is

30,0007-. If the government waives off 16.5% GST on this item, what will be the new sales price?

Sol.

Sale price	=	Rs. 30,000
GST rate	=	16.5%
New sale price	=	100 – 16.5
	=	Rs. 83.5
If sale price is Rs. 100 then new price	=	Rs. 835
If sale price is Rs. 30,000 then new sale price	=	$\dfrac{83.5 \times 30000}{10 \times 100}$
	=	Rs. 25050

EXERCISE 7.2

1. Daud purchased a house for 1 million and sold for eleven million. How much profit did he make?

Sol.

Sale price	=	1 million
Cost price	=	10 million
Profit	=	11 – 10 = 1 million

2. Azam bought 30 dozen eggs of which 30 eggs were rotten. If he bought it for Rs. 1800, what should be the selling price of each egg to get a profit of 1 rupee per egg?

Sol.

Total eggs	=	30
Balance	=	360 – 30
Profit @ 1 per egg	=	Rs. 330
Cost price	=	Rs. 1800
Sale price	=	Rs. 1800 + 330
	=	Rs. 2130
Sale price per egg	=	Rs. 6.50

3. Alamgir purchased a car for Rs. 370,000 spent Rs. 20,000 on its overhauling and decoration. He sold the car for Rs. 385,000. How much profit or loss did he make?

Sol.

Cost price	=	370,000
Decoration Expenses	=	Rs. 20,000
Total cost	=	37000 + 20,000

	=	Rs. 390,000
Sale price	=	Rs. 385,000
Loss	=	Rs. 390,000 – 385,000
	=	Rs. 5,000

4. A book seller purchased 1000 books for Rs. 75000. Due to dampness and termites 84 books got destroyed. What should be the selling price of each book to earn a profit of Rs. 25 per book?

Sol.

Cost price	=	Rs. 75000
Profit on 916 books	=	916 × 25
	=	Rs. 22900
Sale price	=	75000 + 22900
	=	97900
Sale price per 1 book	=	Rs.97900 ÷ 916
	=	Rs. 106.90

5. The cost of a burger is Rs. 90 and it is sold for Rs. 110. What is the %age of the profit?

Sol.

Cost price	=	Rs. 90
Sale price	=	Rs. 110
Profit	=	Rs. 110 – 90
	=	20
Profit % $\frac{200}{9}$	=	$\frac{20 \times 100}{90}$
22.22%	=	$22\frac{1}{9}\%$

6. Find the markup on a bike whose price is Rs.45,000 for 73 days at the rate of 10% per annum.

Sol.

Price of bike = Rs 45000

Mark up for 73 days @ 10% per annum

$$= 45000 \times \frac{10}{100} \times \frac{73}{365}$$

$$= Rs\ 900$$

7. The markup on a principal amont is Rs.820 for 6 months at the rate of 12.5% per annum. calculate the principal amount.

Sol:

Mark up = Rs 820 for 6 months @ Rs 12.5 per annum

Principal amont = ?

Mark up paid for 1 year = $\frac{820 \times 12}{6}$

= Rs 1640

Principal amont = $\frac{100 \times 1640 \times 10}{125}$

= Rs 13120

EXERCISE 7.3

1. Shehla had 15 tola gold and 140 tola silver for more than one year. How much zakat will she have to pay if the market value of gold is Rs. 60,000 and silver is Rs. 1200 per tola.

Sol.

Price of 15 tola gold	=	Rs. 60000 × 15
Total amount	=	Rs. 900000 + 48000
	=	Rs. 948000
Amount of zakat	=	$\frac{474000 \times 5}{100 \times 2}$
	=	Rs. 23700

2. Usman had some jewellery and cash. He paid Rs. 25000 as zakat. How much were his savings?

Sol.

If zakat is Rs. 5 then amount	=	Rs. 100
If zakat is Rs. 25000 then amount	=	100 × 25000 × 2/5
	=	Rs. 1000000

3. Irum has gold worth Rs. 280,000 and silver jewellery worth Rs. 62,400. How much zakat will she have to pay?

Sol.

Price of gold	=	Rs. 280
Price of silver	=	Rs. 62,000
Total amount	=	280,000 + 62,400

Amount of zakat	=	Rs. 342,400
	=	$\dfrac{342 \times 400 \times 5}{100 \times 2}$
	=	Rs. 8560

4. Ali paid Rs. 49500 as zakat. If he has 40 tola gold, how much cash he has? (Gold is Rs. 40,000 per tola).

Sol.

Total amount paid as zakat	=	Rs. 49500
Total amount on which zakat paid	=	$\dfrac{100 \times 2 \times 49500}{5}$
	=	Rs. 1980000

5. Yunas has 30 jarib barani land. He obtained 1000 kg wheat per jarib. How much wheat as Ushr will he have to pay.

Sol.

Total agricultural area	=	30 jarib
Total wheat	=	30 × 000
	=	30,000 kg
Total Ushr	=	$30000 \times \dfrac{1}{10}$
	=	3000 kg.

6. Hayat Khan cultivated tobacco on 10 jarib canal irrigated land. He sold the tobacco for Rs. 120,500. How much Ushr will he have to pay.

Sol.

Total amount	=	Rs. 120,500
Ushar	=	$120500 \times \dfrac{1}{20}$
	=	Rs. 6025

EXERCISE 7
(Objective Type)

1. Colour the correct answer.

(i) Ushr is payable after
(a) one year
(b) six month
(c) every harvest ✓
(d) all of these

(ii) The rate of property tax for recorded value is
(a) 6% ✓
(b) 20%
(c) 18%
(d) 0.2%

(iii) Property tax is levied on
(a) Urban property
(b) Rural property
(c) Both urban and rural properties
(d) None of these ✓

(iv) The rate of ushr for barani land is
(a) 5%
(b) 10% ✓
(c) 20%
(d) 2%

(v). GST is levied on
(a) Factory owner
(b) Wholesaler
(c) Final consumer ✓
(d) All of these

(vi) The rate of GST is
(a) 20 %
(b) 2%
(c) 108 %
(d) 16.5% ✓

(vii) Government levies taxes to collect money to
(a) Construct roads
(b) Pay salaries to its employees ✓
(c) Build army
(d) All of these

(viii) If the cost price is more than the sale price then the seller has made
(a) Profit
(b) Loss ✓
(c) Neither profit nor loss
(d) All of these

(ix) Profit can be calculated in
(a) Match factory
(b) Restaurant (c) Banks
(d) All of these ✓

(x) 20% of 500 is
(a) 1000
(b) 100 ✓
(c) 10
(d) None of these

(xi) The payment of zakat becomes compulsory on a person if 7.5 tola gold is in his or her possession for
(a) One month

(b)   One week

(c)   One year   (d) 355 days

(xii) The rate of Ushr for canal irrigated land is

(a)   5%   (b) 10% ✔

(c)   20%   (d) 2%

Q.2. Ali owns a house worth 72 lac rupees. How much property tax will he have to pay after one year if the rate of property tax is 2%.

Sol.

Total Amount	=	Rs. 7200000
Rate of tax	=	2%
	=	$7200000 \times \dfrac{2}{100}$
Tax	=	Rs. 144,000

3. Anees is living in army flats. He paid Rs. 90,000 as property tax. What is the area of the flat if it is charged at Rs. 50 per square yard.

Sol.

If Rs. 500 paid as tax then area	=	1 yard
If Rs. 90000 paid as tax then area	=	$\dfrac{1 \times 90000}{50}$
	=	1800 yards

4. The cost price of a tube well is Rs. 50,000. What will be its selling price after adding 16.5% GST?

Sol.

Tax on Rs. 100	=	Rs. 16.5
Tax on Rs. 50,000	=	$\dfrac{16.5 \times 50000}{10 \times 100}$
	=	Rs. 8250

5. A shopkeeper purchased 200 tube lights for Rs. 7600. He sold each one for Rs. 45, How much profit he obtained on the sale of tube lights. Also calculate percentage of profit per tube light.

Sol.

Cost price	=	Rs. 7600
Sales price	=	45 × 200
	=	Rs. 9000

Profit %	=	$\dfrac{1400 \times 100}{7600}$
	=	$\dfrac{350}{16}\% = 18\dfrac{8}{9}\%$

Unit 8

ALJABRAIC EXPRESSIONS

EXERCISE 8.1

1. Write the constants and variables of the following algebraic expressions:

Sol.

		Constants	Variables
(i)	x - 3	-3	x
(ii)	y + 5		
(ii)	$x^2 + 2xy + 4 =$	4	x, y
(iii)	$2x - 2 + 5y^2 =$	-2	x, y
(v)	$x^2 - 5x + 8 =$	8	x

2. Find which of the following are polynomial:

(i) $2x + 1$ Polynomial

(ii) $y - \dfrac{1}{y}$ Non-Polynomial

(iii)   3   Polynomial

(iv) $3x^2 - 2x + 5$ Polynomial

(v) $\dfrac{x^2 + 5}{x}$ Polynomial

(vi) $\dfrac{1}{x} - \dfrac{2}{x+1}$ Polynomial

3. Write down the names of the following polynomial:

(i)   2x   Bionomial

(ii)   8x + 4   Nomial

(iii)   4   Bionomial

(iv) $x^2 - y^2$ Bionomial

(v)   x - y + z   Trionomial

(vi) x - 1   Bionomial

(vii) $x^2 + 5x + 6$ Trionomial

(viii) - 7x   Bionomial

(ix) 2x y + 3yz   Trionomial

(x) $\frac{1}{2}x + \frac{1}{5}y + 3$ Trionomial

EXERCISE 8.2

1. Add the following nomials:

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

Sol.
$$\begin{array}{r} x^2 + 3x + 4 \\ + \ 3x^2 = x + 2 \\ \hline 4x^2 + 2x + 6 \end{array}$$

(ii) $3x^3 - 2x^2 + 4x + 5$, $x^3 + x^2 - 3x - 9$

Sol.
$$\begin{array}{r} 3x^3 - 2x^2 + 4x + 5 \\ + \ x^3 + x^2 - 3x - 9 \\ \hline 4x^3 - x^2 + x - 4 \end{array}$$

(iii) $-x + 5x^2 + 4$, $10 - x + 2x^2$, $4x^3 - 3x + 5$

Sol.
$$\begin{array}{r} 5x^2 - x + 4 \\ 4x^3 \ - 3x + 5 \\ + \ 2x^2 - x + 10 \\ \hline 4x^3 + 7x^2 - 5x + 19 \end{array}$$

(iv) $4y + 3 - 3y^2 + 2y^3$, $4y^3 - 5y^2 + 7$, $2y^2 - 5$

Sol.
$$\begin{array}{r} 2y^3 - 3y^2 + 4y + 2 \\ 4y^3 - 5y^2 + 7 \\ + \ + 2y^2 - 5 \\ \hline 6y^3 - 6y^2 + 4y + 4 \end{array}$$

(v)
$$\begin{array}{r} p + 2q - 3r \\ + \ 4p - 3q \ - 4r \\ \hline 5p - 1 + r \end{array}$$

2. Subtract the second polynomial from the first polynomial.

(i)
$$x^2 + 2x + 4, 4x^2 + 6x - 5$$
$$\begin{array}{r} x^2 + 2x + 4 \\ 4x^2 + 6x - 5 \\ \hline -3x^2 - 4x + 9 \end{array}$$

(ii)
$$x^3 - x^2 + x - 5, 4x^3 + 6x + 8$$
$$\begin{array}{r} x^2 + x^2 + x - 5 \\ 4x^3 \quad + 6x + 8 \\ \hline -3x^2 - x^2 - 5x - 13 \end{array}$$

(iii)
$$a + 3b - c, 3a - 4b + 2c$$
$$\begin{array}{r} a + \ 3b \ - \ c \\ 3a - \ 4b + \ 2c \\ \hline -2a + 7b - 3c \end{array}$$

3. Add the following.

(i) $5y^3 - 4y^2 - 3y + 4$
$$\begin{array}{r} 5y^3 - 4y^2 - 3y + 4 \\ 4y^3 + 2y^2 - 6y - 15 \\ \hline y^3 - 6y^2 + 3y + 19 \end{array}$$

(ii).
$$\begin{array}{r} 3x^4 - 6x^3y + 7x^2 + 10 \\ 10x^4 - x^3y \quad - 2x^2 + 5 \\ \hline -7x^4 - 5x^3y + 9x^2 + 5 \end{array}$$

EXERCISE 8.3

1. Simplify:

(i) $(4x^3)(2x^2)$
$= 4 \times 2x^{3+2}$ $= 8x^5$

(ii) $(-3xy)(2x^3y)(-5x^2y^3)$
$= -3 \times 2 \times -5(x^{1+3+2}y^{1+1+3})$
$= 30x^6y^5$

(iii) $-5x^2(x^2 + 2)$
$= (-5x^2 \times x^2) - 5x^2 \times 2$
$= -5x^{2+2} - 5 \times 2x^2$

$= -5x^4 - 10x^2$

(4) $a^3(a^2 + a + 1)$

$= (a^3)(a^2) + a^3(a) + a^3(1)$

$= a^{3+2} + a^{3+1} + a^3$

$= a^5 + a^4 + a^3$

(5) $(x+2)(x^2 - 4)$

$= (x+2)x^2 - (x+2) - 4$

$= x^3 + 2x^2 - 4x - 8$

(6) $(x-y)(x^2 - y^2)$

Sol. $= x^2(x - y) - y^2(x - y)$

$= x^3 - xy - xy^2 + y^3$

(7)   **(a + b) (a + b + c)**

Sol.   (a + b) (a + b + c)

$=$ a(a + b) + b(a+b) + c(a+b)

$=$ a^2 + ab + ab + b^2 + ac + bc

$=$ a^2 + 2ab + b^2 + ac + bc

$=$ a^2 + b^2 + 2ab + ac + bc

(8)   **(x^2 - 9))$6x^2$ - 5x + 4)**

Sol.   (x^2 - 9) ($6x^2$ - 5x + 4)

$=$ $6x^2$ (x^2-9)-5x (x^2-9)+4(x^2-9)

$=$ $6x^4$ - $54x^2$-$5x^3$+45x+$4x^2$ - 36)

$=$ $6x^4$ - $5x^3$ - $50x^2$ + 45x - 36

EXERCISE 8.4

Simplify the following expressions:

(1) $x(x-2) + y(3x+2y) - (x^2 + y^2)$

$= x^2 - 2x + 3xy + 2y^2 - x^2 - y^2$

$= x^2 - x^2 - 2x + 3xy + 2y^2 - y^2$

$= -2x + 3xy + y^2$

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

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

$= x^2 + xy - xy - y^2 - 2xy$

$= x^2 - y^2 - 2xy$

(3) $ab(a+b) - (a^3 + b^3 + a^2b + ab)$

$= a^2b + ab^2 - a^3 - b^3 - a^2b - ab^2$

$= a^2b - a^2b + a^2b - a^2b - a^3 - b^3$

$= -a^3 - b^3 = -(a^3 + b^3)$

(4) $(2a+3b)(2a-3b) + (a^2 - b^2)$

$= 2a(2a+3b) - 3b(2a+3b) + a^2 - b^2$

$= 4a^2 + 6ab - 6ab - 9b^2 + a^2 - b^2$

$= 4a^2 - 9b^2 + a^2 - b^2$

$5a^2 - 10b^2$

(5) $2x^4 - 3x^3 + (2x-1)(x^2 + 5x + 11)$

$= 2x^4 - 3x^3 + (2x-1)(x^2 + 5x + 11)$

$= 2x^4 - 3x^3 + x^2(2x-1) + 5x(2x-1) + 1$

$= 2x^4 - 3x^3 + 2x^3 - x^2 + 10x^2 - 5x + 22$

$= 2x^2 - x^3 + 9x^2 + 17x - 11$

(6) $3 - x^2 + x(x+1)$

$= 3 - x^2 + x^2 + x$

$= 3 + x$

(7) $(y^2 - 5) + (9 + 5y^3) - y(2y^2 - 7y + 4)$

$= y^2 - 5 + 9 + 5y^3 - 2y^3 + 7y^2 - 4y$

$= 5y^3 + 7y^2 + y^2 - 4y - 2y^3 + 9 - 5$

$= 5y^3 - 2y^3 + 7y^2 + y^3 - 4y + 9 - 5$

$= 3y^3 - 18y^2 - 4y + 4$

EXERCISE 8.5

1.   **Simplify with the help of the concerned identity:**

(1) $(x+2)(x+5)$

$x^2 + 7x + 10$

(2) $(x+3)(x-7)$

$x^2 - 4x - 21$

(iii) $(x+1)(x-3) - (x+4)(x+12)$

$= (x^2 - 2x - 3) - (x^2 + 6x + 8)$

$= x^2 - 2x - 3 - x^2 - 6x - 8$

$= x^2 - x^2 - 2x - 6x - 3 - 8$

$= -8x - 11$

2.   **Expand by using suitable identity.**

(1) $(2a+3b)^2$

$= (2a^2) + (3b^2) + 2(2a)(3b)$

$= 4a^2 + 9b^2 + 12ab$

(2) $\left(\dfrac{1}{2}x + 3y\right)^2$

$= \left(\dfrac{1}{2}x\right)^2 + (3y)^2 + 2\left(\dfrac{1}{2}x\right)(3y)$

$= \dfrac{1}{4}x^2 + 9y^2 + 3xy$

(3) $(x - 2y)^2$

$= (x)^2 + (2y)^2 - 2(x)(-2y)$

$= x^2 + 4y^2 + -4xy$

(4) $\left(\dfrac{3}{2}a - \dfrac{5}{4}b\right)^2$

$= \left(\dfrac{3}{2}a\right)^2 + \left(\dfrac{5}{4}b\right)^2 - 2\left(\dfrac{3}{2}a\right)\left(\dfrac{5}{4}b\right)$

$$= \frac{9}{4}a^2 + \frac{25}{16}b^2 - \frac{15}{4}ab$$

(5) $(3a+3b)^2 - (2a-5b)^2$

$= (9a^2 + 16b^2 + 24ab) -$

$= (4a^2 + 25b^2 - 20ab)$

$= 9a^2 + 16b^2 + 24ab - 4a^2 - 25b^2 + 20ab$

$= 9a^2 - 4a^2 + 16b^2 - 25b^2 + 24ab + 20ab$

$= 5a^2 - 9b^2 + 44ab$

(6) $(2x-5y)^2 + (3x+4y)^2$

$= (4x^2 + 25y^2 - 20xy) + (9x^2 + 16y^2 + 24xy)$

$= 4x^2 + 25y^2 - 20xy + 9x^2 + 16y^2 + 24xy$

$= 4x^2 + 9x^2 + 25y^2 + 16y^2 - 20xy + 24xy$

$= 13x^2 + 41y^2 + 4xy$

3. Simplify with the help of a suitable identity:

(1) $x^2 - 49$

$= (x)^2 - (7)^2$

$= (x+7)(x-7)$

(2) $x^2y^2 - 64$

$= (xy)^2 - (8)^2$

$= (xy+8)(xy-8)$

(3) $25a^2 - 49ab^2$

$= (5a)^2 - (7b)^2$

$= (5a+7b)(5a-7b)$

(4) $(100)^2 - (81)^2$

Sol. $(100+81)(100-81)$

$= \quad (181)(19)$

$= \quad 3439$ **Ans.**

EXERCISE 8.6

Factorize the following:

(1) $x^2 + 4x + 4$

$= (x)^2 + 2(x)(2) + (2)^2$

$= (x+2)(x+2)$

(2) $9x^2 + 30x + 25$

$= (3x)^2 + 2(3x)(5) + (5)^2$

$= (3x+5)^2$

$= (3x+5)(3x+5)$

(3) $4x^2 + 12xy + 9y^2$

$= (2x)^2 + 2(2x)(8y) + (3y^2)$

$= (2x+3y)(2x+3y)$

(4) $y^2 - 6y + 9$

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

$= (y-3)(y-3)$

(5) $-2x^2 + 16xy - 30y^2$

$= -2(x^2 - 8xy + 16y^2)$

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

$= -2(x-4y)^2$

$= -2(x-4y)(x-4y)$

(6) $16 - 24x - 9x^2$

$= -(16 + 24x + 9x^2)$

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

$= -(4+3x)^2$

(7) $16 - x^2$

$= (4)^2 - (x)^2$

$= (4+x)(4-x)$

(8) $a^3b - ab^3$

$= ab(a^2 - b^2)$

$= ab(a+b)(a-b)$

(9) $x^4 - y^4$

$= (x^2)^2 - (y^2)^2$

$= (x^2 + y^2)(x^2 - y^2)$

$= \{x^2 + y^2\}\{(x)^2 - (y)^2\}$

$= (x^2 + y^2)(x+y)(x-y)$

(10) $(123)^2 - (120)^2$

$= (100+23)^2 - (100+20)^2$

$= \{(100)^2 + 2 \times 100 \times 23 + (23)^2\} - \{(100)^2 + (20)^2 + 2 \times 100 \times 20\}$

$= (10000 + 4600 + 529) - (10000 + 400 + 4000)$

$= 10000 + 4600 529 - 10000 - 400 - 4000$

$= 4600 + 529 - 4400$

$= 5129 - 4400$

$= 729$

EXERCISE 8.7

Factorize the following algebraic expressions:

(1) $x^2 + 4x + 3$

$= x^2 + 3x + x + 3$

$= x(x+3) + 1(x+3)$

$= (x+1)(x+3)$

(2) $x^2 + 6x + 8$

$= x^2 + 4x + 2x + 8$

$= x(x+4) + 2(x+4)$

$= (x+2)(x+4)$

(3) $x^2 + 2x - 15$

$= x^2 + 5x - 3x - 15$

$= x(x+5) - 3(x+5)$

$= (x-3)(x+5)$

(4) $y^2 - 5y + 6$

$= y^2 - 3y - 2y + 6$

$= y(y-3) - 2(y-3)$

$= (y-2)(y-3)$

(5) $t^2 - t - 12$

$= t^2 - 4t + 3t - 12$

$= t(t-4) + 3(t-4)$

$=(t+3)(t-4)$

(b) $x^3v+6x^2v-27xv$
$=xv(x^2+6x-27)$
$=xv\{(x)^2+9x-3x-27)\}$
$=xv\{x(x+9)-3(x+9)\}$
$=xv(x-3)(x+9)$

(7) $a^2-2a-15$
$=a^2-5a+3a-15$
$=a(a-5)+3(a-5)$
$=(a+3)(a-5)$

(8) $-2a^4+10a^3-8a^2$
$=-2a^2(a^2-5a+4)$
$=-2a^2(a^2-4a-a+4)$
$=\{2a^2\}a(a-4)-1(a-4)$
$=2a^2(a-4)(a-1)$

(9) v^2-4v+3
$=v^2-3v-v+3$
$=v(v-3)-1(v-3)$
$=(v-3)(v-1)$

(10) $x^2+5x-24$
$=x^2+8x-3x-24$
$=x(x+8)-3(x+8)$
$=(x+8)(x-3)$

EXERCISE 8.8

Fill in the blanks.

(i) A symbol whose value does not remain constant is called _____

(ii) In x + 5, 5 is called _____.

(iii) $x^2 + 2$ is _____

(iv) $x^2 + 2x + 3$ is a _____ in one variable.

(v) $(a - b)^2 =$ _____

Ans. (i) Variable   (ii) Constant
(iii) Bionomial (iv) Polynomial

2. Read the following sentences carefully and encircle 'T' in case of true and 'F' in case of false statement:

(i) x - 1/x is a polynomial   T/F

(ii) $x^2+x = 3$ is binomial   T/F

(iii) $(x+a)(x+b)=x^2+(a+b)x+ab$ (T/F)

(iv) $(x+3)(x-2)=x^2+5x-6$ (T/F)

(v) $a^2-b^2=(a+b)(a-b)$ (T/F)

Ans. (i) False   (ii) False   (iii) True
(iv) False   (v) True

3. Choose the correct answer and write as a, b, c, d against each option in the box:

(i) $(a+b)^2 =$ _____.
(a) $a^2-2ab+b^2$
(b) $a^2+2ab-b^2$
✓ (c) $a^2+2ab+b^2$
(d) $b^2+2ab-a^2$

(ii) $x^2+5x+6=$ _____
(a) $(x-3)(x-2)$
✓ (b) $(x+3)(x+2)$
(c) $(x+3)(x-2)$
(d) $(x-3)(x+2)$

(iii) $(x+4)(x-4) =$ _____
(a) x^2-8 (b) x^2+8
(c) x^2+16 (d) x^2-16 ✓

(iv) $p(x)=x^2+5x+4$ **is a**
(a) Monomial   (b) Binomial
✓ (c) Trinomial   (d) None of these

(v) $(-2x^3)(4x^2) =$ _____
✓ (a) $-8x^5$ (b) $-6x^5$
(c) $-8x^6$ (d) $-6x^5$

(vi) **The product of $2x^3$ and $4x^3$ is**
(a) $8x^{12}$ (b) $6x^{12}$
(c) $6x^7$ (d) $8x^6$ ✓

(vii) **If $a^2-2ab+b^2 = 36$ and $a^2-3ab+b^2 = -22$, find ab.**
(a) 6   (b) 8
(c) 12   (d) 14 ✓

(viii) **When x2-x+1 is subtracted frm**

$3x^2 - 4x + 5$, the result will be

✔ (a) $2x_2 - 3x + 4$　　(b) $2x_2 - 4x + 4$

(c) $3x_2 - 6x + 6$　　(d) $4x_2 - 6x + 6$

4. Add $2x^2 + x - 2$ and $-4x^2 + 5x + 6$

Sol.
$$-4x^2 + 5x + 6$$
$$\underline{2x^2 + x - 2}$$
$$-2x^2 + 6x + 4$$

5. Subtract $x^2y + 7x^3y - 5$ from $-3x^2y + 10 + 2x^3y$.

Sol.
$$-3x^2y + 10 + 2xy^3$$
$$\underline{\begin{array}{l} 7x^3y + x^2y - 5 \\ \quad - \quad - \quad + \end{array}}$$
$$-7x^3y + 4x^2y + 15 + 2xy^3$$

$-2x^2 + 6x + 4$

6. Multiply $(x^2 - x + 1)$ with $(x + 1)$

Sol.
$$= x^2(x+1) - x(x+1) + 1(x+1)$$
$$= x^3 + x^2 - x^2 - x + x + 1$$
$$= x^3 + 1$$

7. If $A = x + y + 2$, $B = x + 1$ and

$C = y - 1$ then find:

(i) $A + B - C$
(ii) $A - B + C$
(iii) $A + BC$

(i) $A + B$

Sol.
$$\begin{array}{r} x + y + 2 \\ \underline{x \quad\quad + 1} \\ A + B = \quad 2x + y + 3 \end{array}$$

$$\begin{array}{r} C = \quad -y \pm 2 \\ = \quad 2x - 2 \end{array}$$

(ii)
$$\begin{array}{r} A - B = x + y + 2 \\ -x \quad\quad \pm 1 \\ \hline y + 1 \\ C = \quad y - 1 \\ \hline A - B + C = \quad 2y \end{array}$$

8. Factorize:

(i)
$$x^2 + 16x + 64$$
$$= (x)^2 + 2 \times x \times 8 + (8)^2$$
$$= (x + 8)^2 = (x + 8)(x + 8)$$

(ii)
$$16x^2 - 25v^2$$
$$= (4x)^2 - (5v)^2$$
$$= (4x + 5v)(4x - 5y)$$

(iii)
$$x^2 - x - 42$$
$$= x^2 - 7x + 6x - 42$$
$$= x(x - 7) + 6(x - 7)$$
$$= (x - 7)(x + 6)$$
☆☆☆☆☆

Unit 9
LINEAR EQUATION
EXERCISE 9.1

1. Solve the following equation:

(i) $x + 7 = -5$

Sol. $x + 7 = -5$

By subtracting 7

$= x + 7 - 7 = -5 - 7$

$x = -12$

$\{-12\}$

(ii) $x - 5 = 2$

Sol. $x - 5 = 2$

$= x - 5 + 5 \quad = 2 + 5$

By adding 5 on both sides.

$x = 7 \quad\quad \{7\}$

(iii) $\dfrac{x}{2} = 5$

Sol. $\dfrac{x}{2} = 5$

Or $\dfrac{x}{2} \times 2 \quad = \quad 5 \times 2$

By multiplying 2 on both sides.

$x = 10 \quad\quad \{10\}$

(iv) $5x = 70$

Sol. $5x = 70$

$\dfrac{5x}{5} = \dfrac{70}{5}$ dividing 7 on both sides

$x = 14 \quad\quad \{14\}$

(v) $8x - 2 = 14$

Sol. $8x - 2 = 14$

$8x - 2 + 2 = 14 + 2$

By adding 2 on both sides.

$8x = 16$

$\dfrac{8x}{8} = \dfrac{16}{8}$ By dividing 8 on both sides

$x = 2$ $\{2\}$

(vi)

$\dfrac{x-1}{5} = \dfrac{5}{4}$

Sol.

$\dfrac{x-1}{5} = \dfrac{5}{4}$

$= 4(x-1) = 5 \times 5$

$= 4x - 4 = 25$

$= 4x - 4 + 4 = 25 + 4$

$4x = 29$

$\dfrac{4x}{4} = \dfrac{29}{4}$ $x = 7\dfrac{1}{4} = \left\{7\dfrac{1}{4}\right\}$

(vii)

Sol.

$7(x-2) = 21$

$7(x-2) = 21$

$\dfrac{7(x-2)}{7} = \dfrac{21}{7}$

By dividing 7 on both sides.

$x - 2 = 3$

$x - 2 + 2 = 3 + 2$

By adding 2 on both sides.

$x = 5$ $\{5\}$

(viii)

$\dfrac{2y-6}{y+1} = \dfrac{2}{3}$

Sol.

$\dfrac{2y-6}{y+1} = \dfrac{2}{3}$

$3(2y - 6) = 2(y + 1)$

By cross multiplication

$6y - 18 = 2y + 2$

By subtracting 2y on both sides.

$6y - 18 - 2y = 2y + 2 - 2y$

$4y - 18 = 2$

$4y + 18 - 18 = 2 + 18$

By adding 18 on both sides.

$4y = 20$

$\dfrac{4y}{4} = \dfrac{20}{4}$

By dividing 4 on both sides.

$y = 5$ $\{5\}$

(ix)

$\dfrac{3x-2}{2x+1} = \dfrac{4}{5}$

Sol.

$\dfrac{3x-2}{2x+1} = \dfrac{4}{5}$

$= 15x - 10 = 8x + 4$

$= 15x - 8x + 0 = 8x + 4 - 8x$

By subtracting 8x on both sides.

$7x - 10 = 4$

$7x - 10 + 10 = 4 + 10$

By adding 10 on both sides.

$7x = 14$

By dividing 7 on both sides.

$x = 2$ $\{2\}$

(x)

$\dfrac{3y+1}{2y+4} = \dfrac{3}{4}$

Sol.

$\dfrac{3y+1}{2y+4} = \dfrac{3}{4}$

$12y + 4 = 6y + 12$

By cross multiplication.

$12y + 4 - 4 = 6y + 12 - 4$

By subtracting 4 on both sides.

$12y = 6y + 8$

$12y - 6y = 6y + 8 - 6y$

By subtracting 6y on both sides.

$6y = 8$

$\dfrac{6y}{6} = \dfrac{8}{6}$

By dividing 6 on both sides.

$y = \dfrac{4}{3}$ $\left\{1\dfrac{1}{3}\right\}$

(xi) $0.3x + 0.2(10-x) = 0.15(30)$

Sol: $0.3x + 0.2(10-x) = 0.15(30)$

$= 0.3x + 2 - \dfrac{x}{5} = 4.5$

$= \dfrac{3}{10} + 2 - \dfrac{x}{5} = 4.5$

By dividing 10 on both sides.

$$= \left(\frac{3}{10}x + 2 - \frac{x}{5}\right) = 4.5$$

$= 3x + 20 - 2x = 45$

$= 3x - 2x = 45 - 20$

$= x = 25$

$= \{25\}$

EXERCISE 9.2

1. It a number is multiplied by 4 the result is 20. Find the number.

Sol.

Let number be	=	x
By multiplying 4		20 = 4x
By dividing 4 on both sides	=	$\frac{20}{4} = \frac{4x}{4}$
So requird numb	=	5

2. Sum of the three consecutive even integers is 66, find the numbers.

Sol.

Let 1st even number b	=	x
2nd evdn number	=	x + 2
3rd even number	=	x + 4

According to the given condition

$x + x + 2 + x + 4 = 66$

$3x + 6 = 66$

$3x + 6 - 6 = 66 - 6$

By subtracting 6 from both sides.

$3x = 60$

$x = 20$

1st Even number $= 20$

2nd Even number $= 22$

3rd Even number $= 24$

3. Think of a number, add 4, double the sum, the result is 30, find the number.

Sol.

Let thought number b	=	x
By adding 4	=	x + 4
2 times	=	2(x + 4) 2x + 8

According to the given condition

$2x + 8 - 8 = 30 - 8$

$2x = 22$

By dividing 2 both sides.

$$= \frac{2x}{2} = \frac{22}{2}$$

$x = 11$

So required number = 11

1. Ali Thinks of a number, add 5 to it, subtract 7 from the double of the sum, the result is 9. Find the number you thought.

Sol.

Let the thought number be	=	x
By adding 5	=	x + 5
2 times	=	2(x + 5)
By subtracting 7	=	2x + 10 - 7
	=	2x + 3

According to the given condition:

$2x + 3 = 9$

By subtracting 3 from both sides:

$2x + 3 - 3 = 9 - 3$

$2x = 6$

By dividing 2 on both sides.

$$\frac{2x}{2} = \frac{6}{2}$$

$x = 3$

So the thought number = 3

2. In a class of 45 students, the number of girls is $\frac{7}{8}$ of the number of boys. Find the number of girls in the class.

Sol: Let the number of girls = x

number of boys = x $\frac{7}{8}$ of = $\frac{7x}{8}$

According to the condition of equation

$$x + \frac{7x}{8} = 45$$

$$8\left(x + \frac{7x}{8}\right) = 45 \times 8 \quad \text{Multiplying be 8}$$

$8x + 7x = 360$

$15x = 360$

$$\frac{15x}{15} = \frac{360}{15}$$

$$x = 24$$

A man has Rs. x. From which he spends Rs.6. If twice of the amont left with him is Rs. 86, find x.

Sol: Amount with a man = x

Amont he spends = Rs 6

Amount left with him = x – 6

Twice of amont left = 2(x–6) = 2x –12

Accoding to the condition the equation

$$2x - 12 = 6$$

$$2x - 12 + 12 = 6 + 12$$

$$2x = 18$$

$$\frac{2x}{2} = \frac{18}{2}$$

$$x = 9$$

Rs 9 Ans

4. **Afridi and Shehzad gave 69 runs opening start to Pakistan. If Afridi's score is double of Shehzad's score then he needs how many runs to complete his half century?**

Sol: Let Shahzad's score = x

Afridi's score = 2x

$$2x + x = 69$$

$$3x = 69$$

$$\frac{3x}{3} = \frac{69}{3}$$

$$x = 23$$

Shahzad's score = 2

Afridi's score = 23 × 2 = 46

Afridi needs = 50–46 = 4 runs

5. **Sum of the two consecutive odd integers is 36. Find the numbers.**

Sol.

Let the first odd number	=	x + 1
2nd odd number	=	x + 3

According to the given condition:

$$x + 1 + x + 3 = 36$$

$$2x - 14 = 36$$

By dividing 4 on both sides

$$2x + 4 - 4 = 36$$

$$2x = 32$$

By dividing 2 on both sides.

$$\frac{2x}{2} = \frac{32}{2}$$

$$x = 16$$

1st odd number = 16 + 1 = 17

2nd odd number = 16 + 3 = 19

6. **Perimeter of a rectangle is 32 meter and its length is 4 m more than its breadth. Find the length and breadth of the rectangle.**

Sol. Let the width of rectangles = x

Length = x + 4

Perimeter = 2(x + x + 4)

= 2(2x + 4)

= 4x + 8

According the given condition

$$4x + 8 = 32$$

By dividing 4 on both sides.

$$4x + 8 - 8 = 32 - 8$$

$$4x = 24$$

By dividing 4 on both sides.

$$\frac{4x}{4} = \frac{24}{4}$$

$$x = 6$$

So width 6 meter

Length = 6 + 4 = 10 meter

7. **Age of a mother is 3 times the age of her daughter, after 4 years the sum of their ages will 60 years. Find their present ages.**

Sol. Let the age of daughter be = x year

Mother age = 3x

Daughter age after 4 years = 3x + 4

According to given condition:

$$x + 4 + 3x + 4 = 60$$

$$4x + 8 = 60$$

By subtracting 8 on both sides.

$$= 4x + 8 - 8 = 60 - 8$$

$$= 4x = 52$$

By dividing 4 on both sides.

$$= \frac{4x}{4} = \frac{52}{4}$$

Finish Middle Table
11
Daughter's present age = 14 years,
Khaliq's age = 14 × 3 = 19 years,

REVIEW EXERCISE 9

1. Read the following statements carefully and encircle 'T' in case of true statement and 'F' in case of false statement.

(i) $a x + b = 0$ where $a \ne 0$ is a linear equation in one variable. (T)

(ii) The solution set of $x - 10 = 0$ is {10}. (F)

(iii) The solution set of $4x = 24$ is {6} (T)

(iv) The solution set of $\frac{x}{5} = -4$ is {9} (F)

(v) $x^2 + 1$ is a linear equation in one variable. (F)

2. Fill in the blanks.

(i) A value of variable which makes the equation a true statement is called _____ of the equation.

(ii) To solve a linear equation subtract _____ number from both sides of the equation.

(iii) The solution set of $\frac{x}{5} = 2$ is _____

(iv) $\frac{ax+b}{cx+d} = \frac{m}{n}$ is a _____ equation is _____ variable.

(v) The value of x of a linear equation $3x - 10 = 2$ is _____

Ans. (i) solution (ii) same
(iii) Linear one (iv) 4

3. Choose the correct option and write in (a), (b), (c) and (d) form.

(i) Which equation is not equivalent to $b - 15 = 32$?

   (a) $b+5=52$ (b) $b-20-27$
✓ (c) $b-13=30$ (d) $b=47$

(ii) What is the solution of $x - 167 = -52$?

✓ (a) 115   (b) 219
   (c) -115   (d) -219

(iii) Solve $8x - 3 = 5 (2x + 1)$.

   (a) 4   (b) 2
   (c) 2   (d) -4 ✓

(iv) Which of the following equations has the same solution as $8(x + 2) = 12$?

   (a) $8x + 2 = 12$
   (b) $x + 2 = 4$
   (c) $8x = 10$
   (d) $2x + 4 = 3$ ✓

(v) Which equation has a solution of -5?

   (a) $2a - 6 = 4$
   (b) $3a + 7 = 8$
   (c) $\frac{3a - 7}{4} = 2$
   (d) $\frac{3}{5}a + 19 = 16$ ✓

(vi) Solve $2(b-3) + 5 = 3(b-1)$.

   (a) -2   (b) 2 ✓
   (c) -3   (d) 3

(vii) Solve $75 - 9t = 5 (-4 + 2t.)$

   (a) -5   (b) -4
   (c) 4   (d) 5 ✓

4. Solve the following lunar equation

(i)
$$5(3x + 2) - 2 = -2(1 - 7x)$$
$$15x + 10 - 2 = -2 + 14x$$
$$15x + 8 = 14x - 2$$
$$15x + 8 - 8 = 14x - 2 - 8$$
Subtracting 8 on both sides.
$$15x - 14x - 10$$
Subtracting 14x on both sides.
$$= (15x - 14X = 14X - 14X - 10$$
$$= x = -10$$
$$\{-10\}$$

(ii)
$$\frac{3x+1}{2x+3} = \frac{4}{5}$$
$$5(3x + 1) = 4(2x + 3)$$
$$15x + 5 = 8x + 12$$
$$15x + 5 - 5 = 8x + 12 - 5$$
Subtracting 5 from both sides.
$$15x = 8x + 7$$
$$15x - 8x = 8x + 7 - 8x$$

By dividing

Subtracting 8x from both sides.

$$7x = 7$$

$$\frac{7x}{7} = \frac{7}{7}$$

By dividing 7 on both sides.

$$x = 1 \quad \{1\}$$

(iii)
$$\frac{x-1}{x-2} = \frac{1}{2}$$

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

By subtracting x from both sides.

$$x = 0 \quad \{0\}$$

5. Perimeter of a square is 20 m. Find the length of each side of the square.

Sol. Let 1 side of square = x

Perimeter = 4x

According to the condition

$$4x = 20$$

By dividing 4

$$\frac{4x}{4} = \frac{20}{4}$$

$$x = 5$$

Length of side of square = 5 meter

6. The price of 2 tables and 3 chairs is Rs.340, but a table costs Rs. 20 more than a chairs. Find the price of each.

Sol: Let the price of a chair = Rs x

Price of a table = x + 20

Price of 3 chairs = 3 × x = 3x

Price of 2 tabels = 2(x+20)

equation = 2x + 40

$$3x + 2x + 40 = Rs\ 340$$
$$5x + 40 = Rs\ 340$$
$$5x + 40 - 40 = 340 - 40$$
$$5x = 300$$

$$\frac{5x}{5} = \frac{300}{5}$$

$$x = 60$$

Price of one chair = Rs 60

Price of one table = Rs 60+20 = Rs 80

7. A father is 3 times as old as his son. In 10 years time he will be double his son's. Find their percentages.

Sol: Let the age of son = x years

Age of father = 3x years

Age of son after 10 years = x + 10

Age of father afte 10 years = 3x + 10

Accoding to condition equation

$$2(x+10) = 3x + 10$$
$$2x + 20 = 3x + 10$$
$$2x - 3x = 10 - 20$$
$$-x = -10$$
$$x = 10$$

Son's age = 10 years

Father's age = 10×3 = 30 years

8. The rectangle and square shown below have the same perimeter. Find the dimensions of each figure.

Sol: Perimeter of rectangle

$$= 2(3x+2+x)$$
$$= 6x + 4 + 2x$$
$$= 8x + 4$$

Perimeter of square = 4(3x)

According to condition equation

$$12x = 8x + 4$$
$$12x - 8x = 4$$
$$\frac{4x}{4} = \frac{4}{4}$$
$$x = 1$$

Length of rectangle = 3(1) + 2 = 5

breadth = x = 1

Length of square = 3×1 = 3

Unit 10

BASIC CONCEPTS OF GEOMETRY

EXERCISE 10.1

1. Two complementary angles measure x and 65°. How many degrees are there in x?

Sol. 90° – 65 = 25°

2. Two vertical angles measure x and 45°. How many degrees are there x?

Sol. x = 45°

3. Two supplementary angles measure x and 75°. How many degrees are there in x?

Sol. $180° - 75° = 105°$

4. Two vertical angles measure 2x and 80°. How many degrees are there in following categories:

Bus fare	14 rupees
Recess meal	8 rupees

Sol. $2x = 80°$

$x = 40°$

5. Two complementary angles measure $(2x + 10)$ and $(x + 20)$ degrees. What is the value of x?

$$x + 20$$
$$90 = 2x + 10 + x + 20$$
$$90 = 2x + x + 10 + 20$$
$$90 - 30 = 3x + 30 - 30$$
$$60 = 3x$$
$$\frac{60}{3} = x$$
$$20° = x$$

6. Two supplementary angles measure $(5x-30)$ and $(x+90)$ degrees. What is the vaue of x?

Sol: $(5x-30) + (x+90) = 180°$
$5x-30+x+90 = 180°$
$5x+x+60 = 180°$
$6x + 60 = 180°$
$6x+60-60 = 180 - 60$
$6x = 120$

$$\frac{6x}{6} = \frac{120}{6}$$
$$x = 20°$$

7. Solve for x.

Sol: $(x+3)° + (2x-3)° = 90°$
$x+3+2x-3 = 90$
$x+2x+3-3 = 90$
$3x = 90$

$$\frac{3x}{3} = \frac{90}{3}$$
$$x = 30$$

EXERCISE 10.2

Answer the following questions

1. regarding similar figures; Is this an example of similar figures?

a. Yes   b. No

2. These are two congruent triangles. Fill in the missing values in the given blanks.
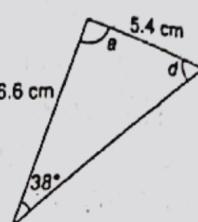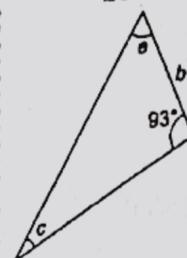
(i)	a	=	93°
(ii)	b	=	5-4 cm
(iii)	c	=	38
(iv)	d	=	e
(v)	e	=	d
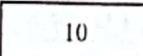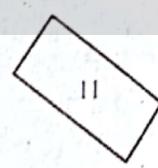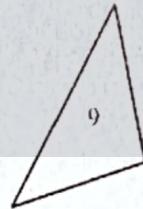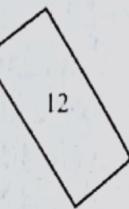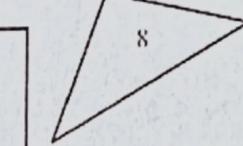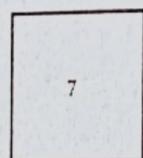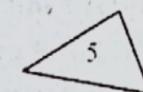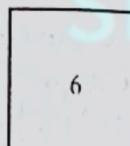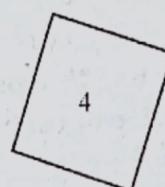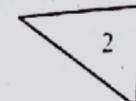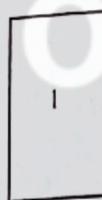
Look at the shapes above and complete the following state-ments:

Shape 1 is congruent or similar to shape _____, _____ and _____.

Shape 6 is congruent to shape _____

Shape 11 is _____ to shape 12.

Shape 8 and 9 are __ to each other.

Shape 5 is similar to shapes _____, and ____

Ans.
(a) 10, 11 and 12   (b) 4
(c) Similar. (d) Congruent
(e) 2, 8 and 9

EXERCISE 10.3

1. Draw circles with radius
(i) 4.4cm   (ii) 4.4cm

O
4.4 cm
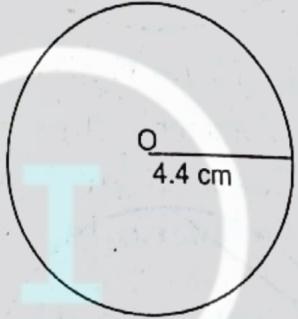
2. Draw circles with diameters
(i) 6.8 cm   (ii) 8.6 cm

O
6.8 cm
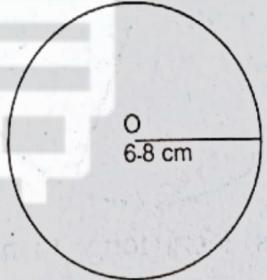
3. Find the diameter of
Sol:

O
8.6 cm
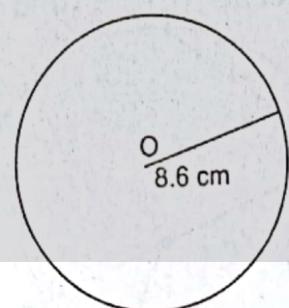
(i) Radius = 5cm
Diameter = 5 × 2 = 10cm
(ii) Radius = 8.6cm
Diameter = 8.6×2 = 12.2 cm

4. Find the length of the radius of the circles whose diameter is
(i) 11cm   (ii) 14mm

Sol:
(i) Diameter = 11cm

$$Radius = \frac{11}{2} = 5.5cm$$

(ii) Diameter = 14mm

$$Radius = \frac{14}{2} = 7mm$$

5. Draw a circle with center O of any radius. Draw any chord
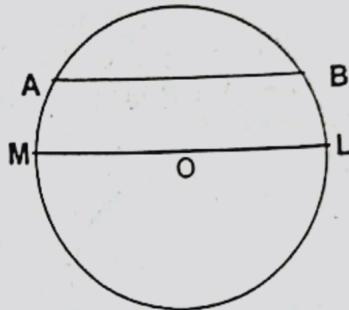
Sol:
chord = $\overline{AB}$ Radius = $\overline{OL}$
Diameter = LOM

6. Draw a circle with center O. Draw any four diameters. How many diameters can you draw in this circle.

Sol:
$\overline{AB}$, $\overline{CD}$, $\overline{EF}$ and GH are diametes.
We can draw many diameters.
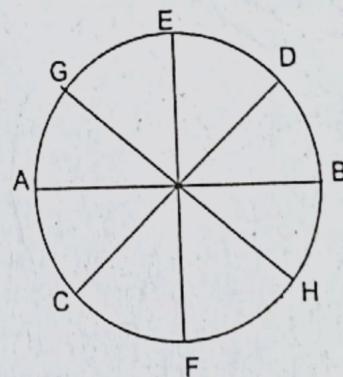
7. Draw a circle with center O of radius 3cm. Draw any $\overline{AB}$

O 3cm
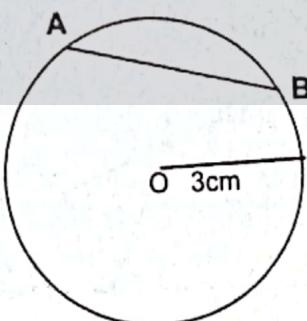
8.   In fig, name the points which are
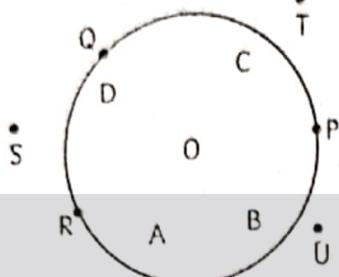
Sol:
(i)   in its exterior = s, u, T.
(ii)   in its interior = A,B,c,D,O
(iii)   on the cirlcle = P,R,Q

9.   Two points A and B are given. Draw any circle whose center is A and which contains B in its interior.

Sol:
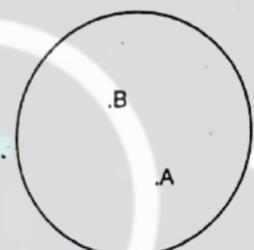
REVIEW EXERCISE 10

Encircle the correct choice:

(i)   Which of the following is a chord, but not a diameter?
(a) $\overline{PR}$ (b) $\overline{QS}$
(c)✓ $\overline{PT}$ (d)   None of these
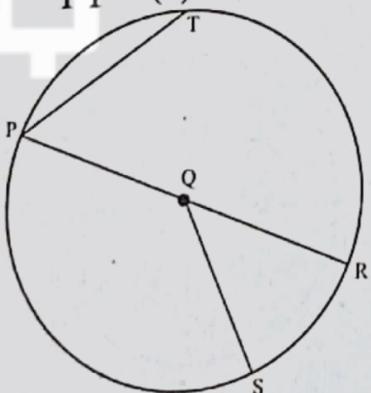
(ii)   Which of the following is a radius?
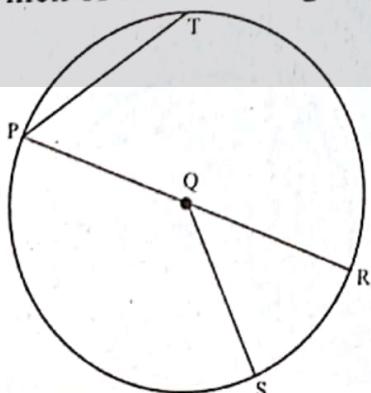
(a) $\overline{PO}$ (b) $\overline{QR}$
(c) $\overline{QS}$ (d)✓ All of the above

(iii)   Name the center of this circle.
(a)✓ Point Q   (b)   Point R
(c)   Point P   (d)   None
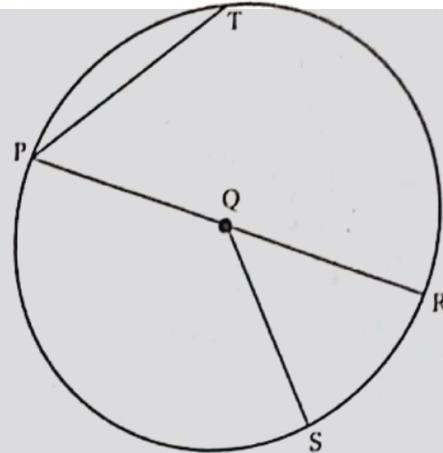
(iv)   What is $\overline{PR}$ (or PQR)?
✓ (a)   Diameter   (b)   Raius
(c)   Center   (d)   None
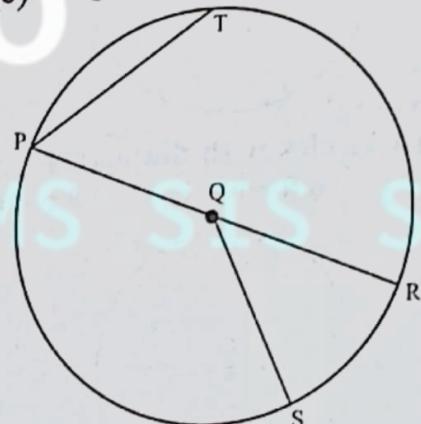
(v)   If PQ is 3 cm long, then how long is PR?
(a)   1.5 cm   (b)   12 cm
(c)✓ 6cm   (d)   None of the above
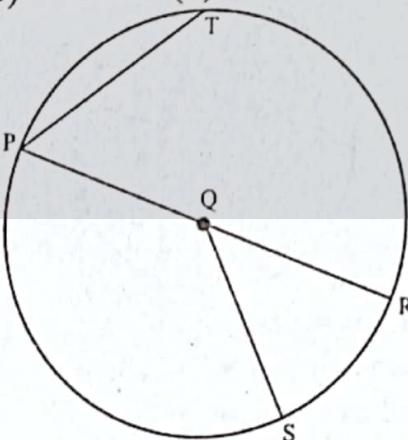
2.   Fill in the blanks.
(i)   The two figures are _____

False not similar

False not congruent

(ıı) The two figures are

True similar and congruent

False not similar and not congruent

3. Write and solve an equation to find the missing angle measues.

(i)
(ii)
(iii)

Sol:

$(3x+12)+5x = 180°$

$3x+12+5x = 180°$

$3x+5x+12 = 180°$

(iv)

Sol: $6x+4+32 = 90°$

Sol:

$6x = 30°$

$(4+5x)+(x+2) = 180°$

Unit 11

PRACTICAL GEOMETRY
EXERCISE 11.1

(1) Construct the required equilateral triangles.

(i) A triangle ABC whose perimeter is 18 cm and the ratio among the three sides is 2:3:4.

(ii) A triangle PQR whose perimeter is 16 cm and the ratio among the sides is 3:2:3.
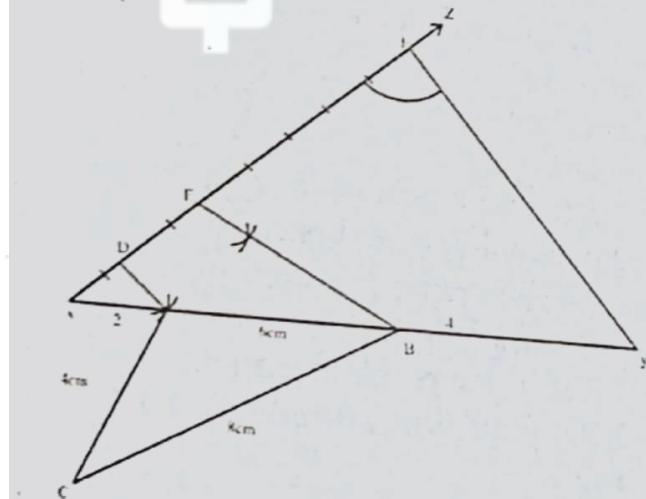
Given:

Perimeter 18 cm and ratios among sides 2:3:4

Required:

A triangle is to be constructed.

Construction:

(i) Drew xy = 18cm

(ii) Drew an angle of 60° at point x,

(iii) Divide xF in 2+3+4 = 9 equal parts with the help of compass,

(iv) Joined point F to point y,

(v) Constructed ∠xFy and xDy = ∠xFy. Its arms join at point A, B.

(vi) Constructed △ ABC according to the measures of $\overline{xA}$, $\overline{By}$ and $\overline{AB}$.

(vii) ABC is the required triangle.

2. Construct the required equi- lateral triangles.

(i) XYZ whose base is 3 cm.

(ii) KLM whose altitude is 4 cm.
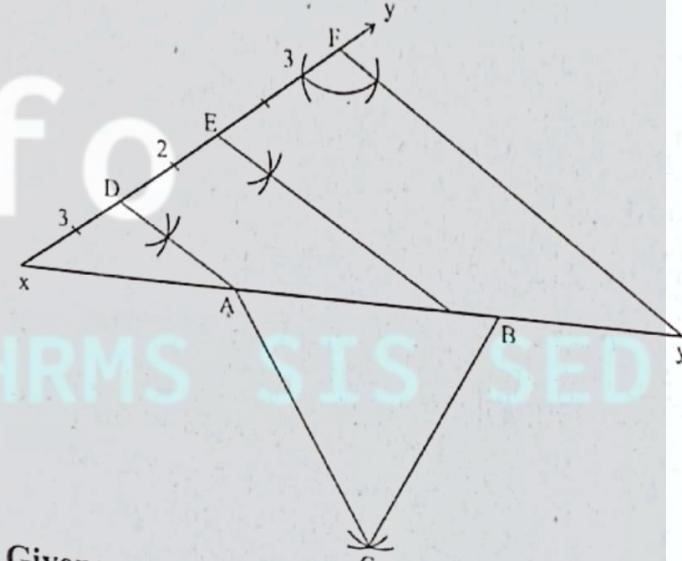
Given:

Perimeter 16 cm and ratio among sides 3:2:3.

Required:

△ ABC is to be constructed.

Construction:

(i) Drew $\overline{xy}$ =16cm

(ii) Drew an angle of 60° at point x.

(iii) Divide $\overline{xF}$ in 3"2"3 = 8 equal parts.

(iv) Joined point F to point y.

(v) Constructed ∠xfy and ∠xDA = ∠xFY.

(vi) Constructed △ABC according measures of $\overline{xA}$, $\overline{By}$ and $\overline{AB}$.

(vii) ABC is the required triangle.

2. Construct isosceles triangles.

(a) XYZ whose base is 3 cm.
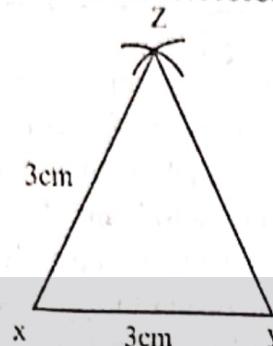
Given: Base = 3 cm

      Required: An equilateral triangle is to be constructed.

Construction:

(i)   Drew $\overline{xY}$ = 3cm

(ii)   Drew an arc of 3 cm radius from point x. and of the same radius from point y which meets first are at point z.

(iii)   Joined point z to x and y.

(iv)   xyz is the required triangle.

**(b)**   **KLM whose altitude is 4 cm.**

**Given:** Altitude = 4 cm

Required:

      △ KLM is to be constructed.

Construction:

(i)   Drew $\overleftrightarrow{AB}$

(ii)   Took a point D on $\overleftrightarrow{KL}$

(iii)   Drew ∠ DKL and ∠ DKM of 30°, 30° whose arms join $\overleftrightarrow{AB}$ at points L, M.

(iv)   △ KLM is the required triangle.
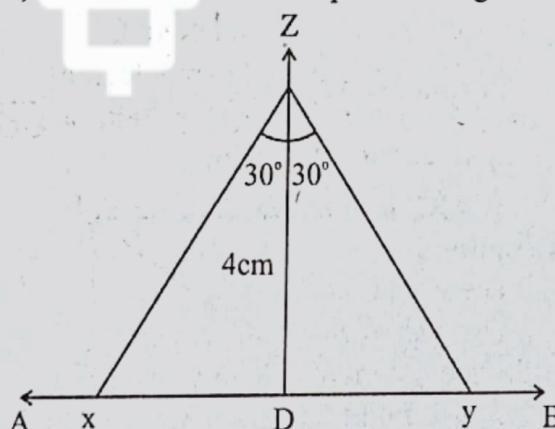
3.   **Construct isosceles triangles.**

(a)   ABC whose base is 5cm and base angle is 45°

(b)   RST with an altitude 7 cm and vertical angle of 30°

(c)   XYZ with 5cm altitude and 30° base angle.
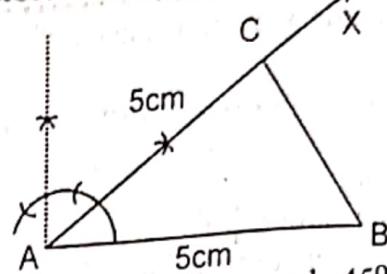
Given: Base 5cm and base angle 45°.

      Required: An isoscales triangle is to be constructed.

Construction:

(i)   Drew $\overline{AB}$ = 5cm

(ii)   Constructed ∠ BAX = 45°.

(iii)   Drew an arc of radius 5cm from point A which meets $\overline{Ax}$ at point c.

(iv)   Joined point C to point B

(v)   △ ABC is a required triangle.

**(b)**   **RST with an altitude 7 cm and vertical angle of 30°**
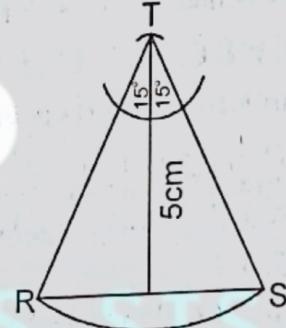
Sol.   **Given:**

      Altitude 7cm and base angle = 30°.

      Required: An isoscales triangle is to be constructed.

Construction:

(i)   Drew $\overrightarrow{xy}$

(ii)   Drew a perpendicular $\overrightarrow{CD}$ on $\overrightarrow{xy}$

(iii)   Joined the intersection of two arcs by a ruler and draw a line upto $\overrightarrow{xy}$

(iv)   Cut m$\overline{CD}$ = 7cm

(v)   RST is the required triangle.

(c)   **XYZ with 5cm altitude and 30° base angle.**
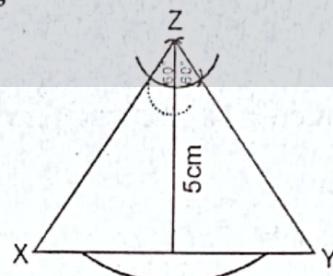
Given: Altitude 5cm, base angle 30°.

Required:
     An isoscales triangle is to be constructed.

Construction:
(i)   Drew a line $\overline{KL}$
(ii)   Drew an altitude $\overline{DC}$ = 5cm
(iii)   Constructed angles of 60°, 60° at C on both side of $\overline{CD}$ (60°+60° = 120°)
(iv)   Rays of the angles cut $\overleftrightarrow{KL}$ at points A and B.
(v)   ABC is the required triangle.

EXERCISE 11.2

1. Construct the required parallelograms.

(a)   PQRS in which m$\overline{PQ}$ = 5cm, $\overline{QR}$ = 4cm and m∠Q = 45°

(b)   ABCD in which m$\overline{AB}$ = 4cm, m$\overline{BC}$ = 3cm and m∠B = 60°

(c)   ACEG in which m$\overline{AC}$ = 7cm, m$\overline{CE}$ = 5cm and m$\overline{EA}$ = 9cm.

(d)   PCBM m$\overline{PC}$ = 4cm, m$\overline{CB}$ = 3cm and $\overline{MC}$ = 5cm.

(a)   PQRS in which m$\overline{PQ}$ = 5cm, $\overline{QR}$ = 4cm and m∠Q = 45°

Sol. (a)
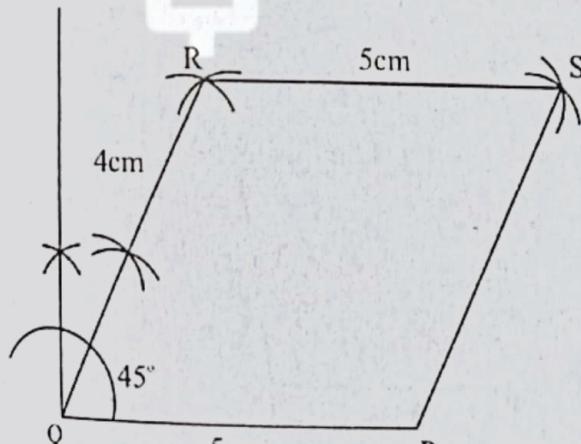
Given: m$\overline{PQ}$ = 5cm, m$\overline{QR}$ = 4cm and m∠Q = 45°.

Required: A parallelogram is to be constructed.

Construction:
(i)   Drew $\overline{PQ}$ = 5cm
(ii)   Constructed an angle of 45° at point Q.

(iii)   Cut off $\overline{QR}$ = 4cm
(iv)   Drew an arc of radius 5cm from R and another arc of radius 4cm from point P which meet each other at point S.
(v)   Joined point S to P and R.
(vi)   PQRS is the required parallelogram.

(b)   ABCD in which m$\overline{AB}$ = 4cm, m$\overline{BC}$ = 3cm and m∠B = 60°
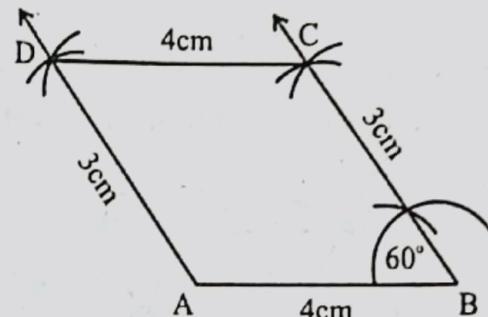
Given: $\overline{AB}$ = 4cm, m$\overline{BC}$ = 3cm and m∠B = 60°.

Required: A parallelogram is to be constructed.

Construction:
(i)   Drew $\overline{AB}$ = 4cm
(ii)   Constructed an angle of 60° at point B.
(iii)   Cut off $\overline{BC}$ = 3cm.
(iv)   Drew an arc of radius 4cm from poin C and an other arc of radius 3 cm from point A which meet each other at point D.
(v)   Joined point D to A and point C.
(vi)   ABCD is the required parallelogram.

(c)   ACEG in which m$\overline{AC}$ = 7cm, m$\overline{CE}$ = 5cm and m$\overline{EA}$ = 9cm.
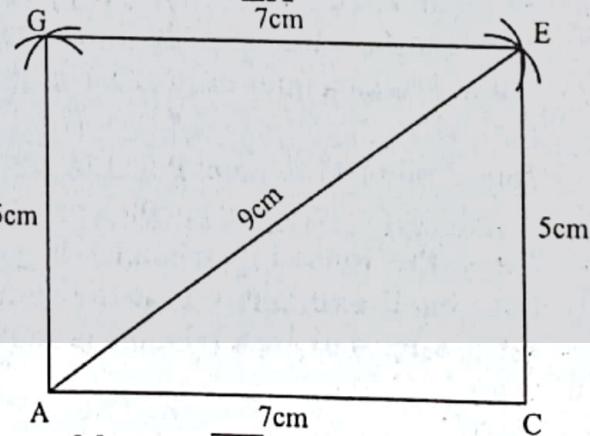
Given: Measure $\overline{AC}$ = 7cm, m$\overline{CE}$ = 5cm and m$\overline{EA}$ = 9cm

Required: A parallelogram is to be constructed.

Construction:

(i)   Drew $\overline{AC}$ = 7cm.

(ii)   Drew an arc of radius 9cm from point A and another arc from point C which meet each other at point E.

(iii)   Drew an arc of radius 5cm from point A and another arc of radius 7cm from point E which meet each other at point G. Joined point G to A and E.

(iv)   ACEG is the required parallelogram.

(d)   PCBM m $\overline{PC}$ = 4cm, m $\overline{CB}$ =3cm and $\overline{MC}$ = 5cm.
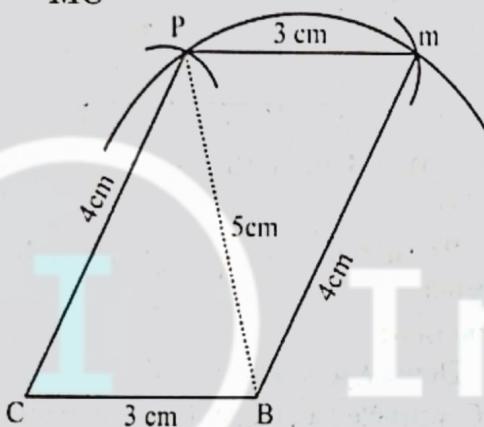
**Given:** m$\overline{PC}$, m$\overline{CB}$=3cm and m$\overline{MC}$ = 5cm

Required: A parallelogram is to be constructed.

**Construction:**

(i)   Drew $\overline{CB}$=3cm

(ii)   Drew an arc of radius 5cm from point B and another arc of 4cm from point C which meet each other at point P.

(iii)   Drew an arc of radius 4cm from point B and another arc of radius 3cm from point P which join each other at point m.

(iv)   Joined point M to point P and B.

(v)   PCBM is the required parallelogram.

2.   Copy the following triangles in your note book and verify that the sum of three angles of each triangle is 180°.

(a)
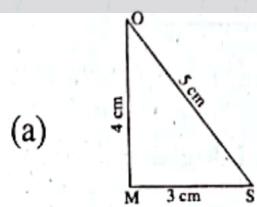
(b)
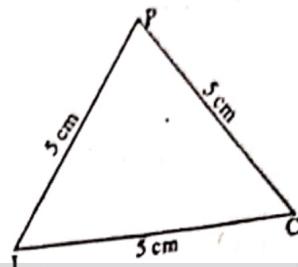
(c)

**3.**   Copy the following quadrilateral in your note book. Measure the four angles and prove that the sum of four angles of each figure is 360°

(a)
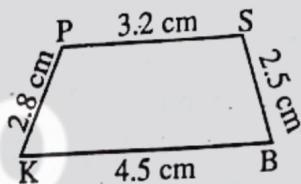

(b)
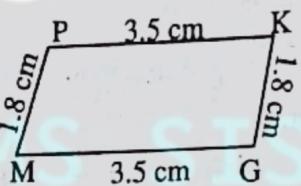
(c)
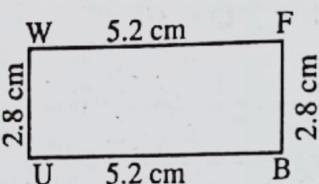
(d)
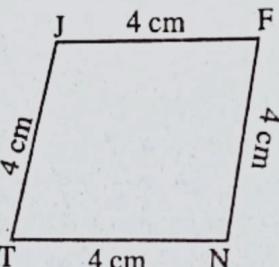
REVIEW EXERCISE 11

1.   Divide a 10 cm line segment in 5 equal parts.

Construction:

(i)   Drew $\overline{AE}$ = 10cm.

(ii)   Constructed an angle of 40° from point A upwards and another angle of 40°

from point E downwards.

Divide the arms of both angles in five equal ports.

Joined the arced parts with parts of other arm.

Hence $\overline{BC}$, $\overline{CD}$, $\overline{DE}$, $\overline{EF}$ and $\overline{FG}$ are required equal parts.

Divide 5 cm line segments in the ratio of 3:2.
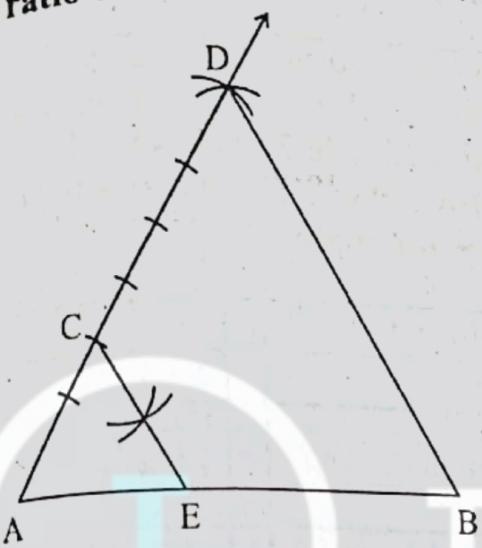
Construction:

(i) Drew $\overline{AB} = 5cm$.

(ii) Drew an angle of 60° at point A.

(iii) Divide the arm of 60° into (2+3=5) equal parts.

(iv) Joined point D to point A.

(v) Constructed ∠ACE at point C = ∠ADE whose arm meets $\overline{AB}$ at point E

(vi) Hence AE : EB = 2:3

3. Construct a triangle PQR whose altitude is 5cm and a base angle is 45°.
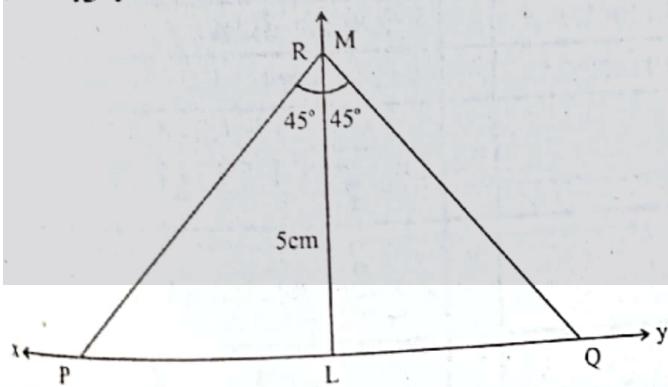
Sol. Construction:

(i) Drew $\overleftrightarrow{xy}$

(ii) Took any point L at $\overleftrightarrow{xy}$

(iii) Constructed an altitude $\overline{LM}$ from point

(iv) L of 5cm length.

Constructed angles of 45° on both sides of point R whose arm meet $\overleftrightarrow{xy}$ at P and Q.

(v) PQR is the required triangle.

4. Construct a parallelogram SACT with two adjacent sides measuring 4 cm and 3 cm at 60° with each other.

Given: $\overline{PQ}$ = 5cm, $\overline{QR}$ = 4cm an angle of 45°.

Required: A parallelogram is to be constructed.

Construction:

(i) Drew $\overline{SA}$ = 4cm

(ii) Constructed an angle of 60° at point S.

(iii) Cut off $\overline{ST}$ = 3cm.

(iv) Drew an arc of 4 cm from point T and another arc of 3 cm from point T which meet each other at point C.

(v) Joined point C to point T and T

(vi) PQRS is the required parallelogram.

5. Construct a parallelogram ABCD such that
mBC = 4.5cm, mAB = 3cm and ZB = 45°

**Sol. Given:**
Adjacent sides 4cm and 3cm, angle 60°.

Required: A parallelogram is to be constructed.

**Construction:**

(i) Drew 8A = 4cm

(ii) Drew an angle of 45° at point A.

(iii) Cut off 3 cm from point A.

(iv) Drew an arc of 4cm from point C and another arc from point S which intersect each other at point T.

(v) SACT as the required parallelo- gram.
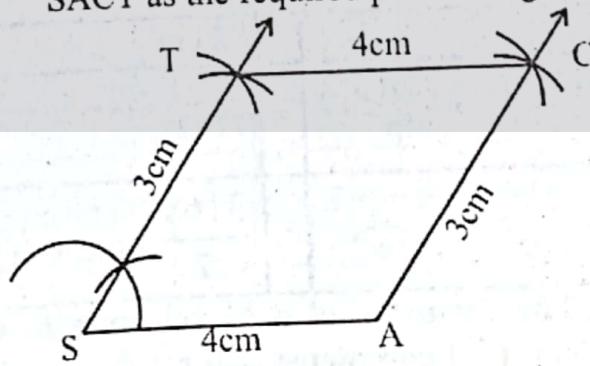
Construction:

(i)   Drew $\overline{BA}$ = 3cm

(ii)   Constructed an angle of 45° at point B.

(iii)   Cut off $\overline{BC}$ = 4.5 cm

(iv)   Drew an arc of radius 3 cm from point C and another arc from point A of radius 45cm which meet each other at point D.

(v)   Joined point D to point A and C.

(vi)   ABCD is the required parallelogram.
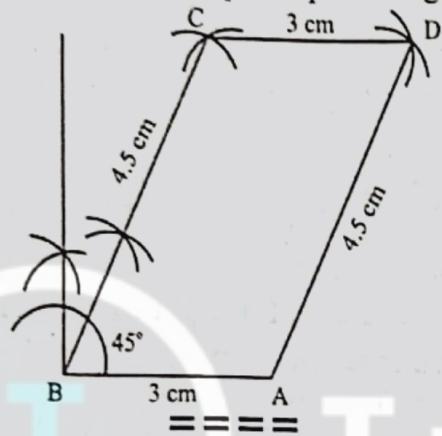
Unit 12
CIRCUMFERENCE, AREA AND VOLUME
EXERCISE 12.1

1.   Radius of a circle is 35 cm. Find the circumierence of this circle.

Sol.

Radius	=	35 cm
Curcumference	=	$35 \times 2 \times \dfrac{22}{7}$
	=	220 cm

2.   Radius of a horse cart (tanga) wheel is 72 cm. How much iron strip will be needed to circle around the wheel $\left(\pi = \dfrac{22}{7} \text{ or } 3.14\right)$

Sol.

Radius	=	72 cm
Circumference or the length of iron strip	=	$72 \times 2 \times \dfrac{22}{7}$
	=	$\dfrac{3168}{7}$ = 452.6 cm

3.   The diameter of a bicycle tyre is 42 cm. If it completes two revolutions in

1 sec, how much distance will it cover in 10 seconds?

Sol.

Diameter	=	4.2 cm
Circumference	=	$42 \times \dfrac{22}{7}$
	=	132 cm
Distance = 240 × 10	=	2640 cm
	=	2640 cm Ans.

4.   The second needle of a clock is 7 cm. How much distance is cover- ed by its outer edge in 24 hours?
(Hint: there are 1440 minutes in a day and night)

Sol.

Length of hand	=	7 cm
Diameter	=	2 × 7 = 14 cm
Circumference	=	$14 \times \dfrac{22}{7}$ = 44 cm
Distance in 1 hour	=	44 × 60 = 2640cm
	=	24×2640 = 63360
633.6	=	$\dfrac{63360}{100}$ or 63360
	=	633.6 Ans.

EXERCISE 12.2

1.   The height and radius of a cylinder are 3 cm and 1.5 cm respectively. Find the surface area of the cylinder.

Sol.

Radius	=	1.5 cm
Diameter	=	1.5 × 2 = 3cm
Surface are	=	$2\pi r(\ell + r)$
	=	$2 \times \dfrac{22}{7} \times 1.5\,(3+1.5)$
	=	$2 \times \dfrac{22}{7} \times 1.5(4.5)$
	=	$42.4 = \dfrac{289}{7} = \dfrac{44 \times 675}{7}$
	=	42.4 cm

2.   A ball point pen has inner radius of

2mm and length of 90 mm. How many mm3 of ink will be needed to fill it?

Sol.

Radius	=	2mm
Length	=	90mm
Volume	=	$v = \pi r^2 h$
	=	$\dfrac{22}{7} \times 2 \times 2 \times 90$
	=	1131.4 mm³

3. Radius of circular play ground is 35m. Find its area.

Sol.

Radius	=	35m
Area	=	πr^2
Area	=	$35 \times 35 \times \dfrac{22}{7}$
	=	3850m²

4. The circumference of a circle is 176 cm. Find its area.

Sol.

Circumference	=	176cm
Diameter	=	$\dfrac{176 \times 7}{22} = 56cm$
Radius	=	$\dfrac{56}{2} = 28cm$
Area	=	πr^2
$28 \times 28 \times \dfrac{22}{7}$	=	246 cm²

5. A car engine has three cylinders if each cylinder has a radius 4 cm and length 6.6 cm, find the total volume of all the three cylinders.

Sol.

Radius	=	4 cm
Length	=	6.6 cm
Volume	=	$\pi r^2 h$
		$\dfrac{22}{7} \times 4 \times 4 \times 6.6$
Volume of 3 cylenders	=	331.9×3
	=	995.7 cm³

6. A tube light is 100 cm long and has a diameter of 3 cm. Find the surface area of the tube light.

Sol.

Diameter	=	3cm
Radius	=	3/2 cm
Length	=	100 cm
Surface area	=	$2\,2\pi r(\ell + r)$
	=	$2 \times \dfrac{22}{7} \times \dfrac{3}{2}\left(\dfrac{3}{2}+100\right)$
	=	$\dfrac{132}{14} \times \dfrac{203}{21}$
	=	$\dfrac{13398}{14}$
	=	957 cm² Ans.

7. A godown for grain has cylinder for storing grain. If the height and radius of cylinder is 15 m and 3 m respectively. Find the volume of cylinder.

Sol.

Radius	=	3 m
Height	=	15m
Volume of cylender	=	$\pi r^2 h$
	=	$\dfrac{22}{7} \times 3 \times 3 \times 15$
	=	$\dfrac{2970}{7}$
	=	424.4 m³

8. A honey bottle is cylindrical. If its volume is 275 cm' (mf) find the height of the bottle if its top has the radius of 3.5 cm.

Sol.

Radius	=	3.5m
Volume	=	275m³
Volyume	=	$\pi r^2 h$
Length	=	$\dfrac{\pi r^2 h}{\pi r^2}$

	=	$\dfrac{7 \times 275}{22 \times 3.5 \times 3.5}$
	=	$\dfrac{7 \times 275 \times 10 \times 10}{35 \times 35}$
	=	$\dfrac{5500}{770}$
		7.02

9. The circumference of Earth is about 25,000 miles. What is the distance to the center of Earth?

Sol:

Circumference = 25000 miles

Diameter = $25000 \times \dfrac{7}{2}$

= 7954.54 miles

Radius = $\dfrac{7954.54}{2}$

= 3977.27 miles

EXERCISE 12

(Objective Type Questions)

Choose the correct option.

(i) Pi (π) is the ratio between
(a) Radius and circumference
(b) Circumference and diameter
(c) Diameter and radius
(d) Diameter and circumference

(ii) The value of Pi(π) is approxi- mately equal to
(a) $\dfrac{22}{7}$ (b) $\dfrac{7}{22}$
(c) $\dfrac{27}{7}$ (d) $\dfrac{23}{7}$

(iii) Formula for the circumference of a circle is:
(a) πr^2 (b) $2\pi r2$
(c) $\dfrac{44}{7}r$ (b) None

(iv) Formula for the area of a circule is:
(a) π^2 (b) $\pi^2 r$
(c) $2\pi r^2$ (d) πr^2

(v) The surface area of a cylinder is determined by
(a) $2\pi + \ell$ (b) $2\pi r^2 + \ell 2$
(c) $2\pi r(\ell + r)$
(d) $2\pi \ell(\ell + r)$

(vi) The volume of a cylinder is found by:
(a) $2\pi r^2 \ell$ (b) $\pi^2 r \ell$
(c) $\pi r^2 \ell$ (d) $2\pi r \ell$

(vii) The constant ratio between the circumference and the diameter of a circle is called:
(a) Pi   (b) Phi
(c) Si   (d) None

(viii) The ratio between a circumference and a diameter of all sizes of circle is
(a) $\dfrac{22}{7}$ (b) $\dfrac{7}{22}$
(c) $\dfrac{27}{7}$ (d) None

(ix) If the radius of a circle is 14 cm, its circumference will be
(a) 88 cm   (b) 88 mm
(c) $\dfrac{44}{7}$ cm   (d) $\dfrac{44}{7}$ mm

(x). The diameter of a circle is 8 units. What is the area of the circle if the diameter is double?
(a) 50.3 unit^2
(b) 100.5 units^2
(c) 201.1 units^2
(d) 804.2 units^2

Ans. (i) (b)   (ii) (a)   (iii) (c)
(iv) (d)   (v) (c)   (vi) (c)
(vii) (a)   (8) (a)   (ix) (a)   (x) c

2. A compass is opened 14 cm on a ruler. Find the length of the circle drawn by it.

Sol.

Radius	=	14cm
Diameter	=	14 × 2 = 28 cm
Circumference	=	$\dfrac{22}{7} \times 28$

3. A cylindrical milk container needs to

be painted. If the cylinder is 7m long with radius of 2m. Find the cost of painting it, if per m cost is 27 rupees.

Sol.

Surface area	=	$2\pi r(\ell+r)$
	=	$\dfrac{88}{7}\times 9 = 2\times\dfrac{22}{7}\times 2(7+2)$
	=	$\dfrac{292}{7}\times 27$
	=	$\dfrac{292}{7}\times 27 = \dfrac{7884}{7}$
	=	Rs. 1269.14

4. A cold drink tin has the radius of 3 cm and is 10 cm in height. In a junkyard its height is compressed to 1.5 cm. Find its volume before and after the compression.

Sol.

Radius	=	3 cm
Height	=	10 cm
Volume	=	$\pi r^2 h$
	=	$\dfrac{22}{7}\times 3\times 3\times 10$
	=	$\dfrac{1980}{7} = 282.9\ cm^3$
	=	$3\times 3\times \dfrac{22}{7}\times \dfrac{8.5}{10}$
	=	$\dfrac{1683}{7} = 240.4$

5. Find the area of the head of a screw if its diameter is 14 mm.

Sol.

Diameter	=	14mm
Radius	=	$\dfrac{14}{2} = 7mm$
Area		$7\times 7\times \dfrac{22}{7}$
	=	154 mm^2

6. A well is 50 m deep and its diameter

is 4 m. How many tiles will be required to cover all its inner surface if the area of one tile is 0.9 m^2?

Sol.

Diameter	=	4m
Radius	=	$\dfrac{2}{4} = 2m$
Depth	=	50m
Surface area	=	$2\pi r(\ell+r)$
	=	$2\times \dfrac{22}{7}\times 27(2+50)$
	=	$\dfrac{88}{7}\times 52 = \dfrac{4576}{7}$
Number of tiles	=	$\dfrac{4576}{7}\times \dfrac{10}{9}$
	=	$\dfrac{45760}{63} = 725$ tiles

Unit 13

INFORMATION HANDLING
EXERCISE 13.1

1. The frequency distribution of the age of adults who listen to FM radio is:

Sr. No.	Age (years)	Frequency: percent of listeners
1	15 - 25	12
2	25 - 35	22
3	35 - 45	32
4	45 - 55	23
5	55 - 65	11

(i) What is the percentage of listeners in the first class?

(b) What is the minimum age limit of listeners in the frequency distribution?

(c) What is the maximum age limit of listeners in the frequency distribution?

(d) What is the class interval of the frequency distribution?

Sol. (a) 12% (b) 15 years (c) 65 years (d) 10

2. The number of units produced per day in a factory is:

Serial Number	Classes	Frequency: Units produced
1	30 - 40	1
2	40-50	1
3	50-60	1
4	60-70	?
5	70-80	7
6	80-90	2
7	90-100	5
8	100-110	2
Total		**25 days**

(a) How many days were studied in the frequency distribution?

(b) What does 7 represent in frequency column?

(c) What is the fifth class interval?

(d) What is the unknown frequency of class 4?

Sol.

(a) 25 days   (b) 7 days

(c) units production from 70 units up to 80 units. d. 25-19 = 6 days

EXERCISE 13.2

1. **Damage at a paper mill (millions of rupees) due to breakage can be divided according to the product:**

Toilet paper 132

Hand towels 85

Napkins 43

Other products 50

Draw a pie graph to indicate percentage damage in each category.

Sol.

1. **The frequency distribution for the above problem is:**

Sr. No.	Classes/ Category	Frequency	Class relative Frequency
1	Toilet paper	132	132/31 0= .43(100%) = 43%
2.	Hand towels	85	85/31 0= .27(100%) = 27%
3	Napkins	43	43/310=.14(1005)=14%

4	Other products	50	50/310 = 16 (100%) =16%
	Total	310	100%

The proportion in each category is the following:

Toilet paper=360°(.43) = 154.8°

Hand towels=360°(.27) = 97.2°

Napkins = 360°(.14) - 50.4°

Other Products=360°(.16) = 57.6°

The pie graph is as under:
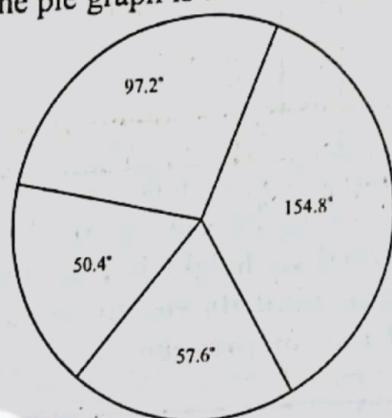
2. **The number of units of electric power company consumed by consumers in different categories are the following:**

Domestic   1950

Commercial   4000

Industrial 8000

Draw a pie graph to indicate the percentage unit's consumption in each 3. category.

Sol.

2. The frequency distribution for the above problem is:

Sr. No.	Classes/ Category	Frequency	Class relative Frequency
1	Domestic	1950	= .14(100%) = 14%
2.	Commercial	4000	= .29(100% = 29%

3	Industrial	8000	= .57 (100%)
			= 57%
	Total	13950	100%

The proportion in each category is the following:

Domestic = $360°(.14) = 50.4°$
Commercial $360° (.29) = 104.4°$
Industrial $360° (.57) = 205.2°$
The pie graph is as under:

**3.** The number of students in a private sector university in each category are the following:

BBA   61
BCS   40
MBA   28
B. Eng   70

Draw a pie graph to indicate the percentage unit's consumption in each category.

Sol.
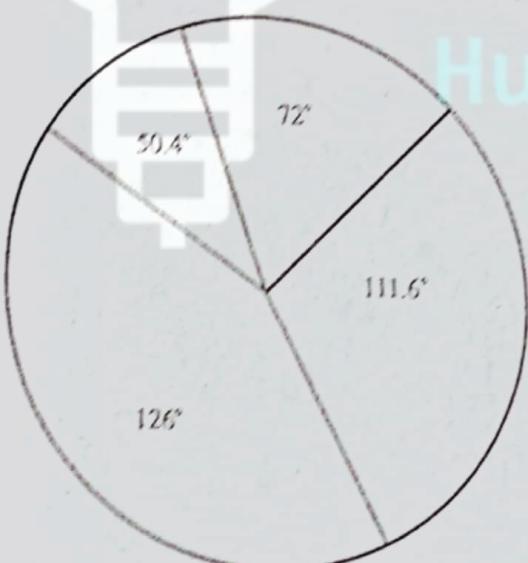
Sr. No.	Classes/ Category	Freq-uency	Class relative Frequency
1	BBA	62	$62/25 = 0.31(100\%)$ = 31%

2	BCS	40	$40/25 = 0.20(100\%)$ = 20%
3	MBA	28	$28/25 = 0.14(100\%)$ = 14%
4	B. Eng	70	$70/25 = 0.35(100\%)$ = 35%
5		200	100%
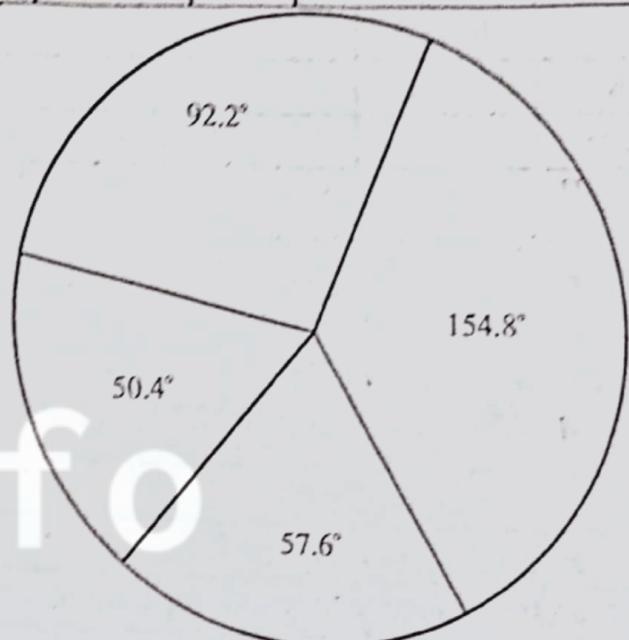
Exercise 13

i. The numerical information is called:
   a.   data   b.   table
   c.   knowledge
   d.   none of these

ii. Data can be available in
   a.   grouped data
   b.   ungrouped data
   c.   none of these
   d.   all of these

iii. The lower limit of a class 7-12 is:
   a.   12   b.   7
   c.   5   d.   none of these

iv. The upper limit of a class 5-15 is:
   a.   5   b.   15
   c.   10   d.   none of these

v. The class interval of of a class 14-18 is:
   a.   14   b.   18
   c.   32   d. 4

vi. If the central angle in a pie graph is 90°,

then the proportion of that part is;

a. 50%   b. 25%

c. 75%   d 90%

2. The time (in seconds) to run by 36 students a race of 500 m develops a data set:

45, 40, 44, 51, 40, 59, 44, 47, 42, 41, 54, 39, 50, 55, 61, 59, 47, 44, 49, 50, 52, 47, 44, 51, 59, 55, 59, 43, 44, 41, 41, 42, 46, 54, 51, 52

Organize the data in a frequency distribution with 5 as the class interval.

Sol. The frequency distribution is as under:

Sr. No.	Classes	Frequency
1	35-40	1
2	40-45	13
3	45-50	6
4	50-55	9
5	55-60	6
6	60-65	1
Total	-	36 students

3. The frequency distribution represents the annual tempera- ture (°C) of a certain area:

Sr. No.	Temperature (°C)	Frequency; days
1	0 - 10	43
2	11 - 21	70
3	22 - 32	110
4	33 - 43	94
5	44 - 54	48
Total	-	365 days

a. How many days of the year are involved in a frequency distribution?

b. How many days of the year are found coldest?

c. What was the maximum temperature throughout the year?

Sol. (a) 365 days

(b) 43 days

(c) 54C°

4. A student of class 7th is getting rupees 25 as pocket money daily. He spent the pocket money in the

He saved rupees 3 according to above expenditure. Draw a pie graph to show the expenditure in each category.

Sol.

3. The frequency distribution for the above problem is:

| Sr. No.	Classes	Frequency	Class relative frequency
1	Bus fare	14	14/25 = 0.56 (100%) = 56%
2	Recess meal	8	8/25 = 0.32(100%) = 32%
3	Money saved	3	3/25 = 0.12(100%) = 12%
	Total	25 Rs.	100%

The proportion in each category is the following:

Bus fare = 360°(.56) = 201.6°

Recess = 360° (.32) = 115.2°

Money saved = 360°(.12) = 43.2°

The pie graph is as under:

☆☆☆☆☆☆

The End