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Catalog

SET THEORY

SYNOPSIS - 1

1. Introduction : In everyday life, we have to deal with the collections of objects of one kind or the other.

For Example :

i) The collection of even natural numbers less than 12 i.e., the numbers 2, 4, 6, 8 and 10.

ii) The collection of vowels in the English alphabet i.e., the letters a, e, i, o, u.

iii) The collection of all natural numbers that divide 12 i.e., the numbers 1, 2, 3, 4, 6 and 12.

Definition : Any well defined collection of objects is called a set.

By *'well-defined collection'* we mean that given a set and an object, it must be possible to decide whether or not the object belongs to the set.

The objects are called the members or the elements of the set. Sets are usually denoted by capital letters and their members are denoted by small letters.

We write the elements of set with in the bracess { }.

If x is a member of the set S, we write $x \in S$ (read as x belongs to S) and if x is not a member of the set S, we write $x \notin S$ (read as x does not belong to S). If x and y both belongs to set S, we write $x, y \in S$.

Representation of Sets : There are two ways to represent a given set.

1) Roster or Tabular Form or list form. In this form, list all the members of the set, separate these by commas and enclose these within braces (curly brackets)

For example :

i) The set S of even natural numbers less than 12 in the tabular form is written as S = { 2, 4, 6, 8, 10 }. Note that $8 \in S$ while $7 \notin S$.

ii) The set S of prime natural numbers less than 20 in the tabular form is written as S = { 2, 3, 5, 7, 11, 13, 17, 19 }

iii) The set N of natural numbers in the tabular form is written as N = { 1, 2, 3, ... }, the dots indicating infinitely many missing positive integers.

2. Set Builder or rule form : In this form, write one or more (if necessary) variables (say x, y etc.) representing an arbitrary member of the set, this is followed by a statement or a property which must be satisfied by each member of the set.

For example :

i) The set S of even natural numbers less than 12 in the set builder form is written as S = { x/x is an even natural number less than 12}.

ii) The set of prime natural number less than 20 in the set builder form is written as {x/x is a prime natural number less than 20}.

The symbol '|' stands for the words 'such that' or 'where'. Sometimes we use the symbol ';' or ':' in place of the symbol '|'.

iii) The set N of natural numbers in the set builder form is written as N = { x :x is a natural number}.

Some Standard Sets : We enlist below some sets of numbers which are most commonly used in the study of sets :

i) The set of natural numbers (or positive integers). It is usually denoted by N. i.e. N = { 1, 2, 3, 4, ... }

ii) The set of whole numbers. It is usually denoted by W. i.e. W = { 0, 1, 2, 3, ... }.

iii) The set of integers. It is usually denoted by Z . i.e. Z = { ...., -3, -2, -1, 0, 1, 2, 3,... }

iv) The set of rational numbers. It is usually denoted by Q i.e. Q = { x : x is a rational number } or $Q = \left\{ x : x = \frac{m}{n}, \text{ where } m \text{ and } n \text{ are integers and } n \neq 0 \right\}$

v) The set of real numbers. It is usually denoted by R. i.e. R = { x : x is a real number } or R = { x : x is either a rational number or an irrational number }

Note :- $i = \sqrt{-1}$

Types of sets :

The Empty set : A set containing no element is called the empty set.

It is also called the *null set* or *void set* . There is only one such set. It is denoted by ϕ or by { }.

For example :

i) The collection of all integers whose square is less than 0 is the empty set.

(∵ Square of an integer cannot be negative)

The order of the empty set is zero.

Singleton set : A set is said to be a singleton set if it contains only one element.

The set { 7 }, { – 15 } are singleton sets. { x : x + 4 = 0, $x \in Z$ } is a singleton set, because the set contains only one integer namely, –4.

The set { x : x + 4 = 0, $x \in N$ } is a null set, because there is no natural number which may satisfy the equation x + 4 = 0.

A set whose order is 1 is called a singleton set. Thus, a singleton set is a set which contains only one distinct element.

For example :

i) If A = { x : x is a positive divisor of 20 }, then n(A) = 6 as

A = { 1, 2, 4, 5, 10, 20 }

ii) If B = { x : x is a positive even prime }, then n(B) = 1 as B = { 2 }.

Note that B is a singleton set.

iii) If C = { x : x is an integer neither positive nor negative }, then n(C) = 1 as C = {0}.

C is a singleton set.

Finite and Infinite sets : A set is called finite if the process of counting of its different elements comes to an end; otherwise, it is called infinite. The empty set is taken as finite.

For example : i) The set S = { 2, 4, 6, 8 } is a finite set.

ii) The set of all students studying in a given school is a finite set.

iii) The set N of all natural numbers is an infinite set.

iv) The set of divisors of a given natural number is a finite set.

v) The set of all prime numbers is an infinite set.

Order of a finite set : The number of different elements in a finite set S is called order of S, it is denoted by O(S) or n(S).

Note : The order of an infinite set is not defined.

Equivalent sets : Two finite sets A and B are said to be equivalent written A ~ B (or $A \approx B$), iff they contain the same number of distinct elements i.e., iff n(A) = n(B).

For example :

i) The sets { 1 } and {2, 2, 2} are equivalent.

ii) The sets { 3, 4 } and { x : x^2 = 4 } are equivalent sets.

iii) The sets { a, b, c, d, e }, { 1, 2, 3, 4, 5 } and { a, e, i, o, u } are equivalent sets as each of these sets contains 5 distinct elements.

Equal sets :

Two sets A and B are said to be equal, written as A = B, iff every member of A is a member of B and every member B is a member of A.Remember that equal sets are always equivalent but equivalent sets may not be equal.

For example :

i) The sets { – 1, +1 } and { x : x^2 = 1 } are equal.

ii) The sets { 0, 0 } and { 3 } are not equal, but they are equivalent.

Cardinal number of set : The number of distrinct elements contained in a finite set is called its cardinal number and is denoted by n(A).

Examples : If A = {1, 2, 3, 4, 5} then n(A) = 5, if B = {1, 2, 3} then n(B) = 3.

WORKSHEET - 1

SINGLE ANSWER TYPE

1. The collection of rich persons in india is

   1) A null set 2) A finite set 3) A infinite set 4) Not a set

2. Which of the following is a set ?

   1) The collection of all talented persons of all beautiful flowers 2) The collection

   3) The collection of all peaple in hyderabad.

   4) The collection of beautiful girls in india.

3. Which of the following is a set ?

   1) The collection of all difficult problems in maths

   2) The collection of all difficult problems in physics

   3) The collection of all difficult problems in chemistry

   4) The collection of all topics in algebra.

4. Which of the following is a void set ?

   1) The prime numbers less than 100

   2) The collection of compositic numbers between 90 to 100

   3) Even primes in between 100 to 200

   4) Perfect numbers between 1 to 100

5. Which of the following is a null set ?

   1) $\{x : |x| < 1, x \in N\}$ 2) $\{x : |x| = 5, x \in N\}$

   3) $\{x : x^2 = 1, x \in z\}$ 4) $\{x : x^2 2x + 1 = 0, x \in R\}$

6. Which of the following is infinite set ?

   1) The natural numbers less than 1,00,000.

   2) The real numbers in between 2011 to 2013.

   3) The Collection of all 8th class students.

   4) None

7. The cardinal number of the set $A\{x : x + 1 < 12, x \in N\}$ is

   1) 9 2) 10 3) 11 4) 12

8. The cardinal number of the set containing the word “MATHEMATICS”

   1) 11 2) 10 3) 9 4) 8

9. The cardinal number of the set containing all primes less than 100.
   1) 21 2) 22 3) 23 4) 24

10. The cardinal number of the set $A\{x : x^2 + 1 < 0, x \in R\}$
    1) 0 2) 10 3) 1 4) 2

11. The set of all composite numbers is a
    1) Finite set 2) Infinite set 3) Null set 4) Not set

12. If $Q = \left\{x : x = \frac{1}{y}, where\ \text{x, y} \in \text{N}\right\}$, then
    1) $0 \in Q$ 2) $1 \in Q$ 3) $2 \in Q$ 4) $\frac{2}{3} \in Q$

13. Which of the following is a singleton set
    1) The natural numbers less than 1
    2) The whole numbers greater than 9
    3) The even primes less than 100
    4) The real numbers in between 1 and 3.

14. If $A = \{S, H, I, V, A\}$, $B = \{V, A, I, S, H\}$ then A, B are
    1) Equivalent 2) Equal 3) Not sets 4) Unequal

15. If $A = \{x : x^2 - 4 < 0, x \in z\}$, $B = \{N, A, G, A\}$ Then A, B are
    1) Equal 2) Equivalent 3) Unequal 4) None

MULTI ANSWER TYPE

16. Which of the following sets are singleton sets ?
    1) $\{x : 6x + 9 = 0, x \in Q\}$ 2) $\{x : x^2 + 1 = 0, x \in R\}$
    3) $\{x : x < 2, x \in N\}$ 4) $\{x : 2x^2 - 8 = 0, x \in N\}$

17. Which of the following is not a singleton set ?
    1) $\{x : |x| = 9, x \in z\}$ 2) $\{x : x^2 + 2x + 1 = 0, x \in N\}$
    3) $\{x : x^2 = 101, x \in N\}$ 4) $\{x : x + 12 = 10, x \in N\}$

18. $A = \{1, 2, 3, 4\}$, $B = \{x : x - 5 < 0, x \in N\}$ then A, B are
    1) equal 2) Equivalent 3) Finite 4) Unequal

19. If $x = \{a, b, c, d\}$ then which of the following are not Correct
    1) $a \in x$ 2) $\{a, b\} \in x$ 3) $b \in x$ 4) $\{c\} \in x$

20. Which of the following set having cardinal number is infinite.
1) Set of rational is infinite. 2) Set of Comptex numbers
3) Set of real numbers between 2012 and 2013.
4) Set of all odd numbers.

COMPREHENSION TYPE

Writeup-1

21. If $A=\{5,9,13,17,21\}$ then set builder form of A is

1) $A=\{n(n+1) \ / \ n<5,\ n\in N\}$ 2) $A=\{4n+1 \ / \ n\le 5,\ n\in N\}$

3) $A=\{4n+1 \ / \ n<5,\ n\in N\}$ 4) $\{A=2n+1 \ / \ n\ge 2,\ n\in N\}$

22. The no. of prime numbers in A is
1) 5 2) 4 3) 3 4) 2

23. The no. of composite numbers in A is
1) 5 2) 4 3) 3 4) 2

Writeup-2

If Variable are representing an arbitrary member of the set, this is followed by a statement is called set builder or rule form of a set.

24. If $A=\{1,3,5,7,9\}$ then rule form of A is

1) $\{x:\ \ x=2n+1,\ \ n\in N,\ \ n\le 5\}$ 2) $\{x:\ \ x=2n+1,\ \ n\in W,\ \ n<5\}$

3) $\{x:\ \ x=2n-1,\ \ n\in N,\ \ n\le 5\}$ 4) $\{x:\ \ x=2n-1,\ \ n\in N,\ \ n<5\}$

25. If $A=\{2,4,9,16,25\}$ then set builder form of A is

1) $\{x:\ \ x=n^2,\ \ n\in N,\ \ n<5\}$ 2) $\{x:\ \ x=(n+1)^2,\ \ n\in W,\ \ n\le 5\}$

3) $\{x:\ \ x=n^2,\ \ n\in z,\ \ n\le 5\}$ 4) $\{x:\ \ x=(n+1)^2,\ \ n\in W,\ \ n<5\}$

26. If $A=\{2,9,28,65\}$ then set builder form of A is

1) $\{x:\ \ x=n^3+1,\ \ n\in N,\ \ n\le 4\}$ 2) $\{x:\ \ x=n^3+1,\ \ n\in N,\ \ n<4\}$

3) $\{x:\ \ x=(n+1)^3+1,\ \ n\in W,\ \ n\le 4\}$ 4) $\{x:\ \ x=n^3-1,\ \ n\in N,\ \ n\le 4\}$

REASONING ANSWER TYPE

27. S.I : The set of all Consonants in the English alphabet is a finite set
S.II : A set Containing finite number of elements is called a finite set.
1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

28. S.I : The set builder form of $A=\left\{-1,\frac{1}{2},\frac{-1}{3},\frac{1}{4},\frac{-1}{5},..\right\}$ is $A=\left\{\frac{(-1)^n}{n}\middle/ n\in N\right\}$

S.II : $(-1)^n=-1$ if n is odd, $(-1)^n=1$, if n is even

1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

MATRIX MATCHING TYPE

29.

Column - I	**Column - II**
1) The Collection of good books in Library	p) Set
2) $\{1,3,5,7,9\}$	q) Not a sest
3) $\{2n/n\in N, n\le 5\}$	r) Roster form
4) The collection of all even numbers	s) Set builder form
	t) $\{2,4,6,8,10\}$

30.

Column - I	**Column - II**
1) $A=\left\{0,\frac{1}{3},\frac{1}{2},\frac{3}{5}\right\}$	p) Singleton set
2) $A=\{2,5,10,17\}$	q) $n(A)=4$
3) $A=\{x:\ x\in z,\ x^2-4=0\}$	r) $\left\{x:\ x=\frac{n-1}{n+1},\ n\in N,\ n\le 4\right\}$
4) $A=\{x:\ x\in W,\ x^2+1<2\}$	s) $A=\{x:\ x=n^2+1,\ n\in N,\ n\le 4\}$
	t) $n(A)=2$

INTEGER ANSWER TYPE

31. A = set of vowels in first 10 alphabets then $n(A)=$_____

32. If A = set of letters in the word MISSISSIPI then $n(A)=$ _____

33. If $A=\{2^x<50, x\in N\}$ then $n(A)=$ _____

34. If A = Set of even primes less than 2012 then $n(A)=$_____

SYNOPSIS - 2

Subsets:

Let A, B be two sets such that every member of A is a member of B, then A is called a subset of B, it is written as $A \subseteq B$.

Thus, $A \subseteq B$ iff (read as 'if and only if') $x \in A \Rightarrow x \in B$.

If $\exists$ (read as 'there exists') atleast one element in A which is not a member of B, then A is not a subset of B and we write it as $A \not\subset B$.

For example:

i) Let A = {–1, 2, 5} and B = {3, – 1, 2, 7, 5}, then $A \subseteq B$. Note that $B \not\subset A$

ii) The set of all even natural numbers is a subset of the set of natural numbers.

Some properties of subsets :

i) The null set is subset of every set. Let A be any set.

$\phi \subseteq A$, as there is no element in ϕ which is not in A.

ii) Every set is subset of itself. Let A be any set.

$\therefore\ x \in A \Rightarrow x \in A \qquad \therefore\ A \subseteq A.$

iii) If $A \subseteq B$ and $B \subseteq C$, then $A \subseteq C$. Let $x \in A$.

$\therefore\ x \in B \qquad (\because A \subseteq B)$

$\therefore\ x \in C \qquad (\because B \subseteq C)$

$\therefore\ A \subseteq C.$

iv) A = B iff $A \subseteq B$ and $B \subseteq A$. Let A = B.

$\therefore\ x \in A \Rightarrow x \in B \qquad (\because A = B)$

$\therefore\ A \subseteq B$. Similarly, $x \in B \Rightarrow x \in A \qquad (\because A = B)$

$\therefore\ B \subseteq A$. Conversely, let $A \subseteq B$ and $B \subseteq A$.

$\therefore\ x \in A \Rightarrow x \in B \quad (\because A \subseteq B)$ and $x \in B \Rightarrow x \in A \quad (\because B \subseteq A) \ \therefore\ A = B$

Note:-

1. Two sets A and B are equal iff $A \subseteq B$ and $B \subseteq A$.
2. Since every element of a set A belongs to A, it follows that every set is a subset of itself.

Proper subset: Let A be a subset of B. We say that A is a proper subset of B if $A \neq B$ i.e., if there exists atleast one element in B which does not belong to A. A subset, which is not proper, is called an improper subset.

Observe that every set is an improper subset of itself. If a set A is non-empty, then the null set is a proper subset of A.

Ex 1 : If A = { 1, 2, 3 }, then proper subsets of A are ϕ, { 1 }, { 2 } , { 3 }, { 1, 2 }, { 1, 3 }, { 2, 3 }

Ex 2 : A = { 1, 2, 3, 4, 5 }, B = { 2, 3, 4 }

Every element of B i.e., 2, 3 and 4 is also an element of A.

$\therefore B \subset A$

Further we note that there are two more elements that are in A and not in B. They are 1 and 5. Then $A \neq B$. In such circumstances we say that B is a proper subset of A.

Ex 2 : $N \subset W \subset Z \subset Q \subset R$

Remark 1 : If $A \subseteq B$ then every element of A is in B and there is a chance that A may be equal to B i.e., every element of B is A, but if $A \subset B$, then every element of A is in B and there is no chance that A may be equal to B i.e., there will exist at least one element in B which is not in A.

$\therefore \quad A \subset B \Rightarrow A \subseteq B, A \neq B$ i.e., $A \subseteq B, B \not\subset A$.

Remark 2 : If $A \subseteq B$, we may have $B \subseteq A$, but if $A \subset B$, we cannot have $B \subset A$.

Power Set:

The set formed by all the subsets of a given set A is called the power set of A, it is usually denoted by P(A).

For example:

i) Let A = {0}, then P(A) = {ϕ, {0}}. Note that n(P(A)) = 2 = 2^1.

ii) Let A = {a, b}, then P(A) = {ϕ, {a}, {b}, {a, b}}. Note that n(P(A)) = 4 = 2^2

iii) Let A = {1, 2, 3}, then P(A) = {ϕ, {1}, {2}, {3}, {1, 2}, {1, 3}, {2, 3}, A}.

Note that O(P (A)) = 8 = 2^3. In all these examples, we have observed that n(P(A)) = $2^{n(A)}$.

Rule to write down the power set of a finite set A:

First of all write ϕ.

Next, write down singleton subsets each containing only one element of A.

In the next step write all the subsets which contain two elements from the set A.

Continue this way and in the end write A itself as A is also a subset of A.

Enclose all these subsets in braces to get the power set of A.

Comparable Sets : Two sets A and B are said to be comparable iff either $A \subset B$ or $B \subset A$.

For example :

i) The sets A = {1, 2} and B = {1, 2, 4, 5} are comparable as $A \subset B$.

ii) The sets A = {0, 1, 3} and B = {1, 3} are comparable as $B \subset A$.

iii) The sets A = {–1, 1} and B = {x : x^2 = 1} are comparable as $A \subset B$ and also $B \subset A$.

Clearly, equal sets are always comparable. However, comparable sets may not be equal

Universal Set:

In any application of the theory of sets, all sets under investigation are regarded as subsets of fixed set. We call this set the universal set, it is usually denoted by X or U or ξ.

OPERATIONS OF SETS

UNION OF SETS

The union of two sets A and B is the set of all those elements, which are either in A or in B (including those which are in both)

In symbolic form, union of two sets A and B is denoted as, $A \cup B$. It is read as "A union B".

Clearly, $x \in A \cup B \Rightarrow x \in A$ or $x \in B$.

And, $x \notin A \cup B \Rightarrow x \notin A$ and $x \notin B$.

It is evident from definition that $A \subseteq A \cup B; B \subseteq A \cup B$

SOLVED EXAMPLES

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

(ii) $A = \{1,3,5\}, B = \{1,2,3\}$

Solution :- (i) We have, $A \cup B = \{a,e,i,o,u\} \cup \{a,b,c\}$

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

Here, the common element a has been taken only once, while writing $A \cup B$.

(ii) We have $A \cup B = \{1,3,5\} \cup \{1,2,3\} \Rightarrow A \cup B = \{1,2,3,5\}$

Here, the common elements 1 and 3 have been taken only once, while writing $A \cup B$.

UNION OF THREE OR MORE SETS

The union of $n(n \geq 3)$ for sets $A_1, A_2, \ldots\ldots, A_n$ is defined as the set of all those elements which are in A_i $(1 \leq i \leq n)$ for atleast one value of i. The union of $A_1, A_2, A_3, \ldots\ldots A_n$ is denoted $\bigcup_{i=1}^{n} A_i$ In symbols, we write

$\bigcup_{i=1}^{n} A_i = \{ x : x \in A_i$ for at least one value of i, $1 \leq i \leq n\}$

SOLVED EXAMPLE

Example :- If A = {1, 2, 3, 4} B = {3, 4, 5, 6}, C = {5, 6, 7, 8} and D = {7, 8, 9, 10}, find

(i) $A \cup B$ (ii) $A \cup B \cup C$ (iii) $B \cup C \cup D$

Solution :- (i) We have, $A \cup B = \{1,2,3,4\} \cup \{3,4,5,6\}$

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

(ii) We have, $A \cup B \cup C = \{1,2,3,4\} \cup \{3,4,5,6\} \cup \{5,6,7,8\}$

$\Rightarrow A \cup B \cup C = \{1,2,3,4,5,6,7,8\}$

(iii) We have, $B \cup C \cup D = \{3,4,5,6\} \cup \{5,6,7,8\} \cup \{7,8,9,10\}$

$\Rightarrow B \cup C \cup D = \{3,4,5,6,7,8,9,10\}$

INTERSECTION OF SETS

The intersection of two sets A and B is the set of all those elements which belong to both A and B.

Symbolically, we write $A \cap B = \{x : x \in A \text{ and } x \in B\}$ and read as "A intersection B".

Let $x \in A \cap B \Leftrightarrow x \in A$ and $x \in B$ and $x \notin A \cap B \Leftrightarrow x \notin A$ or $x \notin B$

It is evident from the definition that $A \cap B \subseteq A, A \cap B \subseteq B$

SOLVED EXAMPLES

Example 1 : (i) If A = {3,5,7,9,11}, B = {7,9,11,13}, find $A \cap B$.

(ii) If A = {a, b, c}, B = ϕ, find $A \cap B$.

Solution. (i) We have, $A \cap B = \{3,5,7,9,11\} \cap \{7,9,11,13\}$

Since, 7,9,11 are the only elements which are common to both the sets A and B.

$\Rightarrow A \cap B = \{7,9,11\}$

(ii) We have, $A \cap B = \{a,b,c\} \cap \phi = \phi$. Since, there is no common element.

Example 3. Let A = {x : x is a natural number} and B = { x : x is an even natural number}.

Find $A \cap B$

Solutions : We have, A = { x : x is a natural number}. A = {1, 2, 3, 4,.....}

B = {x : x is an even natural number}. B = {2, 4, 6,.....}

We observe that 2, 4, 6,..... are the elements which are common to both the sets A and B. Hence, $A \cap B$ = {2, 4, 6.....} = B.

INTERSECTION OF MORE SETS

The intersection of $n(n \geq 3)$ sets $A_1, A_2, A_3 \ldots\ldots\ldots A_n$ is defined as the set of all those elements which are in $A_i (1 \leq i \leq n)$ for each i.

The intersection of $A_1, A_2, \ldots\ldots, A_n$ is denoted by $\bigcap_{i=1}^{n} A_i =$

In symbols, we write, $\bigcap_{i=1}^{n} A_i = \{ x : x \in A_i \text{ for all } i, 1 \le i \le n\}$

DISJOINT SETS : Two sets A and B are said to be disjoint, if $A \cap B = \phi$. If $A \cap B \neq \phi$, then A and B are said to be intersecting sets or overlapping sets. e.g. Let $A = \{1, 2, 3\}$, $B = \{a, b, c\} \Rightarrow A \cap B = \phi$, hence A and B are disjoint.

Solved example :

1. Which of the following pairs of sets are disjoint ?

   i) $A = \{1, 2, 3, 4\}$, $B = \{ x : x \text{ is a natural number and } 4 \le x \le 6 \}$.

   ii) $A = \{ a, e, i, o, u\}$, $B = \{ c, d, e, f\}$

   iii) $A = \{x : x \text{ is an even integer}\}$, $B = \{x : x \text{ is an odd integer}\}$

Solution :-

i) We have, $A = \{1, 2, 3, 4\}$; $B = \{x : x \text{ is a natural number and } 4 \le x \le 6 \}$

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

Here, $A \cap B \neq \phi$, hence A and B are not disjoint sets, but are intersecting sets.

ii) We have, $A \cap B = \{ a, e, i, o, u \} \cap \{ c, d, e, f \} = \{ e \}$

Here, $A \cap B \neq \phi$, hence A and B are not disjoint sets but are intersecting sets.

iii) We have, $A = \{ x : x \text{ is an even integer}\} = \{ \ldots\ldots -2, 0, 2, \ldots\ldots\}$
and $B = \{ x : x \text{ is odd integer } \} = \{ \ldots -3, -1, 1, 3, \ldots.\}$

Hence, $A \cap B = \phi$, hence A and B are disjoint sets

WORKSHEET - 2

SINGLE ANSWER TYPE

1. Let 'n' be the Cardinal number of a set A then the no. of subsets of A is

   1) $2^n - 1$ 2) 2^n 3) 2n 4) n

2. Which of the following is false ?

   1) Every set is a subset of itself. 2) Empty set is a subset of everyset.

   3) If $A = \{1,2,3,\}$ then $\{1\} \subset A$ 4) $\phi \in \{ \}$

3. If $A = \{a, e, i, o, u\}$ then the no. of proper subsets of A is

   1) 32 2) 31 3) 16 4) 4

4. A set Contains n elements. Then the no. of elements in power set

1) 2^n-1 2) 2^n 3) 2n 4) n

5. If $A \subset B$, Then $A \cup B =$

1) A 2) B 3) ϕ 4) $A \cap B$

6. If $A = \phi$, then $A \cap B$

1) A 2) B 3) ϕ 4) $A \cup B$

7. If A, B are disjoint sets then

1) $A \cap B = \mu$ 2) $A \cap B = A \cup B$ 3) $A \cap B = \phi$ 4) $A \cup B = A$

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

1) A 2) B 3) C 4) $A \cap B$

9. A = set of all vowels then which of the following is correct ?

1) $a \subset A$ 2) $\{a,i,o,u\} > A$ 3) $a\{i,o,u\} \in A$ 4) $\{a,o\} \subset A$

10. If $A = \{1,2,5,7,11,\}$ and $B = \{3,5,11,13,7\}$ then $A \cup B$ =

1) $\{1,2,3,5,7,11,13\}$ 2) $\{5,7,11\}$ 3) $\{1,2,3,13\}$ 4) $\{3,5,7,11\}$

11. If $P = \{x : x = 2n, n \in N\}$, $Q = \{x : x = 3n, n \in N\}$, then $A \cap B =$

1) 5n 2) 6n 3) $6n^2$ 4) n

12. If $A = \{x : \ x = 4n+1, \ 2 \le n \le 5\}$, then the numbers of subset of A is

1) 16 2) 8 3) 4 4) 15

13. If $A = \{x : \ x = n^2+1, \ n < 4, \ n \in N\}$ then the number of proper subset of A

1) 3 2) 8 3) 7 4) 15

14. If $A = \{2,4,6,8\}$, $B = \{3,5,6,7\}$, $C = \{1,2,3,4,5,6,7,8\}$ then $(A \cap B) \cap C$

1) $A \cap B$ 2) A 3) B 4) C

15. $A = \{x / x = n+1, \ n \in N, \ 1 < n < 6\}$, $B = \{x : \ x = n^2+1, \ n \in N, \ n < 3\}$ then $A \cap B =$

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

MULTI ANSWER TYPE

16. If A, B are two non-empty sets and $A \subset B$ then

1) $A \cup B = B$ 2) $A \cap B = A$ 3) $A \cup B = A$ 4) $A \cap B = B$

17. If $A=\{T,E,C,H,N,O\}$ then

1) The no. of subsets of A is 64

2) The no. of non-empty proper subsets of A is 62

3) $n(P(A))=64$ 4) $n(A)=6$

18. Let $A=\{-1,-3,2,5,9\}$, $B=\{2,4,9,11\}$, $C=\{-3,5,7,11\}$ Then

1) $(A\cup B)\cap C=\{-3,5,11\}$ 2) $A\cap(B\cup C)=\{-3,2,5,9\}$

3) $(A\cap B)\cap C=\phi$ 4) $A\cap(B\cap C)=\phi$

19. If $A=\{1,2\}$ then which of following is true ?

1) $\{1\}\subset P(A)$ 2) $A\in P(A)$ 3) $\{1\}\in P(A)$ 4) $\phi\subset P(A)$

20. If $A=\{x:x=2n,n\in N\}$, $B=\{x:x=2n-1,n\in N\}$ then

1) $A\cup B=N$ 2) $A\cap B=\phi$ 3) $A\cup B=R$ 4) $A\cup B=Q$

COMPREHENSION TYPE

Writeup-1

$A\cup B=\{x:x\in A \text{ or } x\in B\}$

21. If $A=\{x:\ \ x=2n-1,\ \ n\le 5,\ \ n\in N\}$ and

$n(A\cap B\cap C)=4$ then $A\cup B$ is

1) $\{1,3,5,7,9,11\}$ 2) $\{-1,0,3,5,7,9,11\}$ 3) $\{-1,1,3,5,7,9,11\}$ 4) $\{-1,3,7,11,13\}$

22. If $A=\{x:\ \ -3\le x\le 3,\ \ x\in z\}$, $B=\{x:\ \ 0\le x\le 3,\ \ x\in W\}$ and

$C=\{x:\ \ 1\le x\le 3,\ \ x\in N\}$ then which of the following is false

1) $n(A\cup C)=7$ 2) $n(B\cup C)=4$ 3) $n(A\cup(B\cup C))=7$ 4) $n(A\cap(B\cap C))=4$

23. The smallest set 'X' such that $X\cup\{1,3\}=\{1,3,5,7,9\}$ then X is

1) $\{1,3,5,7,9\}$ 2) $\{3,5,7,9\}$ 3) $\{1,5,7,9\}$ 4) $\{5,7,9\}$

Writeup-2

$A\cap B=\{x:\ \ x\in A\ \ and\ \ x\in B\}$

24. A= Set of natural numbers, B = Set of integers and C = Set of real numbers then $A\cap(B\cap C)$ is

1) N 2) W 3) z 4) R

25. If $A\cap\{1,3,5,7\}=\{1,3,5\}$ then the smallest possible set for A is

1) $\{3,5\}$ 2) $\{1,3,5\}$ 3) $\{3,5,7\}$ 4) $\{1,3,5,7\}$

26. If $n(A)=6$ and $n(B)=9$ then the maximum number of elements in $A\cap B$ is

1) 15 2) 9 3) 6 4) 3

MATRIX MATCHING TYPE

27. If A, B are any two non-empty sets and $n(A)=m, n(A)=n$ if $m>n$

Column - I	Column - II
1) Maximum value of $n(A\cup B)$	p) o
2) Minimum value of $n(A\cup B)$	q) m
3) Maximum value of $n(A\cap B)$	r) n
4) Minimum value of $n(A\cap B)$	s) $m+n$
	t) $m-n$

28. If $A=\{M,A,T,H,S\}$

Column - I	Column - II
1) No. of Subsets of A	p) 2^0
2) No. of proper subsets of A	q) 2^n
3) No. of elements in powerset of A	r) $\frac{2^n}{2}$
4) No. of improper subsets of A	s) 4.2^{n-2}
	t) 8.2^{n-4}

29. If $A=\{x: \ x=2n+1, \ n\in W\}$ and $B=\{x: \ x=2n, \ n\in N\}$ then $n(A\cap B)=$ _____

30. If A = letters from the word 'EAMCET' abd B = letters from the word "AIEEE" then $n(A\cup B)=$ _____

VERBAL REASONANING

Directions : In each of the following questions, a number series is given with one term missing. Choose the correct alternative that will continue the same pattern and replace

1) T, R, P, N, L, ?, ?

(a) J, G (b) J, H (c) K, H (d) K, I

2) U, B, I, P, W, ?
(a) D (b) F (c) Q
(d) Z

3) Z, ?, T, ?, N, ?, H, ?, B
(a) W, Q, K, E (b) W,R,K,E (c) X,Q,K,E (d) X,R,K,E

4) a,d,c,f, ?, h,g,?,i
(a) e,j (b) e,k (c) f,j
(d) j,e

5) A, I, P, V, A, E, ?
(a) E (b) F (c) G
(d) H

6) Z, W, S, P, L I, E, ?
(a) B (b) D (c) F
(d) K

7) Y, W, T, P, K, E, X, ?, ?
(a) G, H (b) P,G (c) R,G
(d) S,R

8) A, B, N, C, D, O, E, F, P, ?, ?, ?
(a) G, H, I (b) G, H, J (c) G, H, Q (d) J, K, L

9) Y, B, T, G, O, ?
(a) N (b) M (c) L
(d) K

10) M, N, O, L, R, I, V, ?
(a) A (b) E (c) F
(d) H (e) Z

11) b e d f ? h j ? l
(a) I m (b) m I (c) i n
(d) j m

12) AI, BJ, CK, ?
(a) DL (b) DM (c) GH
(d) LM

13) GH, JL, NQ, SW, YD, ?
(a) EJ (b) FJ (c) EL
(d) FL

14) DF, GJ, KM, NQ, RT, ?
(a) UW (b) YZ (c) XZ
(d) UX (e) YA

15) PMT, OOS, NQR, MSQ, ?
(a) LUP (b) LVP (c) LVR (d) LWP

16) BZAM DYC, FXE, ?, JVI
(a) HUG (b) HWG (c) UHG (d) WHG

17) DHL, PTX, BFJ, ?
(a) CGK (b) KOS (c) NRV (d) RVZ

18) AZY, BUT, CXW, DWV, ?
(a) EVA (b) EVU (c) VEU (d) VUE

19) DEF, HIJ, MNO, ?
(a) STU (b) RST (c) SIJ
(d) SRQ

20) ejo tyd ins xch ?
(a) nrw (b) mrw (c) msx (d) nsx

21) AYBZC, DWEXF, GUHVI, JSKTL, ?
(a) MQORN (b) MQNRO (c) NQMOR (d) QMONR

22) ATTRIBUTION, TIRIBUTIO, RIBUTIO, IBUTI, ?
(a) IBU (b) UT (c) UTI (d) BUT

23) Consider the following series :
(a) ABCD.....XYZ|YX.....BA|BCD....YZ|YX....CBA|BC....YZ.... Which letter occupies the 1000th position in the above series ?
(a) B (b) C (c) X
(d) Y

KEY & HINTS

WORK SHEET – 1 (KEY)				
1) 4	**2)** 3	**3)** 4	**4)** 3	**5)** 1
6) 2	**7)** 2	**8)** 4	**9)** 4	**10)** 1
11) 2	**12)** 2	**13)** 3	**14)** 2	**15)** 2
16) 1,3,4	**17)** 1,2,3,4	**18)** 1,2,3	**19)** 2,4	**20)** 1,2,3,4
21) 2	**22)** 3	**23)** 4	**24)** 2	**25)** 4
26) 1	**27)** 1	**28)** 1	**29)** 1-Q 2-PR 3-PST 4-P	**30)** 1-QR 2-QS 3-T 4-P
31) 3	**32)** 4	**33)** 5	**34)** 1	

6. By using dens property (i.e. in between any two consecutine real numbers there are infinitly many real numbers.)

7. $x+1<12$

$x<11$

$\therefore A=\{1,2,3,....10\} \Rightarrow n(A)=10$ Ans : (2)

8. $\{M,A,T,H,E,M,A,T,I,C,S\}$

Ans : (4)

10. For any x, $x^2+1>0$ Ans : (1)

12. By Verification

Ans : (2)

14. $n(A) = n(B) = 4$

Both having same elements.

Ans : (2)

15. $A=\{-1,0,1\}$

$n(A)=3, n(B)=3$

16. For $x\in R$, $x^2+1\neq 0$ Ans : (1), (3), (4)

17. Ans : 1, 2, 3, 4

18. $A=\{1,2,3,4\}$ $B=\{x<5, x\in N\}$

$\therefore A=B$

Every equal set is equivalent also

Ans : 1, 2, 3

19. By Definition

20. 1, 2, 3, 4

21. $A=\{5,9,13,17,21\}$

$\therefore A=\{4n+1/n\leq 5, n\in N\}$

prime numbers of $A=\{5,13,17\}$

Composit numbers = $\{9,21\}$

22. $A=\{5,9,13,17,21\}$

$\therefore A=\{4n+1/n\leq 5, n\in N\}$

prime numbers of $A=\{5,13,17\}$

Composit numbers = $\{9,21\}$

23. $A=\{5,9,13,17,21\}$

$\therefore A=\{4n+1/n\le 5, n\in N\}$

prime numbers of $A=\{5,13,17\}$

Composit numbers = $\{9,21\}$

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

$A=\{x: \quad x=2n+1, \quad x\in W, \quad n<5\}$

$x:\{x=2n-1, \quad x\in N, \quad n\le 5\}$

25. $A=\{1,4,9,16,25\}$

$A=\{x: \quad x=n^2, \quad n\in N, \quad n\le 5\}$

or

$=\{x: \quad x=(n+1)^2, \quad n\in W, \quad n<5\}$

26. $A=\{2,9,28,65\}$

$A=\{x: \quad x=n^3+1, \quad n\in N, \quad n\le 4\}$

27. (1)
28. (1)

29. (1) → q (2) → p , r (3)→ p, s, t (4) →p
30. (1) → q, r (2) →q, s (3) → t,(4) →p
31. 3
32. 4
33. 5
34. 1

WORK SHEET – 2 (KEY)				
1) 2	**2)** 4	**3)** 2	**4)** 2	**5)** 2
6) 3	**7)** 3	**8)** 2	**9)** 4	**10)** 1
11) 2	**12)** 1	**13)** 3	**14)** 1	**15)** 4
16) 1,2	**17)** 1,2,3,4	**18)** 1,2,3,4	**19)** 2,3,4	**20)** 1,2
21) 3	**22)** 4	**23)** 4	**24)** 1	**25)** 2
26) 3	**27)** 1-S 2-Q 3-R 4-P	**28)** 1-QS 2-RT 3-QS 4-P	**29)** 0	**30)** 6

1. 2^n
   Ans : (2)
2. Since '$\in$' using relation between element and set.
   But $\phi, \{\ \}$ both are sets.
3. $2^n - 1 = 2^5 - 1 = 31$
   Ans : (2)
4. 2^n
   Ans : (2)
5. If $A \subset B \Rightarrow A \cup B = B$ (Greatest set)
   Ans : (2)
6. $A \cap B = \phi$ Since ϕ is subset of every set.
7. By definition
   Ans : (3)
8. $A \cup B = \{1,2,3,4,5\}$
   $\therefore (A \cup B) \cup C = \{1,2,3,4,5\} \cap \{1,2,3,4,5,6\} = \{1,2,3,4,5\} = B$
   Ans : (2)
9. Ans : (4)
10. Ans : (1)

11. $P=\{2,4,6,8,....\}$ $Q=\{3,6,9,12,....\}$

$\therefore P\cap Q=\{6,12,18,...\}$

$6n$, $n\in N$

Ans : (2)

12. $A=\{x:\ \ x=4n+1,\ \ 2\le n\le 5\}$

$\therefore A=\{9,13,17,21\}$

$\therefore$ No. of subsets of A is $2^4=16$

Ans : (1)

13. $A=\{x:\ \ x=n^2+1,\ \ n<4,\ \ n\in N\}$

$\therefore A=\{2,5,10\}$

$\therefore$ No. of proper subsets of $A=2^3-1=7$

Ans : (3)

14. $A=\{2,4,6,8\}$ $B=\{3,5,6,7\}$

$\therefore A\cap B=\phi$

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

Ans : (1)

15. $A=\{x/x=n+1,n\in N,1<n<6\}$ $B=\{x:x=n^2+1,n\in N,n<3\}$

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

$\therefore A\cap B=\{5\}$

Ans :1,2

16. Properties

Ans : 1,2

17. $A=\{T,E,C,H,N,O\}$

$n(A)=6$

$\therefore$ no. of subsets $=2^6=64$

non-empty proper subsets $=2^n-2=64-2=62$

No. of elements in power ser $=2^n=64$

Ans : 1, 2, 3, 4

18. $A=\{-1,-3,2,5,9,\}$, $B=\{2,4,9,11\}$, $C=\{-3,5,7,11\}$

$A\cup B=\{-1,-3,2,4,5,9,11\}$

$(A\cup B)=\{-3,5,11\}$

$B\cup C=\{-3,2,4,5,7,9,11\}$

$\therefore A\cap(B\cup C)=\{-3,2,5,9\}$

$A\cap B=\{2,9\}$

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

Ans : 1,2 3, 4

19. $A=\{1,2\}$

$P(A)=\{\phi,\{1\},\{2\},\{1,2\}\}$

$\therefore\{1\}\in P(A)$; $A=\{1,2\}\in P(A)$

$\phi\subset P(A)$ Since ϕ is subset of every set.

Ans : 2,3,4

20. A= Set of even numbers $=\{2,4,6,8....\}$

B= Set of odd number $=\{1,3,5,7....\}$

$\therefore A\cup B=\{1,3,5,7...\}$

$A\cap B=\phi$

Ans : (1), (2)

21. $A=\{x:\quad x=2n-1,\quad n\le 5,\quad n\in N\}$

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

$B=\{x:\quad x=4n-1,\quad n\le 3,\quad n\in W\}$

$B=\{-1,3,7,11\}$

$\therefore A\cup B=\{-1,1,3,5,7,9,11\}$

Ans : (3)

22. $A=\{x:-3\le x\le 3, x\in z\}=\{-3,-2,-1,0,1,2,3\}$

$B=\{x:0\le x\le 3, x\in W\}=\{0,1,2,3\}$

$C=\{x:1\le x\le 3, x\in N\}=\{1,2,3\}$

$\therefore n(A\cup C)=7,\quad n(B\cup C)=4,\quad n(A\cup(B\cup C))=7,\quad n(A\cap(B\cap C))=3$

Ans : (4)

23. $X\cup\{1,3\}=\{1,3,5,7,9\}$

$\therefore$ Smallest possibility of $X=\{3,7,9\}$

Ans : (4)

24. $N\subset z\subset R$

$\therefore A\cap(B\cap C)=N$

Ans : (1)

25. $A\cap\{1,3,5,7\}=\{1,3,5\}$

$\therefore A=\{1,3,5\}$

Ans : (2)

26. $n(A)=6,\quad n(B)=9$

Maximum no. of elements in $A\cap B=6$

Ans : (3)

27. $(1)\to s,\quad (2)\to q\quad (3)\to r\quad (4)\to p$

28. $(1)\to q,s\quad (2)\to r,\quad (3)\to q,s\quad (4)\to p$

29. $A=\{1,3,5,7...\}$

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

$n(A\cap B)=0$

30. $A=\{E,A,M,C,T\}$

$B=\{A,I,E\}$

$A\cup B=\{A,E,C,I,M,T\}$

$\therefore n(A\cup B)=6$

VERBAL REASONING (KEY)				
1) B	**2)** A	**3)** A	**4)** A	**5)** D
6) A	**7)** B	**8)** C	**9)** C	**10)** B
11) A	**12)** A	**13)** D	**14)** D	**15)** A
16) B	**17)** C	**18)** B	**19)** A	**20)** B
21) B	**22)** C	**23)** A		

1. (b): $a \xrightarrow{+3} b \xrightarrow{-1} c \xrightarrow{+3} f \xrightarrow{-1} (e) \xrightarrow{+3} h \xrightarrow{-1} g \xrightarrow{+3} (j) \xrightarrow{-1} i$

2. (a): $U \xrightarrow{+7} B \xrightarrow{+7} I \xrightarrow{+7} P \xrightarrow{+7} W \xrightarrow{+7}$

3. (a): $Z \xrightarrow{-6} T \xrightarrow{-6} N \xrightarrow{-6} H \xrightarrow{-6} B$ \

$Z \xrightarrow{-3} (W) \xrightarrow{-3} T \xrightarrow{-3} (Q) \xrightarrow{-3} N \xrightarrow{-3} (K) \xrightarrow{-3} H \xrightarrow{-3} (E) \xrightarrow{-3} B$

4. (a): $a \xrightarrow{+3} b \xrightarrow{-1} c \xrightarrow{+3} f \xrightarrow{-1} (e) \xrightarrow{+3} h \xrightarrow{-1} g \xrightarrow{+3} (j) \xrightarrow{-1} i$

5. (d): $A: \xrightarrow{+8} I \xrightarrow{+7} P \xrightarrow{+6} V \xrightarrow{+5} A \xrightarrow{+4} E \xrightarrow{+3} (H)$

6. (a): $Z \xrightarrow{-3} W \xrightarrow{-4} S \xrightarrow{-3} P \xrightarrow{-4} L \xrightarrow{-3} I \xrightarrow{-4} E \xrightarrow{-3} (B)$

7. (b): $Y \xrightarrow{-2} W \xrightarrow{-3} T \xrightarrow{-4} P \xrightarrow{-5} K \xrightarrow{-6} E \xrightarrow{-7} X \xrightarrow{-7} (P) \xrightarrow{-9} (G)$

8. (c): The given series may be divided into 2 groups :
I. A, B, C, D, E, F, ?, ? and II. N, O, P, ?
Clearly, the given series consists of two terms of I followed by one term of II.
The missing terms in I are G and H while the missing term in II is Q.

9. (c): The given sequence is a combination of two series :
I. Y, T, O and II. B, G, ?

10. (b): The given sequence is a combination of two series :
I. M, O, R, V and II. N, L, I, ?
The pattern in I is : $M \xrightarrow{+2} O \xrightarrow{+3} R \xrightarrow{+4} V$
The pattern in II is : $N \xrightarrow{-2} L \xrightarrow{-3} I \xrightarrow{-4} (E)$
So, the missing letter is E.

11. (a): The series may be divided into groups as shown :
b e d / f ? h / j ? l
Clearly in the first group, the second and third letters are respectively three and two steps ahead of the first letter. A similar pattern would follow in the second and third groups.

12. (a): 1st letter : $A \xrightarrow{+1} B \xrightarrow{+1} C \xrightarrow{+1} (D)$

2nd letter : $I \xrightarrow{+1} J \xrightarrow{+1} K \xrightarrow{+1} (L)$

13. (d): 1st letter : $G \xrightarrow{+3} J \xrightarrow{+4} N \xrightarrow{+5} S \xrightarrow{+6} Y \xrightarrow{+7} (F)$

2nd letter : $H \xrightarrow{+4} L \xrightarrow{+5} Q \xrightarrow{+6} W \xrightarrow{+7} D \xrightarrow{+8} (L)$

14. (d): 1st letter : $D \xrightarrow{+3} G \xrightarrow{+4} K \xrightarrow{+3} N \xrightarrow{+4} R \xrightarrow{+3} (U)$

2nd letter : $F \xrightarrow{+4} J \xrightarrow{+3} M \xrightarrow{+4} Q \xrightarrow{+3} T \xrightarrow{+4} (X)$

15. (a): 1st letter : $P \xrightarrow{-1} O \xrightarrow{-1} N \xrightarrow{-1} M \xrightarrow{-1} (L)$

2nd letter : $M \xrightarrow{+2} O \xrightarrow{+2} Q \xrightarrow{+2} S \xrightarrow{+2} (U)$

3rd letter : $T \xrightarrow{-1} S \xrightarrow{-1} R \xrightarrow{-1} Q \xrightarrow{-1} (P)$

16. (b): 1st letter : $B \xrightarrow{+2} D \xrightarrow{+2} F \xrightarrow{+2} (H) \xrightarrow{+2} J$

2nd letter : $Z \xrightarrow{-1} Y \xrightarrow{-1} X \xrightarrow{-1} (W) \xrightarrow{-1} V$

3rd letter : $A \xrightarrow{+2} C \xrightarrow{+2} E \xrightarrow{+2} (G) \xrightarrow{+2} I$

17. (c): 1st letter : $D \xrightarrow{+12} P \xrightarrow{+12} B \xrightarrow{+12} (N)$

2nd letter : $H \xrightarrow{+12} T \xrightarrow{+12} F \xrightarrow{+12} (R)$

3rd letter : $L \xrightarrow{+12} X \xrightarrow{+12} J \xrightarrow{+12} (V)$

18. (b): 1st letter : $A \xrightarrow{+1} B \xrightarrow{+1} C \xrightarrow{+1} D \xrightarrow{+1} (E)$

2nd letter : $Z \xrightarrow{-5} U \xrightarrow{+(5-2)=+3} X \xrightarrow{-(-3-2)=-1} W \xrightarrow{+(1-2)=-1} (V)$

3rd letter : $Y \xrightarrow{-5} T \xrightarrow{+(5-2)=+3} W \xrightarrow{-(3-2)=-1} V \xrightarrow{+(1-2)=-1} (U)$

19. (a): 1st letter : $D \xrightarrow{+4} H \xrightarrow{+5} M \xrightarrow{+6} (S)$

2nd letter : $E \xrightarrow{+4} I \xrightarrow{+5} N \xrightarrow{+6} (T)$

3rd letter : $F \xrightarrow{+4} J \xrightarrow{+5} O \xrightarrow{+6} (U)$

20. (b): There is a gap of four letters between the first and second, the second and third letters of each term, and also between the last letter of a term and the first letter of the next term.

21. (b): 1st letter : $A \xrightarrow{+3} D \xrightarrow{+3} G \xrightarrow{+3} J \xrightarrow{+3} (M)$

2nd letter : $Y \xrightarrow{-2} W \xrightarrow{-2} U \xrightarrow{-2} S \xrightarrow{-2} (Q)$

3rd letter : $B \xrightarrow{+3} E \xrightarrow{+3} H \xrightarrow{+3} K \xrightarrow{+3} (N)$

4th letter : $Z \xrightarrow{-2} X \xrightarrow{-2} V \xrightarrow{-2} T \xrightarrow{-2} (R)$

5th letter : $C \xrightarrow{+3} F \xrightarrow{+3} I \xrightarrow{+3} L \xrightarrow{+3} (O)$

22. (c): In the first step, one letter from the beginning and one from the end of a term are removed to give the next term. In the second step, two letters from the beginning of a term are removed. These two steps are repeated alternately.

23. (a): We have 3 patterns :

I. ABCD ..... XYZ, which occurs only once.
II. YX ..... BA, which repeats alternately.
III. BC ..... YZ, which repeats alternately.

Now, I has 26 terms.

So, number of terms before the desired term $= (999 - 269) = 973.$

Each of the patterns which occurs after I, has 25 letters.

Now, $973 \div 25$ gives quotient $= 38$ and remainder $= 23$.

Thus, the 1000th term of given series is the 24th term of the 39th pattern after I. Cleary, the 39th pattern is II and its 24th term is B.

NUMBERS

SYNOPSIS - 1

1. Representing a number is called, **Notation.**
2. Expressing a number in words is called, **Numeration.**
3. 0 1 2 3 4 5 6 7 8 9

   All the other nmbers are written using these 10 symbols which are otherwise universally called as **digits**.
4. A group of digits denoting a number is called, **Numeral.**
5. We use place system to represent a number.
6. For a given numeral, we start from the extreme right as, Units. Tens, Hundreds, Thousands, Lakhs, Ten lakhs, Crores, Ten crores.

Indo - Arabic system	**International system**
Ten Crores	Hundred Millions
Crores	Ten Millions
Ten Lakhs	Millions
Lakhs	Hundred Thousands
Ten Thousands	Ten Thousands
Thousands	Thousands
Hundereds	Hundreds
Tens	Tens
Units	Units

8. Place value of a digit depend on its position in the numeral
9. The place value of 0 is called local value.
10. The face value of a digit does not depend on its position in the numeral
11. The face value of 5 in 234567 is 5.
12. The place value of 6 in 1963 is 60.
13. Smallest 2, 3, 4, 5 digit numbers are 10, 100, 1000, 10000 ...
14. Largest 2, 3, 4, 5 digit numbers are 99, 999, 9999, 99999 ...
15. The difference of the places of 9 in 19239 is, 9000 – 9 = 8991.
16. Number of 5 digit numbers are 99999 – 9999 = 90000.

    The number that comes just after a given number is called its “Successor”.

    The number that comes just before a given number is called its “Predecessor”.

    Comparision of Numbers by using Symbols.

    5 = 5, 10 > 9, 20 < 35

WORK SHEET - 1

SINGLE ANSWER TYPE

1. The place value of 9 in 1983 is
   1) 9 2) 100 3) 10 4) 900
2. The face value of 5 in 1451983 is
   1) 1 2) 10000 3) 5 4) 50000
3. The sum of place values of 6 in 16376 is
   1) 12 2) 6006 3) 6000 4) 606
4. The difference of place values of 3 in 123453
   1) 2997 2) 3003 3) 0 4) 3
5. The sum of place and face value of 2 in 2013 is
   1) 2002 2) 4 3) 2 4) 1998
6. The largest 4-digit numnber that can be formed by using the digits 1, 3, 8 and 9 is
   1) 1983 2) 1389 3) 9831 4) 9813
7. The difference of largest and smallest 3-digit numbers is
   1) 999 2) 899 3) 100 4) 1
8. The sum of smallest 4-digit number and largest 3-digit number
   1) 9899 2) 1999 3) 10099 4) 1
9. The difference of 3 digit numbers and the number of 2 digit numbers in base 10 system is
   1) 900 2) 901 3) 810 4) 910
10. The smallest 5 digit number having 4-different digits is
    1) 10023 2) 10021 3) 10121 4) 10320
11. 6 laksh is equal to how many thousands
    1) 60 2) 600 3) 6000 4) 6
12. 4 millions is equal to how many lakhs
    1) 4 2) 40 3) 400 4) 4000
13. In the international system 10 crores is equal to
    1) 100 lakhs 2) 10 millions 3) 100 millians 4) 1000 lakhs
14. In the Indian system, 1 million is equal to
    1) 10 lakhs 2) 100 lakhs 3) 1 crore 4) 10 crores
15. The successor of 123789 is
    1) 123788 2) 123790 3) 123800 4) 123900
16. The predecessor of 987326 is
    1) 987325 2) 987327 3) 987328 4) 987324

17. The place value of 5 in the numeral 18, 56, 22, 387

1) 50 millians 2) 50 lakhs 3) 5 crores 4) 50 crores

MULTI ANSWER TYPE

18. Which of the following statements is/are true

1) The face value of a digit does not depend on its position in the numeral
2) The place value of a digit depend on its position in the numeral
3) The number of 5 digit numbers 90000
4) The face value of 6 in 2060 is 60

19. The numeral 60000000 is equal to

1) 6 crores 2) 60 millians 3) 60 lakhs 4) 600 millians

REASONING ANSWER TYPE

20. **Statement - I:** The place value of 7 in 17834 is 7

Statement - II: The face values of a digit does not depend on its position in the numeral

1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

21. **Statement - I:** The difference of largest 5 digit number and predecessor of smalllest 6 digit number is zero

Statement - II: Smallest 6 digit number is 10000

1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

If the given the digits are 0, 1, 2, 3, 4, 5

22. The largest 6 digit number formed is

1) 543210 2) 504321 3) 534120 4) 541230

23. The smallest 6 digit number formed is

1) 123450 2) 102345 3) 012345 4) 103245

24. The difference of largest and smallest 6 digit number is

1) 140855 2) 130855 3) 130755 4) 140755

MATRIX MATCHING TYPE

25.

Column - I	Column - II
(A) 654, 123, 789	(P) 900
(B) Largest 5 digit number	(Q) English system
(C) Place value of 9 in 1947	(R) 99999
(D) Smallest 3 digit number	(S) International system
	(T) 100

INTEGER ANSWER TYPE

26. The difference of successor of 1983 and predecessor of 1985 is ___

27. The face value of 3 in 319840 is ____

SYNOPSIS - 2

1. Roman Numerals for 1, 5, 10, 50, 100, 500, 1000 are I, V, X, L, C, D, M
2. Roman Numeral can be maximum repeated three times.

Points to remember

3. V, L and D are never subtracted.
   I can be subtracted only from V and X.
   X can be subtracted from L and C.
   C can be subtracted from D and M.
   0 cannot be represented in Roman number system.
   The numerals I, V and X are used to write numbers from 1 to 39.
   When a bar is used above the Roman numerals it indicates that Roman numeral is multiplied by 1000.
4. **Rule - 1 :** If a digit is repeated a number of times, the value of the digit is added as many times as it occurs.
5. **Rule - 2 :** To write a number in which the smallest digit always comes to the right of the greatest digit, we add the values of all the digits.
6. **Rule - 3 :** To write a number in which the smaller digit is placed before the greater digit, we subtract the value of the smaller digit from that of the greater digit.

WORK SHEET - 2

SINGLE ANSWER TYPE

1. The number of alphabets used for Roman number system are
   1) 5 2) 6 3) 7 4)8
2. Which of the following cannot be represented in Roman number system
   1) 0 2) 11 3) 999 4) 1001
3. The number I can be substracted from
   1) X 2) L 3) C 4) D
4. X cannot be substracted from
   1) V 2) D 3) M 4) All the three
5. Which of the following are never be substracted
   1) V 2) L 3) D 4) All the three
6. The Roman numeral 36 is
   1) XXXIV 2) XXXVI 3) XXXIV 4) IVXXXX
7. XII + VIII + XXXIV
   1) 54 2) 34 3) 56 4) 48

8. The roman numeral corresponding to successor of 1000
   1) M 2) IM 3) MI 4) DI
9. The sum of 584 and 634 is
   1) IIMCCXX 2) MCCXVIII 3) MCCIIXX 4) MCCXV
10. The product of VI and CVI is
   1) DCXXXVI 2) VIDCXXX 3) DCXIVL 4) DCVILC
11. The difference of MDCLVI and DCLXI
   1) 995 2) 996 3) 895 4) 896
12. The sum of DCLXI and MDCLVI
   1) MMCCCXVII 2) MDDCLXVI 3) MMCCCIIIXX 4) MMCCCXXI

MULTI ANSWER TYPE

13. The sum of MCCXL and DLX is
   1) 2190 2) MCC 3) MDCCC 4) 1800
14. The product of XI and XV is
   1) 605 2) DCV 3) 506 4) DVI

REASONING ANSWER TYPE

15. **Statement - I:** In a roman number if the smaller digit is placed after the larger digit, the smaller digit is added to the larger digit

   Statement - II: In a roman number, if the smaller digit is placed before the larger digit, the smaller digit is substracted from the larger digit
   1. Both Statements I and II are correct
   2. Both statement I and II are incorrect
   3. Statement I is true, Statement II is false.
   4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

The numbers 1, 5, 10, 50, 100, 500, 1000 are represented by I, V X, L, C, D, M
respectively in roman numeral system.

16. The roman numeral corresonding to 1010 is
   1) LX 2) CX 3) DX 4) MX
17. Which of the following is equal to 905?
   1) $\overline{IXV}$ 2) CMV 3) DMV 4) LMV
18. LX + CX + DX =
   1) 680 2) 1080 3) 780 4) 480

MATRIX MATCHING TYPE

19.

Column - I	Column - II
(A) SUm of 700 and 14	(P) CCCXX
(B) DCXXXIII - ? = DC	(Q) LXXV
(C) Product of V and XV	(R) XXXIII
(D) DIfferent of 540-210	(S) DCCIVX

INTEGER ANSWER TYPE

20. The difference of XL - XXXV = _____
21. DL - D - L = _____

SYNOPSIS - 3

1. In Binary system only 0, 1 are used.
2. Place value in the binary system starts from $2^0, 2^1, 2^2, 2^3, 2^4$ ...
3. Numerals in
   Binary system are 0, 1, 10, 11, 100, 101, 110, 111, 1000, 1001.
   Decimal system are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

   Ex: $101010_{(2)} = 1\times32+0\times16+1\times8+0\times4+1\times2+0\times1$

   $32+8+2=42$

WORK SHEET - 3

SINGLE ANSWER TYPE

1. In binary system, thebase is always
   1) 2 2) 5 3) 9 4) 10
2. Binary system of numerals is also called
   1) Base - 10 system 2) Base - 2 system
   3) Base - 5 system 4) Base - 9 system
3. The number of digits used to write the numbers in binary system is
   1) 9 2) 10 3) 1 4) 2
4. The number 34 is written in binary system is
   1) $100010_{(2)}$ 2) $100001_{(2)}$ 3) $100100_{(2)}$ 4) $110011_{(2)}$
5. The sum of 120 and 36 is written in binary system is
   1) $10100110_{(2)}$ 2) $10110010_{(2)}$ 3) $1100001_{(2)}$ 4) $10010110_{(2)}$
6. The difference of $11100_{(2)}$ and $1010_{(2)}$ expressed in the binary system is
   1) $1111_{(2)}$ 2) $1010_{(2)}$ 3) $1110_{(2)}$ 4) $10010_{(2)}$
7. The product of $101_{(2)}$ and $110_{(2)}$ expressed in the binary system
   1) $11111_{(2)}$ 2) $11110_{(2)}$ 3) $11101_{(2)}$ 4) $10111_{(2)}$

MULTI ANSWER TYPE

8. The decimal equivalent of $101101_{(2)}$ is greater than
   1) 44 2) 42 3) 45 4) 46
9. The decimal equivalent of $1110010_{(2)}$ is less than
   1) 104 2) 105 3) 106 4) 103

REASONING ANSWER TYPE

10. Statement-I: The product of least even and odd composite numbers in binary system is $100100_{(2)}$.

Statement - II: The least even composite is 4 and least odd composite is 9.

1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

$P=101_{(2)}$, $Q=110_{(2)}$ and $R=111_{(2)}$ then

11. $P+Q+R$

1) $10010_{(2)}$ 2) $10110_{(2)}$ 3) $11001_{(2)}$ 4) $10101_{(2)}$

12. $(P+Q)R$

1) $1001100_{(2)}$ 2) $1001101_{(2)}$ 3) $1100111_{(2)}$ 4) $111100_{(2)}$

13. $P(R-Q)=$

1) P 2) Q 3) R 4) P + Q

MATRIX MATCHING TYPE

14.

1) $1101_{(2)}$	(A) 45
2) $100011_{(2)}$	(B) 57
3) $101101_{(2)}$	(C) 13
4) $111001_{(2)}$	(D) 36
	[E] 35

INTEGER ANSWER TYPE

15. $P=10_{(2)}$, $Q=11_{(2)}$ then the product of P and Q is equal to _____

16. The Hindu Arabic value of $1001_{(2)}$ = _____

SYNOPSIS - 4

1. The numbers which are useful for counting are called natural numbers. Natural numbers starts from 1, 2, 3, 4..... (which is infinite set)
2. The natural numbers are expanded to whole members by including zero. Zero : The number which is representing for nothing.
3. Whole numbers are represented by W.
4. W = { 0, 1, 2, 3 ... } represents an infinite set. The least whole number is O. All natural numbers are present in whole numbers.

PROPERTIES OF WHOLE NUMBERS

5. If a, b, c are whole numbers

	Addition	**Subtraction**	**Multiplication**	**Division**
Closure Law	$a+b \in W$	$a-b \notin W$	$ab \in W$	$\frac{a}{b} \notin W$
Commutative Law	$a+b=b+a$	$a-b \neq b-a$	$ab=ba$	$\frac{a}{b} \neq \frac{b}{a}$
Associative Law	$a+(b+c)$ $=(a+b)+c$	$a-(b-c)$ $\neq(a-b)-c$	$(ab)c=a(bc)$	$(a\div b)\div c$ $\neq a\div(b\div c)$
Identity	0	Does not exist	1	Does not exist
Inverse	Does not exist	Does not exist	Does not exist	Does not exist
Distributive	$a(b+c)=ab+ac$			

Note : If a is a whole number then $-a$ is not a whole number.

If a is a whole number then $\frac{1}{a}$ is not a whole number.

If a, b are whole numbers then $a-b$ is not a whole number when $b>a$.

If a, b are whole numbers then $\frac{a}{b}$ is not a whole number unless $a=bk$, $k \in N$.

WORK SHEET - 4

SINGLE ANSWER TYPE

1. The difference of smallest whole number and smaller natural number is
   1) -1 2) 0 3) 1 4) 2
2. Additive identify in natural number is
   1) 0 2) 1 3) -1 4) Does not exist
3. Multiplicative identify in whole numbers is
   1) 0 2) 1 3) -1 4) 2
4. Additive inverse 6 in natural number system is
   1) -6 2) 6 3) 0 4) Does not exist
5. Multiplicative inverse of 9 in whole numbers is
   1) 1/9 2) -9 3) -1/9 4) Does not exist
6. The number of elements in natural number system
   1) 10000000 2) Finite 3) 0 4) Infinite
7. The natural number which does not have a predecessor in
   1) 0 2) 1 3) 1000000 4) -1
8. Which of the following is closure property
   1) $a+b=b+a$ 2) $a+(b+c)=(a+b)+c$
   3) $a(b+c)=ab+ac$ 4) $a\in w, b\in w \rightarrow a+b\in w$
9. Which of the following is associative property with respect to division in whole number system
   1) $a+(b+c)=(a+b)+c$ 2) $a\div(b\div c)=(a\div b)\div c$
   3) $a(bc)=(ab)c$ 4) Does not exist
10. Commutative property with respect to substraction in whole number system
    1) $a-b=b-a$ 2) $a-b=b+a$ 3) $a+b=b-a$ 4) Does not exist

MULTI ANSWER TYPE

11. Which of the following is/are false
    1) Set of natural numbers in finite
    2) Set of natural numbers in infinite
    3) Set of whole numbers is finite
    4) Set of whole numbers in infinite
12. The whole numbers doesnot satisfying which of the following properties under division
    1) Closure 2) Commutative 3) Associatic 4) Distributive
13. The whole numbers do not satisfy commutative property under
    1) Addition 2) Substraction 3) Multplication 4) Division

REASONING ANSWER TYPE

14. Statement - I : If a, b are whole numbers then $a \times \frac{1}{b} = b \times \frac{1}{a}$ is not commutative property in whole number system

Statement - II: If $a(+1)$ is a whole number then $\frac{1}{a}$ is not a whole number

1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

MATRIX MATCHING TYPE

15. If a, b,c are whole numbers

Column - I	Column - II
1) Closure property under substraction	(A) $a+(b+c)=(a+b)+c$
2) Commutative under addition	(B) $a(bc)=(ab)c$
3) Addititive identify	(C) $a-b \in W$
4) Associative under multiplication	(D) 0
	(E) Does not exist
	(F) $a+b=b+a$

COMPREHENSION TYPECOMPREHENSION TYPE

If a, b, c are whole numbers

16. Which of following is possible in whole number system

1) $a-b=b-a$ 2) $a \div b = b \div a$ 3) $a+b=b+a$ 4) $a \times b = a \div b$

17. If $a \times 1 = 1 \times a = a$ is ___ property

1) Additive identify 2) Multiplicative identify
3) Additive inverse 4) Multiplicative inverse

18. Additive inverse of b in whole number system is

1) -b 2) b 3) 0 4) Does not exist

SYNOPSIS - 5

1. The product we get when a number is multiplied by the number 1, 2, 3, 4 .... are called multiple of the given number.

Eg: 3, 6, 9, 12, 15... are multiples of 3.

2. When we multiply two or more numbers we get a product. The product is a multiple of each of the numbers multiplied. Each number multiplied is a factor of the product.

Eg : The factors of 8 are 1, 2, 4, 8

3. All numbers divisible by 2 are called Even numbers.
   Eg : 2, 4, 6, 8....
4. Numbers which are not divisible by 2 are called Odd numbers.
   Eg : 1, 3, 5, 7, 9 .....

Properties of even and odd numbers

1. *The sum or product of any number of even numbers is even.*
2. *The difference of two even numbers is even.*
3. *The sum of odd numbers depends on the number of numbers.*
   a) If the number of numbers is odd, the sum is odd
   b) If the number of numbers is even, the sum is even.
4. *If the product of a certain number of numbers is even, then atleast one of them is even.*
5. *If the product of a certain number of numbers is odd, then none of the numbers is even. i.e., the product of any number of odd numbers is odd.*
6. *Every odd number is obtained by adding 1 to every even number.*

7. The natural number which have only two factors (1 and itself) are called prime numbers.
   Eg : 2, 3, 5, 7, 11, 13.... (2 is even prime and remaining all are odd primes)

Sieve of Eratosthenes :

To find primes between 1 to 20 by sieve method.

~~1~~ ② ③ ~~4~~ 5 ~~6~~ 7 ~~8~~ ~~9~~ ~~10~~

11 ~~12~~ 13 ~~14~~ ~~15~~ ~~16~~ 17 ~~18~~ 19 ~~20~~

Procedure :

i) We first cross out 1 as it is not a prime or composite.
ii) We then encircle 2 and cross out every other multiple of 2. i.e., 4, 6, 8 ...
iii) We then encircle '3' and cross out every other mltiple of 3 i.e., 6, 9, 12 ....
∴ The prime numbers between 1 to 20 are 5, 7, 11, 13, 17, 19

1. The natural numbers which have more than two factors are called composite numbers.
   Eg : 4, 6, 8, 9, 10 ....
2. 4 is smallest even composite number.
   9 is smallest odd composite number.
3. Pairs of primes whose difference is 2 are twin primes.
   Eg : 3, 5 ; 5 , 7
4. A number in which sum of all factors is equal to twice the number is called a perfect number.
   Eg : The factors of 6 are 1, 2, 3 and 6 sum of the factors of 6 = 1 + 2 + 3 + 6 = 12 = 2 x

WORK SHEET - 5

SINGLE ANSWER TYPE

1. If a number is multplied by the numbers 1, 2, 3,..... THen the resultants are called
   1) Multplies 2) Factors 3) Divisors 4) Remainders
2. If 'a' is exactly divisible by b then 'b' is said to be _____ of 'a'.
   1) Multiple 2) Factor 3) Remainder 4) None
3. The least factor of every number is
   1) 0 2) 1 3) 2 4) -1
4. The greatest factor of every number is
   1) 1 2) 0 3) -1 4) Numer it self
5. Which of the following is not a factor of 128
   1) 2 2) 3 3) 4 4)8
6. Which of the following is not a multiple of 24
   1) 12 2) 24 3) 48 4) 72
7. Every number is a factor of
   1) 0 2) 1 3) 2 4) 10
8. The least non-zero multple of a
   1) -1 2) 0 3) 1 4) Number itself
9. The common factor of 15, 25 and 75
   1) 3 2) 5 3) 15 4) 25
10. The number of factors of given number is
    1) Finite 2) Infinite 3) Undefined 4) None
11. Sum of two even numbers is
    1)even number 2) Odd Number
    3)even and odd 4)Neither even nor odd
12. The least prime number is
    1) 3 2)1 3)2 4)5
13. The greatest prime that is less than 25 is
    1) 24 2)21 3)19 4) 23
14. Total number of primes that are between 40 and 60 is
    1) 4 2)5 3)6 4) 7
15. The number of pairs of twin primes between 1 and 100 is
    1)7 2)8 3)9 4)10
16. If two numbers do not have a common factor other than 1, then they are know as
    1) Twin primes 2) Co-Primes
    3) Perfect number 4)Odd number
17. The number of composite numbers upto 100 is
    1) 75 2) 73 3) 76 4) 74

18. The number of pairs of prime number with digits reversed upto 100 is

1) 3 2) 5 3) 6 4) 4

19. The number of times that 11 is contained in 109648 is

1)9958 2)9948 3)9978 4) 9968

MULTI ANSWER TYPE

20. The factors of 24 are

1) 1 2) 12 3) 6 4) 24

21. Multiplies of 13 is/are

1) 26 2) 52 3) 48 4) 72

22. Prime number between 50 and 60

1) 53 2)57 3)59 4)55

23. Composite number between 80 and 99 is

1)87 2)91 3) 89 4)97

REASONING ANSWER TYPE

24. Statement - I: 8 is a factor of 24.
Statement - II: If 'P' divides exactly 'Q'. Then 'P' is called the factor of 'Q'
1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

25. Statement - I: The number of multiplies of a given number is finite
Statement - II: The number of factors of a given number is infinite.
1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

26. *Statement I* : 29 is a prime number and an odd number
Statement II: All prime numbers are odd numbers.
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

27. *Statement I* : (59, 61) and (89, 91) are twin primes.
Statement II: If the difference between a pair of prime numbers is 2, then they are called twin primes.
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup-1:

Which we multiply two or more numbers, we get a product. Each number is called a factor of the product. The product is called a multiple of each of the numbers.

28. Every number is a multiple of
    1) 1 2) 0 3) 3 4) 2
29. The largest multiple of a number is
    1) 1 2) 0 3) 3 4) Does not exist
30. _____ is a factor of every number
    1) 1 2) 0 3)3 4) 2

Writeup-2:

A natural numbers having factors 1 and itself is known as a 'Prime number'
A natural number having more than 2 factors is called a "composite number'

31. Number of even prime numbers is
    1) 1 2)2 3)0 4) Infinite
32. Which of the follwing is a prime number ?
    1) 21 2)31 3) 49 4) 65
33. The composite number between 10 and 90 is
    1) 47 2) 97 3) 81 4)9

MATRIX MATCHING TYPE

34.

Column - I	Column - II
1) Multiples of 8	a) 1
2) No. of factors of 24 is	b) 6
3) 23 is a multiple of	c) 8
4) 3 is a factor of	d) 16
	e) 24

35.

Column-I	**Column-II**
a) Number of primes below 100	1) 23
b) Number of composite numbers below 100	2) 48
c) Number of odd primes below 100	3) 24
d) Numeber of even composite numbers below100	4) 25
	5) 74

36.

Column-I	**Column-II**
a) Greatest prime less than 42 is	1) 6
b) Number of twin prime pairs below 50	2) 41
c) Sum of the prime numbers less then 15 is	3) Between 9 and 100
d) Two digit composite numbers lies	4) 5
	5) Between 10 and 100

INTEGER ANSWER TYPE

37. The number of factors of every prime number is _____
38. The other factor of 23 is _____

39. Least odd composite number is _____
40. Sum of the least and highest odd prime numbers below 100 is ___

SYNOPSIS - 6

Divisibility rules :-

i) A natural number is divisible by 2 if and only if the digit in its units place is either 2, 4, 6, 8 or 0.

ii) A natural number is divisible by '3' if and only if the number obtained by adding it's digits is divisible by 3.

iii) A natural number is divisible by '4' if and only if the number formed by the last two digits of the given number is divisible by 4.

iv) A natural number is divisible by '5' if and only if its last digit is either 5 or 0.

v) A natural number is divisible by '6' if and only if it is divisible by '2' and '3'.

vi) A natural number is divisible by '8' if the number formed by the last three digits of the given number is divisible by 8.

vii) A natural number is divisible by '9' if and only if the sum of its digits is divisible by 9.

viii) A natural number is divisible by 10. If and only if its last digit is 0.

ix) A natural number is divisible by '11' if and only if the difference of the numbers obtained on adding the alternate digits of the number separately is divisible by 11.

x). A natural number is divisible by 12. If and only if it is divisible by 3 and 4.

WORK SHEET - 6

SINGLE ANSWER TYPE

1. If a number is divisible by 2 then it has even digit in its
   1) Ten place 2) Hundred place 3) Units place 4) Thousands place
2. A number is divisible by 3 if the sum of its digits is divisible by
   1) 2 2) 3 3) 9 4) 10
3. A number is divisible by 4 if the number formed by last two digits is divisible by
   1) 2 2) 3 3) 4 4) 8
4. A number is divisible by 8 if the number formed by last three digits is divisible by
   1) 2 2) 3 3) 4 4) 8
5. If the number $517x324$ is completely divisible by 3, then the smallest whole number in place of x will be
   1) 0 2) 1 3) 2 4) 3
6. If the number $5x2$ is divisible by 6, then $x =$
   1) 2 2) 3 3) 6 4) 7

7. If the number $91876x2$ is completely divisible by 8, then the smallest whole number in place of x will be
   1) 1 2) 2 3) 3 4) 4
8. If the number $481x673$ is completely divisible by 9, then the smallest whole number in place of x will be
   1) 2 2) 5 3) 6 4) 7
9. If a number is divisible by 5, then its last must be
   1) 0 2) 5 3) 0 or 5 4) 4
10. A number is divisible by 10 if its last digit is ϕ
    1) 0 2) 5 3) 9 4) 2
11. Which one of the following numbers is exactly divisible by 11
    1) 235641 2) 245642 3) 315624 4) 415624
12. If the number 97215x6 is completely divisible by 11, then the smallest whole number in place of x will be
    1) 1 2) 2 3) 3 4) 5
13. Which one of the following numbers is completely divisible by 45?
    1) 181560 2) 331145 3) 202560 4) 2033550
14. If x and y are the two digits of the number 653xy such that this number is divisible by 80, then $x+y=$
    1) 2 2) 3 3) 4 4) 6
15. What smallest number should be added to 4456 so that the sum is completely divisible by 6 ?
    1) 1 2) 2 3) 3 4) 4

MULTI ANSWER TYPE

16. If any number is divisible by 6 then that is also divisible by
    1) 2 2) 3 3) 4 4) 8
17. If any number is divisible by 12 then it is also divisible by
    1) 2 2) 3 3) 4 4) 6
18. The number 2730 is divisible by
    1) 2 2) 3 3) 5 4) 6
19. Which of the following numbers divisible by 3 ?
    1) 4536 2) 10072 3) 1431 4) 789
20. Which of the following number are divisible by 9 ?
    1) 1233 2) 436527 3) 356731 4) 739243
21. Which of the following numbers are divisible by 8 ?
    1) 95624 2) 842128 3) 658134 4) 532154
22. Which of the following numbers are divisible by 11 ?
    1) 3150719 2) 9071326 3) 1111 4) 11111

REASONING ANSWER TYPE

23. Statement - 1: The number 12342 is divisible by 6

    Statement - 2: A number is divisible by 6 then the sum of digits formed by number is also divisible by 6.

24. Statement - 1: The number 284120 is divisible by 8

    Statement - 2: A number is divisible by 8 then it is also divisible by 2 and 4

25. Statement - 1: The number 35861 is divisible by 7.

    Statement - 2: The digit 7 is both odd and prime.

COMPREHENSION TYPE

Writeup - 1

A number is divisible by 2 if the units digit of the number is divisible by 2. A number is divisible by 3 and 9 if the sum of digits of the number is divisible 3 and 9 respectively

26. Which of the following number is divisible by 9 ?

    1) 200409 2) 124678 3) 32197 4) 320418

27. The number which is divisible by both 2 and 3 is

    1) 120360 2) 123031 3) 20709 4) 5632

28. The number which is divisible by 3 but not by 9 is

    1) 1080 2) 46782 3) 112233 4) 35685

Writeup-2

A number is divisible by 6 if it is divisible by both 2, 3 and a number is divisible by 8 if the number formed by last three digits is divisible by 8

29. The number 2358132 is divisible by

    1) 2 2) 3 3) 8 4) Both 1&2

30. Which of the following is divisible by 8 ?

    1) 41384 2) 236134 3) 56019 4) 31563

31. The number which is divisible by 8 but not by 6 is

    1) 35610 2) 124672 3) 52183 4) 369276

MATRIX MATCHING TYPE

32.

Column - I **Number**	**Column - II** **Divisible by**
1) 31224	p) 2
2) 32456	q) 3
3) 343678	r) 4
4) 97478	s) 6
	t) 8

33.

Column - I **Number**	**Column - II** **Divisible by**
1) 11816	p) 5
2) 3116365	q) 10
3) 3572404	r) 7
4) 379110	s) 11
	t) 35

INTEGER ANSWER TYPE

34. If a number is divisible by 9, then it must be divisible by _____
35. The number 1234x is divisible by 3 then the least possible whole number in place of x will be _____
36. The number 97215x6 is divisible by 8 then the least possible whole number in place will be _____

SYNOPSIS - 7

Highest Common Factor :

i) The greatest number which is the common factor of two or more given numbers is called H.C.F. or G.C.D.

H.C.F. can be determined in different methods

H.C.F. of 144, 198 by prime factorisation method.

$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 2^4 \times 3^2$

$198 = 2 \times 3 \times 3 \times 11 = 2 \times (3)^2 \times 11$

$\therefore$ G.C.D. of 144, 198 $= 2 \times (3)^2 = 9 \times 2 = 18$

ii) H.C.F. of 144, 198 by division method

The G.C.D. of 144, 198 is 18, since the last divisor is 18.

i.e.,

```
144) 198 ( 1
     144
     ---
      54) 144 ( 2
          108
          ---
           36) 54 ( 1
               36
               --
               18) 36 ( 2
                   36
                   --
                    0
                   --
```

Note : HCF of two distinct prime numbers is one.

HCF of two co-primes is one.

HCF of an even number and an odd number is one.

HCF of two consecutive even numbers is two.

L.C.M. :

The least common multiple of two or more numbers is the smallest number which is a multiple of each of the numbers.

i) **To find L.C.M. of 24, 36 and 40 by prime factorisation method**

$24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$

$36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$

$40 = 2 \times 2 \times 2 \times 5 = 2^3 \times 5$

$\therefore$ L.C.M. of 24, 36, 40 is $2^3 \times 3^2 \times 5 = 360$.

ii) **To find L.C.M of 24, 36 and 40 by division method**

2	24, 36, 40
2	12, 18, 20
2	6, 9, 10
3	3, 9, 5
	1, 3, 5

$\therefore$ L.C.M. of 24, 36 and 40 is $2 \times 2 \times 2 \times 3 \times 3 \times 5 = 8 \times 9 \times 5 = 360$.

Note : If two numbers are relatively primes, then their LCM is equal to their product.

In the given two numbers if the first number is a multiple of second number, then their LCM is equal to the first number.

The least common multiple of two prime numbers is their prodduct.

The LCM of two numbers is neven less than either of the two numbers.

iii. **LCM and GCD of fractions**

The LCM and GCD of fractions can be determined by the following relations:

$$\text{LCM of fractions} = \frac{\text{LCM of numerators}}{\text{GCD of denominators}}$$

$$\text{GCD of fractions} = \frac{\text{GCD of numerators}}{\text{LCM of denominators}}$$

Example:

Find the HCF and LCM of $\frac{4}{5}, \frac{2}{5}$ and $\frac{3}{4}$.

$$\text{LCM}\left(\frac{4}{5}, \frac{2}{5}, \frac{3}{4}\right) = \frac{LCM\,(4,2,3)}{HCF\,(5,5,4)} = \frac{4 \times 3}{1} = 12$$

$$HCF = \left(\frac{4}{5}, \frac{2}{5}, \frac{3}{4}\right) = \frac{HCF\,(4,2,3)}{LCM\,(5,5,4)} = \frac{1}{5 \times 4} = \frac{1}{20}$$

Note: The given fractions should be reduced to their lowest terms, before finding the GCD or LCM.

Example:

If the LCM/GCD of $\frac{2}{4}$ and $\frac{6}{9}$ has to be found, first $\frac{2}{4}$ and $\frac{6}{9}$ have to be expressed as $\frac{1}{2}$ and $\frac{2}{3}$ and LCM/GCD should be found.

WORK SHEET - 7

SINGLE ANSWER TYPE

1. The L.C.M of 24, 36 and 40 is
   1) 120 2) 240 3) 360 4) 480
2. The L.C.M of 22, 54, 108, 135 and 198 is
   1) 330 2) 1980 3) 5940 4) 11880
3. The L.C.M of $\frac{1}{3},\frac{5}{6},\frac{2}{9},\frac{4}{27}$ is
   1) $\frac{1}{54}$ 2) $\frac{10}{27}$ 3) $\frac{20}{3}$ 4) $\frac{3}{20}$
4. The L.C.M of $\frac{2}{3},\frac{3}{5},\frac{4}{7},\frac{9}{13}$ is
   1) 36 2) $\frac{1}{36}$ 3) $\frac{1}{1365}$ 4) $\frac{12}{455}$
5. The L.C.M of $2^3\times3^2\times5\times11$, $2^4\times3^4\times5^2\times7$ and $2^5\times3^3\times5^3\times7^2\times11$
   1) $2^3\times3^2\times5$ 2) $2^5\times3^4\times5^3$
   3) $2^3\times3^2\times5\times7\times11$ 4) $2^5\times3^4\times5^3\times7^2\times11$
6. The L.C.M of 3, 2.7 and 0.09 is
   1) 2.7 2) 0.27 3) 0.027 4) 27
7. The H.C.F of 2923 and 3239 is
   1) 37 2) 47 3) 73 4) 79
8. The H.C.F of 204, 1190 and 1145 is
   1) 17 2) 18 3) 19 4) 21
9. The H.C.F of , and is
   1) $2^2\times3^2\times5$ 2) $2^2\times3^2\times5\times7\times11$
   3) $2^4\times3^4\times5^5$ 4) $2^4\times3^4\times5^5\times7\times11$
10. The H.C.F of $2^4\times3^2\times5^3\times7$, $2^3\times3^3\times5^2\times7^2$ and $3\times5\times7\times11$ is
    1) 105 2) 1155 3) 2310 4) 27720

11. The H.C.F of $\frac{9}{10}, \frac{12}{25}, \frac{18}{35}$ and $\frac{21}{40}$ is

1) $\frac{3}{5}$ 2) $\frac{252}{5}$ 3) $\frac{3}{2800}$ 4) $\frac{63}{700}$

12. The H.C.F of $\frac{2}{3}, \frac{8}{9}, \frac{64}{81}$ and $\frac{10}{27}$ is

1) $\frac{2}{3}$ 2) $\frac{2}{81}$ 3) $\frac{160}{3}$ 4) $\frac{160}{81}$

13. The H.C.F of 1.75, 5.6 and 7 is

1) 0.07 2) 0.7 3) 3.5 4) 0.35

14. The G.C.O of 1.08, 0.36 and 0.9 is

1) 0.03 2) 0.9 3) 0.18 4) 470.108

15. The ratio of two numbers is $3:4$ and their H.C.F is 4. Their L.C.M is

1) 12 2) 16 3) 24 4) 48

16. Three numbers are in the ratio $1:2:3$ and their H.C.F is 12. The numbers are

1) 4, 8, 12 2) 5, 10, 15 3) 10, 20, 30 4) 12, 24, 36

MULTI ANSWER TYPE

17. If $A=7^2\times9\times5^3$, $B=7\times9^2\times5^2$ and $C=7^3\times9^3\times5$ then

1) H.C.F of A, B, C is $7\times9\times5$

2) G.C.D of A, B, C is $7^3\times9^3\times5^3$

3) L.C.M of A, B, C is $7^3\times9^3\times5^3$

4) L.C.M of A, B, C is $7\times9\times5$

18. The L.C.M of two numbers is 48. The numbers are in the ratio $2:3$. Then

1) The numbers are 16, 48
2) The numbres are 16, 24
3) H.C.F of the is numbers is 8
4) Difference of the numbers is 8

19. The Sum of two numbers is 216 and their H.C.F is 27. Then the numbers are

1) 27, 189 2) 81, 135 3) 108, 108 4) 154, 762

20. Product of two Co-prime numbers is 117. Then

1) The numbers are 1, 117
2) The H.C.F of those two numbers is 1
3) The L.C.M of those two numbers is 117
4) The H.C.F of those two numbers is 117

REASONING ANSWER TYPE

21. **Statement - 1:** L.C.M of 15, 24, 32 and 36 is 1440.
Statement - 2: L.C.M of numbers is the least number which is divisible by each of the given number exactly.
1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

22. **Statement - 1:** Greatest number which divides 62, 132 and 237 to leave the same remainder in each Case is 35.
Statement - 2: Greatest number which divides a, b, c to leave the same remainder in each case is H.C.F of $(b-a),(c-b),(c-a)$
1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup-1

LCM of numbers is the least number which is divisible by each of the given numbers.

23. LCM of 48, 108 and 280 is
1) 15120 2) 16150 3) 3950 4) 46790

24. LCM of 1134 and 2106 is
1) 15672 2) 14742 3) 49353 4) 97426

25. LCM of 72, 108, 144, 162 is
1) 676 2) 1579 3) 1296 4) 1892

Writeup-2

Greatest number which divides a, b, c to leave the same remainder in each case is H.C.F of $(b-a),(c-b),(c-a)$.

26. Find the largest number which divides 32, 122 and 157 to leave same remainder in each case ?
1) 5 2) 15 3) 30 4) 20

27. Find the largest number that will divide 43, 91 and 183 so as to leave the same remainder in each case ?
1) 4 2) 7 3) 9 4) 13

28. Find the largest number that will divide 1305, 4665 and 6905 leaving the same remainder in each case then sum of the digits in that number is
1) 4 2) 5 3) 6 4) 8

MATRIX MATCHING TYPE

29.

Column - I	Column - II
1) LCM of 168, 180 and 330	A) 1136
2) LCM of 16, 24, 36 and 54	B) 27720
3) LCM of 248 and 868	C) 5103
4) LCM of 567 and 729	D) 432
	E) 2601

30.

Column - I	Column - II
1) Common factor of 18 and 24	A) 3
2) GCD of 55 and 121 is	B) 6
3) Common factor of 38 and 57	C) 11
4) GCD of 3156 and 6	D) 19
	E) 1

INTEGER ANSWER TYPE

31. G.C.D of two Consecutive even numbers is _____

32. G.C.D of two Co-primes is _____

SYNOPSIS - 8

Relation between G.C.D and L.C.M. :

If 'a' and 'b' are any two natural numbers and L and G are respectively their L.C.M. and G.C.D. then a × b = L × G.

Eg 1 : If the G.C.D of two numbers is 16 and their product is 3072, then their

$$\text{L.C.M.} = \frac{\text{product of the given two numbers}}{\text{their G.C.D}} = \frac{3072}{16} = 192$$

Eg 2 : The L.C.M and G.C.D of two numbers respectively are 80 and 4. If one of the numbers is 16, then the other number is $b = \frac{L \times G}{a} = \frac{80}{16} = 5$

WORK SHEET - 8

SINGLE ANSWER TYPE

1. The H.C.F of two number is 11 and their L.C.M is 693. If one of the numbers is 77 then the other number is
   1) 9 2) 99 3) 69 4) 63
2. The H.C.F of two numbers is 11 and their LCM is 7700. If one of the number is 275, then the other is
   1) 279 2) 283 3) 308 4) 318
3. The H.C.F and L.C.M of two numbers are 84 and 21 respectively. If the ratio of the two numbers is $1:4$, then the larger of the two numbers is
   1) 12 2) 48 3) 84 4) 108
4. The product of two numbers is 1320 and their H.C.F is 6. The L.C.M of the numbers is
   1) 220 2) 1314 3) 1326 4) 7920

5. If the G.C.D of two numbers is 1, theb their LCM is equal to their
   1) Sum 2) Quotient 3) Different 4) Product
6. The LCM of two numbers is 1320. Their GCD is 12. If one of the number is 132 then another number is
   1) 123 2) 12 3) 120 4) 1200
7. The greater number that exactly divides 105, 100, and 2436 is
   1) 3 2) 7 3) 11 4) 21
8. The greatest possible length which can be used to measure exactly the lengths 7m, 3m 85 cm, 12m 95cm
   1) 15 cm 2) 25 cm 3) 35 cm 4) 42 cm
9. The maximum number of students among then 1001 pens and 910 pencils can be distributed in Such a way that each student gets the same number of pens and same number of pencils is
   1) 91 2) 910 3) 1001 4) 1911
10. The greatest number which can divide 1356, 1868 and 2764 leaving the same remainder 12 in each case is
    1) 64 2) 124 3) 156 4) 260
11. The least number of five digits which is exactly divisible by 12, 15 and 18 is
    1) 10010 2) 10015 3) 10020 4) 10080
12. The smallest number which when diminished by 7 is divisible by 12, 16, 18, 21 and 28 is
    1) 1008 2) 1015 3) 10020 4) 10080
13. The least number which when increased by 5 is divisible by each one of 24, 32, 36 and 54 is
    1) 427 2) 859 3) 869 4) 4320
14. The least number, which when divided by 12, 15, 20 and 54 leaves in each case remainder of 8 is
    1) 504 2) 536 3) 544 4) 548
15. Six belts Commence tolling together and toll at intervals of 2, 4, 6, 8, 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together ?
    1) 4 2) 10 3) 15 4) 16

MULTI ANSWER TYPE

16. The H.C.F and LCM of two numbers is 10 and $10^{12} \times 7^2$. If one of the number is 10^{12} then the
    1) Other number is $10^{10} \times 7^2$ 2) Ratio of numbers is $100:49$
    3) Other number is $10^{12} \times 7^2$ 4) Ratio of numbers is $1:49$
17. H.C.F and LCM of two numbers $16^{20}, 32^{56}$ are
    1) $32^{16}, 32^{56}$ 2) $16^{20}, 32^{56}$ 3) $4^{40}, 128^{40}$ 4) $2^{80}, 2^{280}$

REASONING ANSWER TYPE

18. S.I : LCM of two numbers $2^{51}\times3^{18}$ and $2^{12}\times3^{42}\times5^{20}$ is $2^{51}\times3^{42}\times5^{20}$.
S.II : LCM of $a^p\times b^q\times c^r$ and $a^s\times b^t$ is $a^p\times b^q\times c^r$, if $p>s$ and $q>t$
1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

19. S.I : H.C.F of two numbers is 16 and their LCM is 160. If one of the numbers is 32, then the other number is 80.
S.I : Product of two numbers = Product of their HCF and LCM.
1. Both Statements I and II are correct
2. Both statement I and II are incorrect
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Realation between HCF and LCM of two numbres is product of two number = Product of their HCF and LCM.

20. The LCM of 248 and 868 is 1736, Then HCF is
1) 248 2) 124 3) 868 4) 1736

21. The product of two numbers is 15870 and their HCF is 23. Then LCM is
1) 238 2) 158 3) 700 4) 690

22. The HCF of two numbers is 31 and their LCM is 1488. If one of the numbers is 186. Then the other number is
1) 248 2) 134 3) 736 4) 688

MATRIX MATCHING TYPE

23. LCM and GCD of two numbers p and q are l and m respectively.

Column - I	Column - II
1) $p\times q$	A) m/p
2) p/m	B) $l\times m$
3) q/l	C) m/q
4) l/p	D) l/q
	E) q/m

INTEGER ANSWER TYPE

24. The product of LCM and GCD of the numbers 2 and 3 is _____

25. The product of numbers is 24 and LCM of the numbers is 12. Then their GCD is _____.

VERBAL REASONANING

1. R, U, X, A, D, ?
   a) F b) G c) H d) I
2. B, D, F, I, L, P, ?
   a) R b) S c) T d) U
3. H, I, K, N, ?
   a) O b) Q c) R d) S
4. A, G, L, P, S, ?
   a) U b) W c) X d) Y
5. A, D, H, M, ?, Z
   a) T b) G c) N d) S
6. Z, U, Q, ?, L
   a) I b) K c) M d) N
7. Z, Y, X, U, T, S, P, O, N, K, ?, ?
   a) H, G b) H, I c) I, H d) J, I
8. Z, X, S, I, R, R, ?, ?
   a) G, I b) J, I c) J, K d) K, M
9. A, B, B, D, C, F, D, H, E, ?, ?
   a) E, F b) F, G c) F, I d) J, F
10. C, Z, F, X, I, V, L, T, O, ?, ?
    a) O, P b) P, Q c) R, R d) S, R
11. Z, S, W, O, T, K, Q, G, ?, ?
    a) N, C b) N, D c) O, C d) O, D
12. AB, DEF, HIJK, ?, STUVWX
    a) LMNO b) LMNOP c) MNOPQ d) QRSTU
13. AZ, GT, MN, ?, YB
    a) JH b) SH c) SK d) TS
14. AZ, CX, FU, ?
    a) IR b) IV c) JQ d) KP
15. ajs, gpy, ?, sbk, yhq
    a) dmv b) mve c) oua d) qzi
16. BMX, DNW, FOU, ?
    a) GHO b) GPS c) HPS d) HPT
17. ABD, DGK, HMS, MTB, SBL, ?
    a) XKW b) ZAB c) ZKU d) ZKW
18. WFB, TGD, QHG, ?
    a) NIJ b) NIK c) NJK d) OIK

19. UPI, ?, ODP, MBQ, IAW
    a) RHJ b) SHJ c) SIJ d) THK
20. AYD, BVF, DRH, ?, KGL
    a) FMI b) GMJ c) GLJ d) HLK
21. A, CD, GHI, ?, UVWXY
    a) LMNO b) MNO c) MNOP d) NOPQ
22. ADVENTURE, DVENTURE, DVENTUR, ? , VENTU
    a) DVENT b) VENTURE c) VENTUR d) DVENTU

KEY & HINTS

WORK SHEET – 1 (KEY)				
1) 4	**2)** 3	**3)** 2	**4)** 1	**5)** 1
6) 3	**7)** 2	**8)** 2	**9)** 3	**10)** 1
11) 2	**12)** 2	**13)** 3	**14)** 1	**15)** 2
16) 1	**17)** 2	**18)** 1,2,3	**19)** 1,2	**20)** 4
21) 3	**22)** 1	**23)** 2	**24)** 1	**25)** A-QS B-R C-P D-T
26) 0	**27)** 3			

WORK SHEET – 2 (KEY)				
1) 3	**2)** 1	**3)** 1	**4)** 4	**5)** 4
6) 2	**7)** 1	**8)** 3	**9)** 2	**10)** 1
11) 1	**12)** 1	**13)** 3,4	**14)** 1,2	**15)** 1
16) 4	**17)** 2	**18)** 1	**19)** A-S B-R C-Q D-P	**20)** 5
21) 0				

WORK SHEET – 3 (KEY)				
1) 1	**2)** 2	**3)** 4	**4)** 1	**5)** 1
6) 4	**7)** 2	**8)** 1,2	**9)** 2,3	**10)** 1
11) 1	**12)** 2	**13)** 1	**14)** 1-C 2-E 3-A 4-B	**15)** 6
16) 9				

WORK SHEET – 4 (KEY)				
1) 1	**2)** 4	**3)** 2	**4)** 4	**5)** 4
6) 4	**7)** 2	**8)** 4	**9)** 4	**10)** 4
11) 1,3	**12)** 1,2,3,4	**13)** 2,4	**14)** 1	**15)** 3
16) 2	**17)** 4	**18)** 1-E 2-F 3-D 4-B		

WORK SHEET – 5 (KEY)				
1) 1	**2)** 2	**3)** 2	**4)** 4	**5)** 2
6) 1	**7)** 1	**8)** 3	**9)** 2	**10)** 1
11) 1	**12)** 3	**13)** 4	**14)** 2	**15)** 3
16) 2	**17)** 3	**18)** 4	**19)** 4	**20)** 1,2,3,4
21) 1,2	**22)** 1,3	**23)** 1,2	**24)** 1	**25)** 3
26) 3	**27)** 4	**28)** 1	**29)** 4	**30)** 1
31) 1	**32)** 2	**33)** 3	**34)** 1-cde 2-c 3-a 4-be	**35)** A-3 B-5 C-1 D-2
36) A-2,3,5 B-1 C-2,3,5 D-3	**37)** 2	**38)** 1	**39)** 9	**40)** 100

WORK SHEET – 6 (KEY)				
1) 3	**2)** 2	**3)** 3	**4)** 4	**5)** 3
6) 1	**7)** 3	**8)** 4	**9)** 3	**10)** 1
11) 4	**12)** 2	**13)** 4	**14)** 3	**15)** 2
16) 1,2	**17)** 1,2,3,4	**18)** 1,2,3,4	**19)** 1,3,4	**20)** 1,2
21) 1,2	**22)** 1,2,3	**23)** 3	**24)** 1	**25)** 1
26) 4	**27)** 1	**28)** 3	**29)** 4	**30)** 1
31) 2	**32)** 1-pqrst 2-prt 3-pqs 4-p	**33)** 1-r 2-prt 3-s 4-pq	**34)** 3	**35)** 2
36) 3				

5. Key - (3)

$517x324$ is divisible by 3

$\therefore 5+1+7+x+3+2+4=22+x$ is also divisible by 3

$\therefore x=2$

6. (1)

If $5x2$ is divisible by 6 then it is also divisible by 2 and 3

$\therefore 5+x+2=7+x$ is also divisible by 3.

$\therefore x=2$

7. (3)

By using divisibility rule of 8, $6x2$ must be divisible by 8

$\therefore x=3$

8. (4)

$481x673$ is divisible by 9

$\therefore 4+8+1+x+6+7+3=29+x$ is also divisible by 9.

$\therefore x=7$

12. (2)

$97215x6$ is divisible by 11

$\therefore (9+2+5+6)-(7+1+x)$ is also divisible by 11.

$22-(9+x)$

$\therefore x=2$

13. If a number is divisible by 45 then it divisible by 5 and 9.
$\therefore$ By verification option (4) is Correct.

14. (3)
653xy is divisible by 80.
$\therefore$ It is divisible by both 10 & 8
$\therefore \ y=0, \ \Rightarrow \ x=4$ or 8
$\therefore x+y=4+0=4$

15. (2)
$4456+x$ is divisible by 6.
By Verification $x=2$

19. 1, 3, 4
Sum of the digits of the numbers are divisible by 3.

20. (1), (2)
Sum of the digits of the numbers are divisible by 9.

21. (1), (2)
Last Three digits of the number should be divisible by 8

22. 1, 2, 3
By using divisibility rule of 11.

26. By using divisibility rule of 9.
$\therefore$ Option (4) is Correct.

27. Option (2), (3) are not Correct because of odd numbers.
$\therefore 1+2+0+3+6+0=12$ is divisible by 3.
$\therefore$ option (1) is Correct

28. $1080 \rightarrow$ divisible by 9
$46782 \rightarrow$ divisible by 9
$112233 \rightarrow$ divisible by only 3 but not 9
$\therefore$ option (3) is Correct.

29. (4)
2358132 is even and sum of the digits is also divisible by 3.

30. By using divisibility rule of 8
option (1)

31. First Verify which is divisible by 8 after that by 6.
    Option (2) is Correct.
32. By using divisibility rules
    (1) → p, q, r, s, t
    (2) → p, r, t
    (3) → p, q, s
    (4) → p
33. By using divisibility rules
    (1) → r, (2) → p, r, t (3) → s, (4) → p, q
34. 3
35. $1+2+3+4+x=10+x$ must be divisible by 3.
    $\therefore x=2$
36. In $97215x6$, $5x6$ must be divisible by 8.
    $\therefore x=3$

WORK SHEET – 7 (KEY)				
1) 3	**2)** 3	**3)** 3	**4)** 1	**5)** 4
6) 4	**7)** 4	**8)** 1	**9)** 1	**10)** 1
11) 3	**12)** 2	**13)** 4	**14)** 3	**15)** 4
16) 4	**17)** 1,3	**18)** 2,3,4	**19)** 1,2	**20)** 1,2,3
21) 1	**22)** 1	**23)** 1	**24)** 2	**25)** 3
26) 1	**27)** 1	**28)** 1	**29)** 1-b 2-d 3-a 4-c	**30)** 1-abe 2-c 3-de 4-b
31) 2	**32)** 1			

1.

2	24 — 36 — 40
2	12 — 18 — 20
2	6 — 9 — 10
3	3 — 9 — 5
	1 — 3 — 5

L.C.M $= 2\times2\times2\times3\times3\times5 = 360$

3. Required L.C.M $= \dfrac{\text{L.C.M. of } 1, 5, 2, 4}{\text{H.C.F. of } 3, 6, 9, 27} = \dfrac{20}{3}$

4. Required L.C.M $= \dfrac{\text{L.C.M. of } 2, 3, 4, 9}{\text{H.C.F. of } 3, 5, 7, 13} = \dfrac{36}{1} = 36$

5. L.C.M = Product of highest powers of prime factors $= 2^5\times3^4\times5^3\times7^2\times11$

6. Given numbers are 3.00, 2.70 and 0.09 L.C.M of 300, 270 and 9 is 2700
$\therefore$ L.C.M of given numbers $= 27.00 = 27$

7. 2923

8. $204 = 2^2\times3\times17; 1190 = 2\times5\times7\times17; 1445 = 5\times17^2$
$\therefore$ H.C.F = 17.

10. H.C.F = Product of lowest powers of Common factors $= 3\times5\times7 = 105$

11.

12. Required H.C.F $= \dfrac{\text{H.C.F of } 2, 8, 64, 10}{\text{L.C.M of } 3, 9, 81, 27} = \dfrac{2}{81}$

13. Given numbers with two decimal places are 1.75, 5.60 and 7.00 with out decimal places these numbers are 175, 560 and 700 whose H.C.F is 35
$\therefore$ H.C.F of given numbers $= 0.35$

14. Given numbers are 1.08, 0.36 and 0.90 H.C.F of 108, 36 and 90 is 18
$\therefore$ H.C.F of given numbers $= 0.18$

15. Let the number be $3\times$ and $4\times$ then , their H.C.F $= \times.50, \times = 4$
so the numbers are 12 and 16

L.C.M of 12 and 16 $=48$

16. Let the required numbers be $\times$, $2\times$ and $3\times$ then their H.C.F $=\times$. So, $\times=12$

$\therefore$ The numbers are 12, 24 and 36

17. $A=7^2\times9\times5^3,\quad B=7\times9^2\times5^2,\quad C=7^3\times9^3\times5$

$\therefore$ H.C.F $=7\times9\times5$ (Least powers)

L.C.M $=7^3\times9^3\times5^3$ (Greatest powers)

18. Numbers are $2x,3x$

$\therefore$ L.C.M is $6x=48$

$x=8$

$\therefore$ The numbers are 16, 24

H.C.F of 16, 24 is 8

Difference of 16, 24 is also 8

19. Let the required number be 27a and 276.

Then, $27a+27b=216 \Rightarrow a+b=8$.

Now, Co-primes with Sum 8 is (1, 7) and (3, 5)

$\therefore$ Required numbers are $(27\times1,27\times7)$ and $(27\times3,27\times5)$

$\therefore 27,189$ or $81,135$

20. $\therefore$ The numbers are 1, 117

G.C.D of Co-primes is 1.

L.C.M is product of Co-primes.

21. (1)

22. (1)

G.C.D of $(132-62),(237-132),(237-62)$

G.C.D of $70,105,175=35$

26. G.C.D of $(122-32),(157-122),(157-32)$

G.C.D of $90,35,125=5$

27. G.C.D of $(91-43),(183-91),(103-43)$

G.C.D of $48,92,140$ is 4.

28. G.C.D of $(4665-1305),(6905-4665),6905-(1305)$

G.C.D is 4.

29. $(1)\to B,\quad (2)\to D,\quad (3)\to A,\quad (4)\to C$

30. $(1)\to A,B,E,\quad (2)\to C,\quad (3)\to D,E,\quad (4)\to B$

WORK SHEET – 8 (KEY)				
1) 2	**2)** 3	**3)** 3	**4)** 1	**5)** 4
6) 3	**7)** 2	**8)** 3	**9)** 1	**10)** 1
11) 4	**12)** 2	**13)** 2	**14)** 4	**15)** 4
16) 1,2	**17)** 1,2,3,4	**18)** 1	**19)** 1	**20)** 2
21) 4	**22)** 1	**23)** 1-b 2-d 3-a 4-e	**24)** 6	**25)** 2

1. Other number $= \frac{11 \times 693}{77} = 99$
2. Other number $= \frac{11 \times 7700}{275} = 308$
3. Let the number be x and 4x.

   $\therefore \quad x \times 4x \;=\; 84 \times 21$

   $x^2 = \frac{84 \times 21}{4} = 21 \times 21$

   $\therefore$ Larger number $4x = 84$
4. L.C.M $= \frac{\text{Product of numbers}}{\text{H.C.F}} = \frac{1320}{6} = 220$
5. (4)
6. Other number $= \frac{1320 \times 12}{132} = 120$
7. H.C.F of 2436 and 1001 is 7.
   Also, H.C.F of 105 and 7 is 7.
   $\therefore$ H.C.F of 105, 1001, 2436 is 7.
8. Required length = H.C.F of 700 cm, 385 cm, 1295 cm
   $= 35$ cm
9. Required number of students = H.C.F of 1001 and 910
   $= 91$

10. Required number = H.C.F of $(1356-12),(1868-12)$ and $(2764-12)$

$= $ H.C.F of 1344, 1856 and 2752

$=64$

11. Least number of 5 digits is 10000.
L.C.M of 12, 15 and 18 is 180.
On dividing 10000 by 180, the remainder is 100.

$\therefore$ Required number $=10000+(180-100)=10080$

12. Required number $=(\text{L.C.M of } 12, 16, 18, 21, 28)+7$

13. Required number $=(\text{L.C.M of } 24, 32, 36, 56)-5$

$=859$

14. Required number $=(\text{L.C.M of } 12, 15, 20, 54)+8$

$540+8$

$=548$

15. L.C.M of 2, 4, 6, 8, 10, 12 is 120
So, the bells will toll together after every 120 seconds.
i.e. 2 minutes.

In 30 minutes, they will toll together, $\frac{30}{2}+1=16$ times.

16. Othe number $=\frac{10^{10}\times10^{12}\times7^2}{10^{12}}=10^{10}\times7^2$

$\therefore$ Ratio of number is $10^{12}:10^{10}\times7^2$

$100:49$

17. Given number are $16^{20},32^{56}$

$\therefore$ H.C.F is $16^{20}=32^{16}=4^{40}=2^{80}$

L.C.M is $32^{56}=128^{40}=2^{280}$

18. (1)

19. (1)

20. $\therefore$ H.C.F $=\frac{\text{Product of numbers}}{\text{L.C.M}}$

$=\frac{248\times868}{1736}=124$

21. L.C.M $=\frac{15870}{23}=690$

22. Other number $=\frac{1488\times31}{186}=248$

23. $(1) \to B,\ (2) \to D,\ (3) \to A,\ (4) \to E$

24. $\text{L.C.M} \times \text{G.C.D} = \text{Product of number}$

$= 2 \times 3$

$= 6$

25. $\text{G.C.D} = \dfrac{\text{Product of numbers}}{\text{L.C.M}}$

$= \dfrac{24}{12}$

$= 2$

VERBAL REASONING (KEY)				
1) B	**2)** C	**3)** C	**4)** A	**5)** D
6) D	**7)** D	**8)** A	**9)** D	**10)** C
11) A	**12)** C	**13)** B	**14)** C	**15)** B
16) D	**17)** B	**18)** B	**19)** B	**20)** B
21) C	**22)** C			

1. (b) : $R \xrightarrow{+3} U \xrightarrow{+3} X \xrightarrow{+3} A \xrightarrow{+3} D \xrightarrow{+3} G$

2. (c) : $B \xrightarrow{+2} D \xrightarrow{+2} F \xrightarrow{+3} I \xrightarrow{+3} L \xrightarrow{+4} P \xrightarrow{+4} (T)$

3. (c) : $H \xrightarrow{+1} I \xrightarrow{+2} K \xrightarrow{+3} N \xrightarrow{+4} (R)$

4. (a) : $A \xrightarrow{+6} G \xrightarrow{+5} L \xrightarrow{+4} P \xrightarrow{+3} S \xrightarrow{+2} (U)$

5. (d) : $A \xrightarrow{+3} D \xrightarrow{+4} H \xrightarrow{+5} M \xrightarrow{+6} (S) \xrightarrow{+7} Z$

6. (d) : $Z \xrightarrow{-5} U \xrightarrow{-4} Q \xrightarrow{-3} (N) \xrightarrow{-2} L$

7. (d) : $(Z \to Y \to X) \xrightarrow{-3} (U \to T \to S) \xrightarrow{-3} (P \to O \to N) \xrightarrow{-3} (K \to (J) \to (I))$

8. (a) : $Z \xrightarrow{-2} X \xrightarrow{-5} S \xrightarrow{-10} I \xrightarrow{-17} R \xrightarrow{-26} R \xrightarrow{-37} (G) \xrightarrow{-50} (I)$

9. (d) : The given sequence is a combination of two series :

I. 1st, 3rd, 5th, 7th, 9th, 11th, terms $i.e. A, B, C, D, E, ?$

II. 2nd, 4th, 6th, 8th, 10th terms $i.e. B, D, F, H$?

Clearly, I consists of consecutive letters while II consists of alternate letters. So, the missing letter in I is F, while that in II is J.

So, the missing terms $i.e. 10th$ and $11th$ terms are J and F respectively.

10. (c) : The given sequence is a combination of two series :

I. C, F, I, L, O, ? and

II. Z, X, V, T, ?

The pattern in I is : $C \xrightarrow{+3} F \xrightarrow{+3} I \xrightarrow{+3} L \xrightarrow{+3} O \xrightarrow{+3} (R)$

The pattern in II is : $Z \xrightarrow{-2} X \xrightarrow{-2} V \xrightarrow{-2} T \xrightarrow{-2} (R)$

11. (a) :The given sequence is a combination of two series :

I. Z, W, T, Q, ? and II. S, O, K, G, ?

The pattern in I is : $Z \xrightarrow{-3} W \xrightarrow{-3} T \xrightarrow{-3} Q \xrightarrow{-3} (N)$

The pattern in II is : $S \xrightarrow{-4} O \xrightarrow{-4} K \xrightarrow{-4} G \xrightarrow{-4} (C)$

12. (c) : The number of letters in the terms of the given series increases by one at each step.

The first letter of each term is two steps ahead of the last letter of the preceding term. However, each term consists of consecutive letters in order.

13. (b) : 1st letter : $A \xrightarrow{+1} B \xrightarrow{+1} C \xrightarrow{+1} (D)$

2nd letter : $Z \xrightarrow{-6} T \xrightarrow{-6} N \xrightarrow{-6} (H) \xrightarrow{-6} B$

14. (c) : 1st letter : $A \xrightarrow{+2} C \xrightarrow{+3} F \xrightarrow{+4} (J)$

2nd letter : $Z \xrightarrow{-2} X \xrightarrow{-3} U \xrightarrow{-4} (Q)$

15. (b) : 1st letter : $a \xrightarrow{+6} g \xrightarrow{+6} (m) \xrightarrow{+6} s \xrightarrow{+6} y$

2nd letter : $j \xrightarrow{+6} p \xrightarrow{+6} (v) \xrightarrow{+6} b \xrightarrow{+6} h$

3rd letter : $s \xrightarrow{+6} y \xrightarrow{+6} e \xrightarrow{+6} k \xrightarrow{+6} q$

16. (d) : 1st letter : $B \xrightarrow{+2} D \xrightarrow{+2} F \xrightarrow{+2} (H)$

2nd letter : $M \xrightarrow{+1} N \xrightarrow{+1} O \xrightarrow{+1} (P)$

3rd letter : $X \xrightarrow{-1} W \xrightarrow{-2} U \xrightarrow{-1} (T)$

17. (b) : 1st letter : $A \xrightarrow{+3} D \xrightarrow{+4} H \xrightarrow{+5} M \xrightarrow{+6} S \xrightarrow{+7} (Z)$

2nd letter : $B \xrightarrow{+5} G \xrightarrow{+6} M \xrightarrow{+7} T \xrightarrow{+8} B \xrightarrow{+9} (K)$

3rd letter : $D \xrightarrow{+7} K \xrightarrow{+8} S \xrightarrow{+9} B \xrightarrow{+10} L \xrightarrow{+11} (W)$

18. (b) :1st letter : $W \xrightarrow{-3} T \xrightarrow{-3} Q \xrightarrow{-3} (N)$

2nd letter : $F \xrightarrow{+1} G \xrightarrow{+1} H \xrightarrow{+1} (I)$

3rd letter : $B \xrightarrow{+2} D \xrightarrow{+3} G \xrightarrow{+4} (K)$

19. (b) :1st letter : $U \xrightarrow{-2} (S) \xrightarrow{-4} O \xrightarrow{-2} M \xrightarrow{-4} I$

2nd letter : $P \xrightarrow{-8} (H) \xrightarrow{-4} D \xrightarrow{-2} B \xrightarrow{-1} A$

3rd letter : $I \xrightarrow{+1} (J) \xrightarrow{+6} P \xrightarrow{+1} Q \xrightarrow{+6} W$

20. (b) :1st letter : $A \xrightarrow{+1} B \xrightarrow{+2} D \xrightarrow{+3} G \xrightarrow{+4} (K)$

2nd letter : $Y \xrightarrow{-3} V \xrightarrow{-4} R \xrightarrow{-5} M \xrightarrow{-6} (G)$

3rd letter : $D \xrightarrow{+2} F \xrightarrow{+2} H \xrightarrow{+2} J \xrightarrow{+2} (L)$

21. (c) : Each term consists of consecutive letters in order. The number of letters in the terms goes on increasing by one at each step. Also, there is a gap of one letter between the last letter of the first term and the first letter of the second term; a gap of two letters between the last letter of the second term and the first letter of the third terml; and so on. So, there should be a gap of three letters between the last letter of the third term and the first letter of the desired term.

22. (c) : One letter from the beginning and one from the end of a term are removed, one by one, in alternate steps.

INTEGERS

SYNOPSIS - 1

Positive Integers:

The natural numbers 1, 2, 3, 4, 5,.... are also know as positive integers.

Thus, $Z^+ = \{1,2,3,4,5,...\} = N$, is the set of all positve integers.

Negative Integers:

Corresponding to every positve integer 1, 2, 3, 4, 5.... we define a negative integer, denoted by -1, -2, -3, -4, -5, ... such that

$1+(-1)=0, 2+(-2)=0, 3+(-3)=0$ and so on.

The set $Z^- = \{-1,-2,-3,-4,-5,....\}$ is the set of all negative integers.

Remarks: The number 1 and -1 are called the opposites of each other. Similarly, the numbers 2 and -2 are called the opposites of each other and so on.

Integers: All natural numbers, negatives of natural numbers and 0, togetyher form the set Z or I of all integers.

Thus, Z = $\{....,-3,-2,-1,0,1,2,3,....\} = Z^- \cup \{0\} \cup Z^+$.

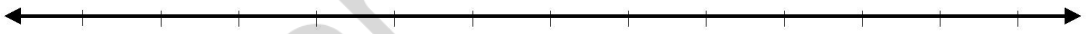
Remark: 0 is an integers which is neither positve nor negative.

Representation of integers on Number line.

Draw a line. Mark a point on this line.Label this point as 0.

Now, set off equal distances on the right as well as left of 0.

On the right hand side of 0, label the points of division as 1, 2, 3,....while on the left hand side of 0, label the points as -1,-2, -3,....as shown below.



The arrowheads on both sides of the number line indicate the continuation of integers indefinitely on each side.

Comparison of Integers: If we represent two integers on the number line, then the integer occuring on the right is greater than that occurring on the left.

As a consequence of it, we can make following observations:

i. 0 is less than every positive integer.

ii. 0 is greater than every negative integer.

iii. Every negative integer is less than every positive integer

iv. The greater is the integer, the lesser is its negative, i.e., $a > b \Rightarrow -a < -b$.

Absolute valueof an Integer: The absolute value of an integer 'a' is the numerical valueof 'a' regardless of its sign. We denote it by $|a|$.

Thus, $|-5|=5,|5|=5,|-9|=9$ and $|9|=9$, etc.

FUNDAMENTAL OPERATIONS ON INTEGERS

I. Addition of Integers: The addition of integers may be carried out by any of the following rules:

Rule 1: (Addition of two positive integers): The sum of two positive integers is a positive integer obtained by taking the sum of the numerical valuesof the addends.

Rule 2: (Addition of two negative integers): The sum of two negative integers is a negative integer obtained by taking the sum of the numerical values of the addends.

Rule 3: (Addition of a positive and negative integer): To add a positive and a negative integer, we find the difference between their numerical values of give the sign of the integer with the greater value to it.

Example: (i) $(+8)+(+7)=(+15)$

(ii) $(+6)+(+3)=(+9)$

(iii) $(-3)+(-4)=-(3+4)=(-7)$

(iv) $(-6)+(-7)=-(6+7)=(-13)$

(v) $(-3)+(+7)=+(7-3)=(+4)$

(vi) $(-23)+(+15)=-(23-15)=(-8)$

Properties of Addition of Integers:

1. Closure Property for Addition of Integers: The sum of two integers is always an integer. Thus, $a\in Z, b\in Z \Rightarrow a+b\in Z$.

   Example: (-7) and 29 are integers. Their sum is 22 which is also an integer.

2. Commutative Law for Addition of Integers: For any two integers a and b, we always have $a+b=b+a$.

   Example: $3+(-12)=(-9)$ and $(-12)+3=(-9)$

   $\therefore 3+(-12)=(-12)+3$

3. Associative Law for addition of Integers: For any three integers a, b and c, we have $(a+b)+c=a+(b+c)$.

   Example: For integers $(-3),(-6)$ and 5 we have

   $[(-3)+(-6)]+5=(-9)+5=(-4)$ and

   $(-3)+[(-6)+5]=(-3)+(-1)=(-4)$

Thus, $\left[(-3)+(-6)\right]+5=(-3)+\left[(-6)+5\right]$

4. Existence of Additive Identity: 0 is the additive identify for integers. So, for any integer 'a', we have.

   $a+0=a$ and $0+a=a$

   Example: (i) $3+0=0+3=3$

   (ii) $(-7)+0=0+(-7)=(-7)$.

5. Existence of Additive Inverse: For each integer 'a' there exists another integer $(-a)$ such that $a+(-a)=(-a)+a=0$. The integer $(-a)$ is called the opposite or negative or additive inverse of the integer 'a'.

   Example: $8+(-8)=(-8)+8=0$

   Therefore, the additive inverse of 8 is (-8)

   Also, the additive inverse of (-8) is 8.

   Remark: The additive inverse of 0 is 0.

II. Subtraction of Integers: To subtract one integer from another, we take the additive inverse of the integer to be subtracted and add it to the other integer. Thus, if a and b are two integers, then $a-b=a+(-b)$.

Example: Subtract (i) 9 from 2 (ii) -8 from 4 (iii) 12 from (-6) (iv) (-13) from (-26)

Solution:

(i) 2 - 9 = 2 + (additive inverse of 9) = $2+(-9)=(-7)$

(ii) $4-(-8)=4+$ (additive inverse of -8) $=4+8=12$

(iii) $(-6)-(12)=(-6)$ + (additive inverse of 12) $=(-6)+(-12)=(-18)$

(iv) $(-26)-(-13)=(-26)+$ (additive inverse of -13)

$=(-26)+13=(-13)$.

Properties of Subtraction of Integers:

1. Closure Property: The difference of two integers is always an integer, i.e., $a\in Z$, $b\in Z\Rightarrow(a-b)\in Z$

2. If 'a' is any integer, then $a-0=a$ and $0-a=-a$.

3. For any integer 'a', we have $-(-a)=a$, i.e., additive inverse of -a is a.

III. Multiplication of Integers: The multiplication of integers may be carried out by any of the following rules:

Rule 1: (Multiplication of two integers having like signs): The product of two integers having like signs is a positive integer obtained by multiplying their numerical values.

Rule 2: (Multiplication of two integers having unlike signs): The product of two integers having unlike signs is the negative of the integer obtained by multiplying the numerical values of the given integers.

Examples: (i) $(+5)\times(+3)=+(5\times3)=+15$

(ii) $(-6)\times(-4)=+(6\times4)=+24$

(iii) $(-4)\times(+3)=-(4\times3)=-12$

(iv) $(+5)\times(-4)=-(5\times4)=-20$

Properties of Multiplication of Integers:

1. Closure Property for Multiplication of Integers: The product of two integers is always an integer, i.e., $a\in Z, b\in Z\Rightarrow ab\in Z$.
2. Commutative Law for Multiplication of Integers: For any two integers a and b, we have $a\times b=b\times a$
3. Associative Law for Multiplication of Integers: For any three integers a, b and c, we have $(a\times b)\times c=a\times(b\times c)$.
4. Distributive Law of Multiplication over Addition: For any three integers a, b and c, we have $a\times(b+c)=(a\times b)+(a\times c)$.
5. Existence of Multiplicative Identify: The integer 1 is the multiplicative identify for integers. So, for any integer 'a' we have $a\times1=1\times a=a$.
6. Multiplicative property of 0: For any integer 'a' we have $a\times a=0\times a=0$.

IV. **Division of Integers:** The division of integers may be carried out by any of the following rules:

Rule 1: (Division of two integers having like signs): The quotient of two integers having like signs is a positive integer obtained by dividing the numerical value of the dividend with the numerical value of the divisor.

Rule 2: (Division of two integers having unlike signs): The quotient of two integers havingunlike signs is the negative of the integer obtained by dividing the numerical value of the dividend with the numerical value of the divisor.

Example: Divide (i) $+(20)$ by $(+5)$ (ii) (-30) by (-6)

(iii) $(+32)$ by (-8) (iv) (-45) by (9)

Solutions: (i) $(+20)+(+5)=+\left(\frac{20}{5}\right)=+4$ (Using Rule 1)

(ii) $(-30)+(-6)=+\left(\frac{30}{6}\right)=+5$ (Using Rule 1)

(iii) $(+32)+(-8)=-\left(\frac{32}{8}\right)=-4$ (Using Rule 2)

(iv) $(-45)+9=-\left(\frac{45}{9}\right)=-5$ (Using Rule 2)

Properties of Division of Integers:

1. If a and b are integers then $(a+b)$ is not necessarily an integer.

   Example: $4\in Z$ and $8\in Z$. But $\frac{4}{8}\notin Z$.
2. If 'a' is a non-zero integer, then $a\div a=1$
3. If 'a' is a non-zero integer, then $0\div a=0$, but $a\div 0$ is meaningless.
4. If 'a' is any integer, then $a\div 1=a$.
5. For unequal non-zero integers a and b, we have $a\div b\neq b\div a$.
6. For unequal non-zero integers a, b, c we have

   $(a\div b)\div c\neq a\div(b\div c)$ unless $c=1$.

WORK SHEET - 1

SINGLE ANSWER TYPE

1. The absolute value fo -8 is
   1) -8 2) 8 3) 0.8 4)8.1
2. 0 is greater than integer
   1) -ve integer 2) +ve integer 3) any integer 4) None
3. Compare +42 □ +23 is
   1)< 2) > 3) = 4) E
4. The value of $8+|-4|$ is
   1) 4 2)-12 3) 12 4) -4
5. The value of $|-5|-|6|+|-8|$ is
   1) 19 2) -19 3) 7 4) None
6. The absolute value of 0 is
   1) 0 2) 1 3) not determined 4) None
7. The movement of units in the direction of left of zero is
   1)0 2) +ve 3) -ve 4) None
8. Two different natural numbers are such that their product is lessthan their sum, then one of the number must be
   1) 1 2) 2 3) 3 4) None
9. For an integer n, is n^3 if odd, then which of the following statements are true.
   I) n is odd II) n^2 is odd III) n^2 is even
   1) I only 2) II only 3) I and II only 4) I and III only
10. The smallest value of n, for which 2n +1 is not a prime number is
    1) 3 2) 4 3) 5 4) 1

11. The absolute value of x-10 if x is an integer greater than 10
1) x-10 2) x+10 3)10-x 4) -x-10

12 Write the integers -61,-36,3,-3,6,-6 in descending order
1) - 36 > 3 > - 3 > - 61 > 6 > - 6 2) 6 > 3 > - 3 > - 36 > - 6 > - 61
3) 6 > 3 > - 3 > - 6 > - 36 > - 61 4) - 61 > - 36 > - 6 > - 3 > 3 > 6

MULTI ANSWER TYPE

13. If R is an integer, then
1) R^2 is an integer 2) R^3 is an integer
3) 5R is an integer 4) $\frac{1}{R}$ is an integer

14. An integer may be
1) + ve 2) –ve 3) Zero 4) all of these

REASONING ANSWER TYPE

15. *Statement I* : -2 lies to the right of -5 on the number line.
Statement II: If a>b for two integers a lies to the right of b on the number line

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

16. *Statement I* : The absolute value of -1991 is 1991
Statement II: The absolute value of an integer is the numerical value of the integer regardless of its sign

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Absolute value of an integer x is defined by

$$|x| = \begin{cases} x : \text{if } x \text{ is Positive} \\ 0 : \text{if } x \text{ is Zero} \\ -x : \text{if } x \text{ is negative} \end{cases}$$

17. $|-516| =$
1) -516 2) 516 3) ± 516 4)615

18. $|100| + |-30| - |-676| =$
1) 746 2) 806 3) -546 4) -606

19. The absolute value of m is

1) m if m>0 2) m if m<0 3) -m if m>0 4)-m if -m<0

MATRIX MATCHING TYPE

20.

Column-I	**Column-II**
a) Set of integers	1) { 1,2,3,4,..... }
b) Set of positive integers	2) { -1,-2,-3,-4..... }
c) Set of negetive integers	3) { .....-2,-1,0,1,2..... }
d) Set of non-negetive integers	4) { 0,1,2,3,4..... }
	5) { .....-3,-2,-1,0 }

21.

Column-I	**Column-II**
a) Absolute value of -25 is	1) -357
b) $\|357\|$ is greate than	2) -10
c) Absolute value of zero is	3) 25
d) -110 is less than	4) 10
	5) 0

INTEGER ANSWER TYPE

22. In the set of positive integers, the least number is _____

23. Absolute value of $\left|\frac{|25 \times (-4)| - |125 \times (-16)|}{|(-50 \times 2)| + |(-45) \times 2|}\right|$ is _____

WORK SHEET - 2

SINGLE ANSWER TYPE

1. The sum of -373, 20, -3, -5 and 5 is

1)–356 2) 356 3) 406 4) –406

2. For all non-zero integers a, b, c $a \times (b - c) = (a \times b) - (a \times c)$ is the property over]

1) Multiplication 2) Addition 3) Division 4) substraction

3. The value of $(-2) \times (5) \times (-30)$ is

1) 300 2) –300 3) 30 4) –7

4. The quotient of $35, (-7)$is

1) 5 2) –5 3) 7 4) –7

5. The value of $-37 - (-15) - 2$ is

1) 24 2)–24 3) 54 4) –54

6. The value of $(22) \times (-3) \times (-2) \times (-1)$ is

1)28 2) –28 3)132 4)–132

7. The value of $3+(-3)+3+(-3)+$ .....(305 times)

1) 3 2) –3 3) 0 4) None

8. The sum of two integers is -300. If one of them is 60 then the other numbers is

1)360 2)–360 3)240 4)–240

9. The product of two numbers is -180. If one of the numbers is 12. Find the other numbers ?

1) 15 2) –15 3) –192 4) 168

10. $7\{13-\{2-6(6\text{ of }-2)\}\}=$

1) –172 2) 180 3)172 4) 0

11 The sum of two numbers is 40 and their difference is 4. The ratio of the numbers is

1) 11:9 2) 11:18 3)21:19 4) 22:9

12 A number is doubled and the sum of that two numbers is equal to 54. Find the numbers?

1) 9, 18 2) 18, 36 3) 16, 32 4) 16, 28

MULTI ANSWER TYPE

13. If 'a' and 'b' are two integers then

1) a+b is an integer 2) a-b is not an integer

3) $a \times b$ is an integer 4) a, b is an integer

14. For any three integers a, b, c

1) $(a+b)+c=a+(b+c)$ 2) $(a \times b) \times c=a(b \times c)$

3) $(a-b)-c=a-(b-c)$ 4) $(a, b), c \neq a, (b, c)$

REASONING ANSWER TYPE

15. *Statement I* : For any integer x, we have $x+0=0+x=0$.
Statement II: '0' is called identity element under addition for integers.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

16. *Statement I* : The product of negative and positive integer is a negativeinteger.
Statement II: Division by zero is not defined.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

'0' is identity element under addition of integers.
'1' is identity element under multiplication of integers.
For any integer a, additive inverse is -a and multiplicative inverse does not exist in integers.

17. $513627 + 0 = 0 + 513627 =$
1)0 2)513627 3) 1027254 4) -513627

18. $987654321 \times 1 = 1 \times 987654321 =$
1)1 2)987654321 3)0 4)123456789

19. Additive inversse of –9032673908 is
9032673908 2)-9032673908 3)0 4)1

MATRIX MATCHING TYPE

20.

Column-I	**Column-II**
a) $x + y$ =	1) $y - x$
b) $x \times (y \times z)$ =	2) $x + (y + z)$
c) $x - y$ =	3) $y + x$
d) $(x + y) + z$ =	4) $(y - x)$
	5) $(x \times y) \times z$

21.

Column-I	**Column-II**
a) $-51 \times (16 + 13)$	1) $-51 + (16 + 13)$
b) $(-51 + 16) \times 13$	2) $(-51 + 16) - 13$
c) $(-51 + 16) + 13$	3) $(-51) \times 13 + 16 \times 13$
d) $-51 + (16 - 13)$	4) $(-51) \times 16 + (-51) \times 13$
	5) $-51 \times (16 \times 13)$

INTEGER ANSWER TYPE

22. $1 - 1 + 1 - 1 + 1 - 1 +$ .....(101 times) = _____

23. Product of three integers is 139750. And product of two of them is –2150 then the other number is _____

WORK SHEET - 3

SINGLE ANSWER TYPE

1. $(-1)^{19} + (2)^2 + (3)^3 =$
1)31 2)32 3) 30 4) 35

2. $(-3)^5 + (-2)^3 =$
1) -250 2) -251 3)–252 4) –253

3. If $(-2) \times (-2) \times (-2)$..... 101 times is simplified, then the index form is
1) $(-2)^{101}$ 2) 2^{101} 3) $(-2)^{-101}$ 4) $(101)^{-2}$

4. Find the sum of cube of 10 and square of 21

1) 1451 2)1461 3) 1441 4) 1431

5. The value of -8 raised to power of 3

1)512 2) 256 3) –256 4) –512

6. If $48 = 2 \times 2 \times 2 \times 2 \times 3$ then $48 \times 3 \times 3 \times 3$ in power form

1) $2^4 \times 3^4$ 2) $2^4 \times 3$ 3) $2^4 \times 3^3$ 4) $2^3 \times 3^4$

7. The cube of (–16) is

1) 3096 2) –4096 3) –2096 4) –1096

8. If $7 \times 7 \times 7$..... x times $= 7^{70}$ and $8 \times 8 \times 8$.....y times $= 8^{71}$ then x, y are

1)x = 71; y = 70 2) x = 71; y = 71 3) x = 70; y = 71 4)x = 70; y = 70

9. Write $\frac{-27}{512}$ in power notation

1) $\left(\frac{3}{8}\right)^2$ 2) $\left(\frac{3}{8}\right)^3$ 3) $\left(\frac{3}{8}\right)^4$ 4) $\left(\frac{3}{8}\right)^5$

10. Simplify $(3^5 \times 5^2 \times 2^4), 2^3 \times 3^2$

1) $3^3 \times 5^2 \times 2^2$ 2) $3^3 \times 5^2 \times 2$ 3) $5^2 \times 3 \times 2$ 4) $5^2 \times 3^2 \times 2$

11. Simplify $(-2)^4 \times (-4)^2 \times 4^2$

1) 4096 2) 1596 3) 1024 4) 1156

MULTI ANSWER TYPE

12. $(-2) \times (-2) \times (-2) \times (-2) \times (-2) =$

1) $(-2)^5$ 2) $5^{(-2)}$ 3) -2^5 4) $5 \times (-2)$

13. $215 \times 128 = 27520$ then $(-27520), (-215)$

1) 128 2) $|-128|$ 3) 215 4)27520

REASONING ANSWER TYPE

14. *Statement I* : In $(25)^{1000}$, 1000 is called index, and 25 is called base.

Statement II: In a^n, a is called base and n is called index.

1. Both Statements are true, Statement II is the correct explanation of Statement I.

2.Both Statements are true, Statement II is not correct explanation of Statement I.

3.Statement I is true, Statement II is false.

4.Statement I is false, Statement II is true.

15. *Statement I* : The value of -5 raised to the power of 5 is 3125

Statement II: a is raised to the power of m means a^m

1. Both Statements are true, Statement II is the correct explanation of Statement I.

2.Both Statements are true, Statement II is not correct explanation of Statement I.

3.Statement I is true, Statement II is false.

4.Statement I is false, Statement II is true.

COMPREHENSION TYPE

If x is an integer, the procuct x.x.x..... x (n times)= x^n power of a number is means multiplication of a number by itself several times.

16. $11' 11' 11$.....(p times) = 11^{25} then p is

1) 11 2) 25 3) $11' 25$ 4) 25 + 11

17. $(-9)' (-9)' (-9)$.....(99 times) = $(-9)^q$ then q is

1) –9 2) 9 3) 99 4)–99

MATRIX MATCHING TYPE

18.

Column-I	**Column-II**
a) $15^{10} - 15^6$	1) 15^{16}
b) $15^{10}, 15^6$	2) 15^4
c) $15^{10}' 15^6$	3) $-(15^6 - 15^{10})$
d) $15^{10} + 15^6$	4) $15^6 + 15^{10}$
	5) 15^0

19.

Column-I	**Column-II**
a) Second power of -10	1) 10^{100}
b) 100^{th} power of 10	2) 100
c) Product -4 and square of 5	3) –100
d) 10^{th} power of 100	4) 100^{10}
	5) 10^{10}

INTEGER ANSWER TYPE

20. Sumof cube of 3 and square of 9 is ____

21. Quotient of $-(5^{91}' 7^{76}' 3^{13})$ and $-(7^{75}' 5^{90}' 3^{12})$ is _____

KEY

WORK SHEET – 1 (KEY)				
1) 2	**2)** 1	**3)** 2	**4)** 3	**5)** 3
6) 1	**7)** 3	**8)** 1	**9)** 3	**10)** 2
11) 1	**12)** 3	**13)** 1,2,3	**14)** 1,2,3,4	**15)** 1
16) 1	**17)** 2	**18)** 3	**19)** 1	**20)** A-3 B-1 C-2 D-1,4
21) A-3 B-1,2,3,4,5 C-5 D-2,3,4,5	**22)** 1	**23)** 10		

WORK SHEET – 2 (KEY)				
1) 1	**2)** 4	**3)** 1	**4)** 2	**5)** 2
6) 4	**7)** 1	**8)** 2	**9)** 2	**10)** 4
11) 1	**12)** 2	**13)** 1,3	**14)** 1,2,4	**15)** 1
16) 2	**17)** 2	**18)** 2	**19)** 1	**20)** A-3 B-5 C-4 D-2
21) A-4 B-3 C-1 D-2	**22)** 1	**23)** -65		

WORK SHEET – 3 (KEY)				
1) 3	**2)** 2	**3)** 1	**4)** 3	**5)** 4
6) 1	**7)** 2	**8)** 3	**9)** 2	**10)** 2
11) 1	**12)** 1,3	**13)** 1,2	**14)** 1	**15)** 4
16) 1	**17)** 4	**18)** 2	**19)** 3	**20)** A-3 B-2 C-1 D-4
21) A-2 B-1 C-3 D-4	**22)** 108	**23)** 105		

DECIMALS

SYNOPSIS - 1

I. Decimal Fractions: Fractions in which denominators are powers of 10 are known as decimal fractions.

Thus, $\frac{1}{10}=1$ tenth = .1; $\frac{1}{100}=1$ hundred = .01

$\frac{99}{100}=99$ hundredths = .99; $\frac{7}{1000}=7$ thousands = .007, etc.

II. Conversion of a Decimal into Vulgar Fraction: Put 1 in the denominator under the decimal point and annex with it as many zeros as is the number of digits after the decimal point. Now, remove the decimal point and reduce the fraction to its lowest terms.

Thus, $0.25=\frac{25}{100}=\frac{1}{4}; 2.008=\frac{2008}{1000}=\frac{251}{125}$.

III. 1. Annexing zeros to the extreme right of a decimal fraction does not change its value.

Thus, 0.8 = 0.80 = 0.800 etc.

2. If numerator and denominator of a fraction contain the same number of decimal places, then we remove the decimal sign.

Thus, $\frac{1.84}{2.99}=\frac{184}{299}=\frac{8}{13}; \frac{.365}{.584}=\frac{365}{584}=\frac{5}{8}$

IV. Operations on Decimals:

1. Addition and Subtraction of Decimal Fractions: The given numbers are so placed under each other that the decimal points lie in one column. The numbers so arranged can now be added or subtracted in the usual way.

2. $\frac{3}{10}, \frac{43}{100}$ are decimal fractions

3. A decimal has two parts.

e.g. 47.329 47 is integral part

329 is the decimal part

4. Adding zeros to the extreme right of the decimal part of a decimal does not change its value.

e.g. 0.9 = 0.90 = 0.900 = 0.9000

5. Writing decimal in an expanded form

e.g. 375.235 can be written as $375+\frac{2}{10}+\frac{3}{100}+\frac{5}{1000}$.

6. Convert all the given decimals into like decimals and add all the decimals. Put the decimal point directly under the decimal points of the addends.

7. When a decimal point is multiplied by power of 10 then the decimal point is shifted to the right by as many digits as there are zeroes in the multiplier.
   e.g. 98.73 × 10 = 987.3
   e.g. 873.296 × 100 = 87329.6
8. Multiplication of a decimal by a whole number
   e.g. 72.39 × 9 = 651.51
9. Multiplication of a decimal by a decimal.
   e.g. 2.9 × 2.5 = 7.25

WORK SHEET - 1

SINGLE ANSWER TYPE

1. The place value of '6' in the decimal number 4608.53 is
   1) 60 2) 600 3) 6000 4) 6
2. In the decimal number 3527.14, 3527 is called the_____
   1) Integral part 2) Decimal part
   3) Decimal and integral part 4) None
3. In the decimal number 1238.654, the place value of '5' is
   1) 500 2) 50 3) $\frac{5}{10}$ 4) $\frac{5}{100}$
4. The fractions in which the denominators are 10, 100, 1000 etc. are known as
   1) Decimals 2) Whole numbers
   3) Decimal fractions 4) None
5. The decimal part in 6.002 is
   1) 2 2) 0.002 3) 0.2 4) 0.02
6. The short form of $30 + 5 + \frac{4}{10} + \frac{7}{100}$ is
   1) 35.407 2) 34.047 3) 35.47 4) 35.74
7. The decimal number 648.329 in expanded form is
   1) 60 +400 + 8 + 0.3 + 0. 2 + 0.009 2) $600 + 40 + 8 + 3 + \frac{2}{10} + \frac{9}{100}$
   3) $600 + 40 + 8 + \frac{3}{10} + \frac{2}{100} + \frac{9}{1000}$ 4) $600 + 400 + 80 + \frac{3}{10} + \frac{2}{100} + \frac{9}{1000}$
8. Nine hundred and seventy eight is
   1) 97.8 2) 0.978 3) 978 4) 9.78
9. 903 + 0.5 + _____= 903.506
   1) 0.06 2) 0.006 3) 0.0006 4) 0.6
10. "Two ones and 5 – tenths" is
    1) 25 2) 52 3) 0.25 4) 2.5
11. Seventeen point zero five six =
    1) 17.56 2) 175.6 3) 17.056 4) 17.0056

12. Place value of 8 in 63.289 and 15.892 recpectively are

1) $\frac{8}{100},\frac{8}{1000}$ 2) $\frac{8}{100},\frac{8}{10}$ 3) $\frac{8}{10},\frac{8}{1000}$ 4) $\frac{8}{1000},\frac{8}{10000}$

13. 1238.629 is called the _____ form

1) ordinary 2) short
3) both (1) and (2) 4) neither 1nor 2

14. $\frac{168}{1000},\frac{1689}{10000}$ can be written respectively as

1) 16.8, 16.89 2) 0.168, 0.01689
3) 0.168, 0.1689 4) 0.168, 0.001689

15. $15\frac{73}{1000},6\frac{3}{10000}$ can be written respectively as

1) 15.73, 6.3 2) 15.073, 6.03
3) 15.073, 6.0003 4) 15.073, 6.00003

16. Point five eight nine and point two zero two three are respectively represented as

1) 0.589, 0.2032 2) 0.589, 0.2023
3) 0.0589, 0.2032 4) 0.00589, 0.2032

MULTI ANSWER TYPE

17. $\frac{100}{10000}$ can be written as

1) $\frac{1}{100}$ 2) 0.01 3) 0.001 4) 0.00001

18. 86.015 can be written as

1) $86+\frac{15}{1000}$ 2) $86+0.15$ 3) $86+0.015$ 4) $86+\frac{15}{100}$

REASONING ANSWER TYPE

19. *Statement I* : The whole number part in point nine seven is 0

Statement II: The left of decimal point is known as whole number part of a given decimal number.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

20. *Statement I* : $\frac{2}{3}$ is called a decimal fraction

Statement II: The fraction in which the denominators are 10, 100, 1000..... are called decimal fractions

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup-1

A = 158.398, B = 12.4269, C = 14.1698

21. The place value of 9 in decimal represented by A is

1) $\frac{9}{10}$ 2) $\frac{9}{100}$ 3) $\frac{9}{1000}$ 4) $\frac{9}{10000}$

22. The place value of 9 in decimal represented by B is

1) $\frac{9}{100}$ 2) $\frac{9}{1000}$ 3) $\frac{9}{10000}$ 4) $\frac{9}{10}$

23. The place value of 9 in decimal represented by C is

1) 9/100 2) 9/10 3) 9/1000 4) 9/10000

Writeup-2

If x = 23.45 and y = 0.725

24. Expandede form of x is

1) 20 + 3 + 0.4 + 0.5 2)

$20+3+\frac{4}{100}+\frac{5}{100}$

3) $20+3+\frac{4}{10}+\frac{5}{100}$ 4) $20+3+\frac{4}{10}+\frac{5}{10}$

25. Expanded from of y is

1) $700+20+5$ 2) $\frac{7}{100}+\frac{2}{100}+5$

3) $\frac{7}{1000}+\frac{2}{100}+\frac{5}{10}$ 4) $\frac{7}{10}+\frac{2}{100}+\frac{5}{1000}$

26. $20+4+\frac{1}{10}+\frac{7}{100}+\frac{5}{1000}$ is the expanded form of

1) 24.175 2) x + y

3) both (1) and (2) 4) neither (1) nor (2)

MATRIX MATCHING TYPE

27.

Column-I	Column-II
a) Place value of 3 in 12.237	1) 30
b) Place value of 3 in 12.327	2) 3
c) Place value of 3 in 12.273	3) $\frac{3}{100}$
d) Place value of 3 in 13.227	4) $\frac{3}{10}$
	5) $\frac{3}{1000}$

28. The place value chart of a number is given below:

Thou	Hund	Tens	Ones	Decimal Part	Tenths	Hundredths	Thousandths
4	6	9	8	.	5	3	0

Column-I	Column-II
a) The place value of 4 is	1) 90
b) The place value of 9 is	2) 30
c) The place value of 3 is	3) $\frac{3}{100}$
d) The place value of 5 is	4) 4000
	5) 5/10

INTEGER ANSWER TYPE

29. Place value of 1 in 123.658 is _____.
30. 86.0 can be written as _____.

SYNOPSIS - 2

1. **Multiplication of a Decimal Fraction By a power of 10:** Shift the decimal point to the right by as many places as is the power of 10.
   Thus $5.9632\times100=596.32; 0.073\times10000=0.0730\times10000=730$
2. **Multiplication of Decimal Fractions:** Multiply the given numbers considering them without the decimal point. Now, in the product, the decimal point is marked off to obtain as many places of decimal as is the sum of the number of decimal places in the given numbers.
   Suppose we have to find the product $(.2\times.02\times.002)$.
   Now $2\times2\times2=8$. Sum of decimal places = $(1+2+3)=6$
   $\therefore \quad .2\times.02\times.002=.000008$
3. Decimals having same number of decimal places are called like decimals.
   e.g. 2.5, 39.6, 147.5
4. Decimals not having the same number of decimal places are called unlike decimals.
   e.g 2.58, 3.2, 4.789

$\frac{a}{b},\frac{c}{d}$ are two fractions.

5. If a × d > b × c, then $\frac{a}{b} > \frac{c}{d}$
6. If a × d < b × c, then $\frac{a}{b} < \frac{c}{d}$
7. If a × d = b × c, then $\frac{a}{b} = \frac{c}{d}$

   This method is used to compare two fractions.
8. By LCM method we can compare more than two fractions.
9. If $\frac{a}{b}$ and $\frac{c}{d}$ are two fractions, then the fractions $\frac{a+c}{b+d}$ lies between $\frac{a}{b}$ and $\frac{c}{d}$.

   Eg : If we take $\frac{5}{6}$ and $\frac{2}{3}$, then the fraction between them is $\frac{5+2}{6+3} = \frac{7}{9}$

WORK SHEET - 2

SINGLE ANSWER TYPE

1. Which of the following is false?
   1) 4.06 > 4.006 2) 6.87 < 6.807 3) 0.98<1 4) 7.805<7.85
2. 0.23, 6.27, 5.63, 9.01 are called _____ decimals.
   1) complex 2) unlike 3) like 4) Vulgar
3. 0.1, 0.01, 0.001 are called _____ decimals.
   1) complex 2) unlike 3) like 4) vulgar
4. Annexing zeros to the extreme right of the decimals point of a decimal ___its value.
   1) changes 2) does not change
   3) decreases 4) increases
5. If 400 + 60 + 5 + 0.1 + 0.06 + 0.009 is simplified, then the answer is
   1) 465.619 2) 456.619 3) 465.169 4) 465.961
6. Which is the smallest of 18.97, 18.097, 18.079, 18.007 ?
   1) 18.97 2) 18.079 3) 18.097 4) 18.007
7. The largest decimal of 48.63, 48.063, 48.36, 48.603 is
   1) 48.63 2) 48.603 3) 48.063 4) 48.36
8. Which of the following are like decimals?
   1) 6.73, 12.08 2) 50.7, 14.09 3) 549.02,54.023 4) 49.71, 49.7
9. If $40+1+\frac{6}{10}+\frac{3}{1000}+\frac{9}{10000}$ is expressed in decimal form, then the answer is
   1) 41.639 2) 41.66309 3) 41.6039 4) 41.006039
10. 0.47, 0.047, 0.0047, 0.00047 are in _____ order
    1) descending 2) ascending 3) irregular 4) none
11. 0.00063, 0.0063, 0.063, 0.63 are in _____ order
    1) descending 2) ascending 3) irregular 4) none

12. The decimals 2.2, 2.02, 0.22, 0.02, 0.202, 2.002 in ascending order is
1) 0.02 < 0.202 <0.22<2.02<2.002<2.2 2) 0.02<0.202<2.02<0.22<2.002<2.2
3 0.02<0.202<0.22<2.002<2.02<2.2 4) 0.02<2.02<0.22<2.002<0.202<2.2

13. If A = 5.39, B = 5.039 and C = 5.9304 then which of the following is true?
1) C > A 2) B < A 3) B < C 4) all of these

14. If A = $14+\frac{9}{100}+\frac{8}{1000}$, B = $14+\frac{9}{10}+\frac{8}{100}+\frac{6}{1000}$,

C = $14+\frac{9}{100}+\frac{8}{1000}+\frac{2}{10000}$, then the larger one is
1) A 2) B 3) C 4) none

15. The fractions $\frac{3}{5},\frac{4}{7},\frac{8}{9}$ and $\frac{9}{11}$ in their descending order is

1) $\frac{8}{9}>\frac{9}{11}>\frac{3}{5}>\frac{4}{7}$ 2) $\frac{9}{11}>\frac{3}{5}>\frac{4}{7}>\frac{8}{9}$

3) $\frac{3}{5}>\frac{9}{11}>\frac{8}{9}>\frac{4}{7}$ 4) $\frac{8}{9}>\frac{4}{7}>\frac{9}{11}>\frac{3}{5}$

16. If $4\times10^3+5\times10^2+6\times10+8\times\frac{1}{10}+9\times\frac{1}{100}+\frac{8}{1000}$ is simplified, then the answer is
1) 4560.898 2) 456.898 3) 45600.898 4) 4560.8098

17. The fractions $\frac{5}{8},\frac{7}{12},\frac{13}{16},\frac{16}{29}$ and $\frac{3}{4}$ in ascending order is 1)

$\frac{16}{28}<\frac{7}{10}<\frac{5}{8}<\frac{3}{4}<\frac{13}{16}$ 2) $\frac{16}{29}<\frac{7}{12}<\frac{5}{8}<\frac{3}{4}<\frac{13}{16}$

3) $\frac{16}{29}<\frac{5}{8}<\frac{7}{12}<\frac{13}{16}<\frac{3}{4}$ 4) $\frac{7}{12}<\frac{5}{12}<\frac{16}{29}<\frac{3}{4}<\frac{13}{16}$

18. If 13.48, 0.189, 9.7, 8.23 are converted into like decimals, then 9.7 becomes
1) 9.7000 2) 9.700 3) 9.70 4) 9.7000

MULTI ANSWER TYPE

19. 5.307 is greater than
1) 5.703 2) 5.370 3) 5.073 4) 5.037

20. If A = 12.52 then its like decimals are
1) 0.8 2) 3.25 3) 13.25 4) 12.552

REASONING ANSWER TYPE

21. *Statement I* : 2.75 = 2.750 = 2.7500

Statement II: On putting any number of zeros to the extreme right side of the decimal part of a decimal, does not change the value of the decimal.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

22. *Statement I* : If A = $3\times10^3+7\times10^2+5\times10^1+\frac{8}{100}+\frac{9}{1000}+\frac{3}{10000}$ and

B = $3\times10^3+7\times10^2+5\times10^0+\frac{8}{10}+\frac{9}{100}+\frac{3}{1000}+\frac{5}{10000}$, then A =B

Statement II: A decimal has two parts- whole number part and decimal part.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup-1

A = 4.639, B = 4.638, C = 4.6372, D = 4.9

23. Which are like decimals?
    1) A 2) B 3) C 4) both 1 & 2
24. Which are unlike decimals?
    1) A, B 2) B, C 3) A, D 4) both 2 & 3
25. Which is the largest of all the decimals
    1) A 2) D 3) C 4) B

Writeup-2

If A = $\frac{14}{70}$, B = $\frac{28}{70}$, C = $\frac{1}{25}$ and D = $\frac{3}{20}$

26. The ascending order of given is
    1) A, B, C, D 2) C, D, A, B 3) D, A, B, C 4) C, A, D, B
27. The greatest of all the given is
    1) D 2) C 3) B 4) A
28. The smallest of all the given is
    1) D 2) C 3) B 4) A

MATRIX MATCHING TYPE

29.

Column-I	Column-II
a) Number of decimal places of 12.38	1) 2
b) Number of decimal places of 1321.28	2) 1
c) Number of decimal places of 281.238	3) 3
d) Number of decimal places of 8.231	4) 4
	5) 5

30.

Column-I	Column-II
a) 3.03, 3.30, 33.03	1) Like decimals
b) 213.6, 64.2, 33.5	2) Unlike decimals
c) 0.1, 0.01, 0.001	3) Are in descending order
d) 13.48, 0.189, 9.7, 8.23	4) Are in ascending order
	5) Cannot be composed

INTEGER ANSWER TYPE

31. The digits in decimal part of 286 is _____

32. The digits in decimals part of $\frac{365}{80}$ is _____

SYNOPSIS - 3

1. When a given decimal without decimal point as divided by powers of 10. The answer obtained is as follows.

   a) $\frac{72963}{10000} = 7.2963$ b) $\frac{72896}{1000} = 72.896$ c) $\frac{68342}{1000} = 68.342$

2. When we convert a fraction into a decimal, if we obtain a zero remainder, then the decimal is a terminating decimal.
3. In recurring decimals a set of digits in the decimal part is repeated continuously.
4. A decimal in which all the digits in the decimal part are repeated is called a pure-recurring decimal. e.g : $0.\overline{4}$.
5. A decimal in which some of the digits in the decimal part are repeated and the rest are not repeated is called a mixed recurring decimal.
   e.g : $0.7\overline{2}$.
6. Converting $0.\overline{6}$ into a vulgar fraction.

   $0.\overline{6} = 0.666...$

   let $x = 0.\overline{6} \Rightarrow x = 0.666.....$

   $10 \times x = 6.6666...$

   $10x = 6.6666...$

   $x = 0.6666...$

   $9x = 6$

   $\therefore x = \frac{6}{9}$

WORK SHEET - 3

SINGLE ANSWER TYPE

1. If $\frac{2}{3}$ is expressed as nonterminating decimal, then the answer is

   1) $0.\overline{6}$ 2) $0.\overline{67}$ 3) $0.\overline{68}$ 4) $0.\overline{69}$

2. If $\frac{15}{8}$ is expressed as terminating decimal, then the answer is

   1) 1.879 2) 1.878 3) 1.876 4) 1.875

3. A rational number is a number of the form $\frac{a}{b}$ where 'a' and 'b' are__, &_

   1) whole numbers, $b \neq 0$ 2) intergers, b = 0

   3) whole numbers, b = 0 4) intergers, $b \neq 0$

4. Every rational number can be expressed as

   1) A nonterminating decimal 2) a terminating decimal

   3) non terminating but repeating 4) both (2) and (3)

5. 0.487636363..... can be represented as

   1) $0.\overline{48763}$ 2) $0.4\overline{8763}$ 3) $0.48\overline{763}$ 4) $0.487\overline{63}$

6. Non terminating repeating decimals are called _____ decimals.

   1) recurring 2) periodic 3) both 1 & 2 4) none

7. $\frac{-33}{80}$ in decimal form is

   1) 0.4125 2) –0.4225 3) –0.4125 4) –0.4325

8. $\frac{24}{7}$ is a _____ decimal

   1) terminating 2) non - terminating 3) whole number 4) none

9. If A = 5/10 and B = 13/4, then the decimal forms

   1) 0.05; 3.25 2) 0.5; 3.025 3) 0.5; 3.25 4) 0.55; 0.325

10. The period in $8.34\overline{7215}$ is

    1) 3 2) 6 3) 5 4) 4

11. $4\frac{3}{25}$ in decimal form is

    1) 4.15 2) 4.25 3) 4.12 4) 4.18

12. If $\frac{146}{25}$ is expressed as terminating decimal, then the answer is

    1) 5.82 2) 5.84 3) 5.86 4) 5.88

13. If $\frac{15277}{2000}$ is expressed as decimal, then the answer is

1) 7.6285 2) 7.6485 3) 7.6385 4) 7.6185

14. If $\frac{100019}{25000}$ is expressed as decimal, then the answer is

1) 4.0076 2) 4.076 3) 4.000076 4) 4.00076

MULTI ANSWER TYPE

15. 0.3125 can be expressed as

1) $\frac{3125}{10000}$ 2) $\frac{5}{16}$ 3) $\frac{5}{32}$ 4) $\frac{3125}{1000}$

16. If $\frac{7}{15} = 0.4\overline{6}$ then which of the following is/are true?

1) period = 6 2) periodicity = 1 3) Period = 46 4) Periodicity = 2

REASONING ANSWER TYPE

17. *Statement I* : $\frac{0.15}{80}$ is a terminating decimal.

Statement II: Only that fraction in simplest form that has a denominator having the prime factor only 2, only 5 or both 2 and 5 can be represented by a terminating decimal.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

18. *Statement I* : $\frac{52}{15}$ can be expressed as a pure repeating decimal

Statement II: If all digits after the decimal are repeating medingly such a decimal is called “pure repeating decimal”.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup-1

If $A=\frac{103}{111}; B=\frac{1187503}{62500}; C=\frac{629}{125}$, then

19. A is a _____
    1) terminating
    2) non - terminating recurring
    3) non - terminating non - recurring
    4) none

20. B is a _____
    1) terminating
    2) non - terminating recurring
    3) non - terminating non - recurring
    4) none

21. The decimal form of C is
    1) 5.32 2) 5.0032 3) 5.032 4) 5.00032

Writeup-2

If $P=\frac{1}{3}$ and $Q=\frac{3}{11}$ then

22. Sum of P and Q is
    1) 0.1010... 2) 0.6060... 3) 0.3737... 4) 0.2323...

23. Difference between P and Q is
    1) 0.0101... 2) 0.0606... 3) 0.0303... 4) 0.0707...

24. (P + Q) + (P – Q) is
    1) 0.111... 2) 0.666... 3) 0.444... 4) 0.333...

MATRIX MATCHING TYPE

25.

Column-I	**Column-II**
a) Rational number	1) 0
b) Repeating decimal	2) 0.1412413...
c) Terminating decimal	3) 0.25
d) Not a rational number	4) 0.252525...
	5) $0.2\overline{75}$

26.

Column-I	**Column-II**
a) $3.4\overline{6}$	1) Pure repeating decimal
b) $0.\overline{90}$	2) Terminating decimal
c) 0.625	3) Non terminating repeating decimal
d) 0.23794	4) Mixed repeating decimal
	5) Non terminating non repeating decimal

INTEGER ANSWER TYPE

27. The integral part of 48.392 is _____

28. The period of 0.909090... is _____

SYNOPSIS - 4

I. 'BODMAS' Rule: Theis rule depicts the correct sequence in which the operations are to be executed, so as to find out the value of a given expression.
Here 'B' stands for 'Bracket', 'O' for 'of', 'D' for 'Division', 'M' for 'Multiplication', 'A' for 'Addition' and 'S' 'Substraction'.
Thus, in simplifying an expression, first of all the brakets must be removed, strictly in the order ( ), { } and [ ].
After removing the brackets, we must use the following operations strictly in the order:
(i) of (ii) Division (iii) Multiplication (iv) Addition (v) Subtraction

II. Virnaculum (or Bar): When an expression contains Virnaculum, before applying the 'BODMAS' rule, we simplify the expression under the Virnaculum.

WORK SHEET - 4

SINGLE ANSWER TYPE

1. If 2/3 of 48 is simplified, then the answer is
1) 36 2) 32 3) 30 4) 38

2. 4/5 of Re. 1 is
1) 60p 2) 90p 3) 80p 4) 75p

3. $\frac{7}{9}$ of 36 km is
1) 26 km 2) 27 km 3) 28 km 4) 29 km

4. $\frac{5}{3}$ of 2 hours equals
1) 200 hrs 2) 200 mts 3) 200 seconds 4) 300 mts

5. If $\frac{5}{13}$ of $19\frac{1}{2}$ is simplified, then the answer is
1) $7\frac{1}{3}$ 2) $7\frac{1}{4}$ 3) $7\frac{1}{2}$ 4) $7\frac{1}{4}$

6. If $1\frac{2}{7}$ of $\frac{28}{63}$ is simplified, then the answer is
1) 4/7 2) 7/4 3) 9/4 4) 4/9

7. $1\frac{1}{2} \div \frac{2}{3}$ equals
1) $\frac{4}{9}$ 2) $\frac{9}{4}$ 3) $2\frac{1}{4}$ 4) both 2 & 3

8. If $\frac{2}{5}$ of 1 metre is added to 3 metres, then the total length is

1) 3.4 m 2) 3.6 m 3) 3.5 m 4) 3.2 m

9. If $\frac{2}{3}$ of 6km is subtracted from 23km, then the answer is

1) 17km 2) 18km 3) 19km 4) 20km

10. $\frac{2}{9}$ of $15+\frac{3}{4}=$

1) $\frac{12}{49}$ 2) $\frac{49}{12}$ 3) $\frac{46}{15}$ 4) $\frac{47}{12}$

11. If $1\frac{2}{3}\div\frac{5}{6}$ of $\frac{24}{25}$ is simplified, then the result is

1) $2\frac{2}{12}$ 2) $2\frac{3}{12}$ 3) $2\frac{1}{12}$ 4) $2\frac{4}{12}$

12. If $\frac{1}{3}$ of $4\frac{2}{3}\div2\frac{1}{3}\times1\frac{1}{2}]$ is simplified, then the result is

1) 1 2) 2 3) 0 4) – 1

13. If x = $1\frac{2}{5}$ of $3\frac{1}{3}$ and y = $\frac{24}{42}$ of x, then x ÷ y is

1) 7/4 2) 7/3 3) 7/2 4) 7/8

14. If Ramesh spends $\frac{3}{8}^{th}$ of the day in library, $\frac{1}{3}^{rd}$ of the day at school, then the number of hours he was left with in a day is

1) 8 hours 2) 9 hours 3) 7 hours 4) 6 hours

15. $5\frac{1}{2}$ of $\left(\frac{2}{3}-\frac{3}{5}\right)+\frac{1}{2}\div\frac{5}{11}$

1) $1\frac{6}{15}$ 2) $1\frac{5}{15}$ 3) $1\frac{8}{15}$ 4) $1\frac{7}{15}$

MULTI ANSWER TYPE

16. If $4\frac{4}{5}\div\frac{3}{5}$ of 5 + $\frac{4}{5}\times\frac{3}{10}-\frac{1}{5}$ is simplified, then the result is

1) $1\frac{16}{25}$ 2) $1\frac{17}{25}$ 3) $\frac{41}{25}$ 4) $\frac{42}{25}$

17. If $\frac{3}{4}$ of 12 km is travelled in 1 hour, then the distance travelled in $4\frac{1}{2}$ hrs is

1) 40.5km 2) $40\frac{1}{2}$km 3) 40,500m 4) 40.05m

REASONING ANSWER TYPE

18 *Statement I* : $\frac{7}{5}$ of $\left(\frac{2}{3}+\frac{7}{12}\right)\div\left(\frac{5}{6}-\frac{3}{5}\right)=2\frac{1}{2}$

Statement II: In BODMAS rule, the order of operations used while simplifying a numerical expression is (i) bracket (ii) of (iii) division (iv) multiplication (v) addition (vi) subtraction

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup-1

x =2/3+3/4 and y = 5/6–3/5

19. The value of x in
1) 17/12 2) 17/30 3) 17/6 4) 17/4

20. The value of y is
1) 17/12 2) 17/30 3) 7/12 4) 7/30

21. The value of (x + y) of x is
1) $\frac{187}{80}$ 2) $\frac{197}{80}$ 3) $\frac{177}{80}$ 4) $\frac{167}{80}$

Writeup-2

$1\frac{1}{3}\div\frac{3}{7}$ of $2\frac{5}{8}+1\frac{1}{9}=x$

22. If $x\times\frac{9}{93}=y$, then the value of y is
1) 1/9 2) 3/9 3) 2/9 4) 5/9

23. If $y\div\frac{7}{81}=z$, then the value of z is
1) $2\frac{4}{7}$ 2) $2\frac{3}{7}$ 3) $2\frac{5}{7}$ 4) $2\frac{1}{7}$

24. If z of $\frac{49}{36}=A$ is simplified, then the answer of A is
1) 7/3 2) 2/7 3) 7/2 4) 7/4

MATRIX MATCHING TYPE

25.

Column-I	**Column-II**
a) 3/8 of 48	1) 18
b) $\frac{4}{9} \div \frac{2}{81}$	2) $\frac{12}{15}$
c) $\frac{4}{7}$ of $(49) - 6$	3) $\frac{16}{15}$
d) $\left(\frac{1}{3} + \frac{4}{5}\right) - \frac{1}{15}$	4) 22
	5) 10

26.

Column-I	**Column-II**
a) $3\frac{1}{3} \times 2\frac{1}{4} \div \left(\frac{2}{4} + 1\frac{3}{4}\right)$	1) $\frac{1}{4}$
b) $\left(5 \div 3\frac{1}{3}\right)\frac{4}{15} \times \left(\frac{25}{4} \div 10\right)$	2) $1\frac{4}{7}$
c) $12\frac{1}{2}$ of $\left(\frac{3}{5} - \frac{2}{7}\right) \times \frac{2}{5}$	3) $\frac{10}{3}$
d) $\left(7 - 1\frac{1}{2} - 3\frac{1}{4}\right)$ of $\left(\frac{3}{4} \div \frac{9}{8}\right)$	4) $3\frac{1}{3}$
	5) $\frac{3}{2}$

INTEGER ANSWER TYPE

27. $\frac{1}{3}$ of $4\frac{2}{3} \div 2\frac{1}{3} \times 1\frac{1}{2} =$ _____

28. If $\frac{3}{4}$ of 32 chocolates were sold then the number of chocolates left unsold are _____.

WORK SHEET – 1 (KEY)				
1) 2	**2)** 1	**3)** 4	**4)** 3	**5)** 2
6) 3	**7)** 3	**8)** 3	**9)** 2	**10)** 2
11) 3	**12)** 2	**13)** 3	**14)** 3	**15)** 3
16) 2	**17)** 1,2	**18)** 1,3	**19)** 1	**20)** 1
21) 2	**22)** 3	**23)** 3	**24)** 3	**25)** 4
26) 3	**27)** A-3 B-5 C-4 D-2	**28)** A-4 B-1 C-3 D-5	**29)** 100	**30)** 86

WORK SHEET – 2 (KEY)				
1) 2	**2)** 3	**3)** 2	**4)** 2	**5)** 3
6) 4	**7)** 1	**8)** 1	**9)** 3	**10)** 1
11) 2	**12)** 3	**13)** 4	**14)** 2	**15)** 1
16) 1	**17)** 2	**18)** 2	**19)** 3,4	**20)** 2,3
21) 1	**22)** 3	**23)** 4	**24)** 4	**25)** 1
26) 2	**27)** 3	**28)** 2	**29)** A-1 B-1 C-3 D-3	**30)** A-1,4 B-1,3 C-2,3 D-2
31) 0	**32)** 5625			

WORK SHEET – 3 (KEY)				
1) 1	**2)** 4	**3)** 4	**4)** 4	**5)** 4
6) 3	**7)** 3	**8)** 2	**9)** 3	**10)** 4
11) 3	**12)** 2	**13)** 3	**14)** 4	**15)** 1,2
16) 1,2	**17)** 1	**18)** 4	**19)** 2	**20)** 1
21) 3	**22)** 2	**23)** 2	**24)** 2	**25)** A-1,3,4,5 B-4,5 C-3 D-2
26) A-3,4 B-1,3 C-2 D-5	**27)** 48	**28)** 90		

WORK SHEET – 4 (KEY)				
1) 2	**2)** 3	**3)** 3	**4)** 2	**5)** 3
6) 1	**7)** 2,3	**8)** 1	**9)** 3	**10)** 2
11) 3	**12)** 1	**13)** 3	**14)** 3	**15)** 4
16) 1,3	**17)** 2	**18)** 1	**19)** 1	**20)** 4
21) 1	**22)** 3	**23)** 1	**24)** 3	**25)** A-1 B-1 C-4 D-3
26) A-3,4 B-1 C-2 D-5	**27)** 1	**28)** 8		

ALGEBRA

SYNOPSIS - 1

ALGEBRAIC EXPRESSIONS

FUNDAMENTAL CONCEPTS

There are two types of symbols in algebra:

(i) Constants: A symbol having a fixed numerical value is called a constant.

Thus, each of the symbols $3, -2, \frac{5}{9}$, 0.6 is a constant.

In fact, every number is a constant.

(ii) Variables: Consider the following example.

Example: We know that the perimeter of a square is given by the formula, $p = 4 \times s$

Here 4 is a constant.

When s = 3, then $p = 4 \times s$

When $s = 5$, then $p = 4 \times 5 = 20$

Thus, the values of p and s are not fixed, they vary.

A symbol which takes on various numerical values is called a variable or a literal.

In the above example, s and p are literals or variables.

OPERATIONS ON NUMBERS AND LITERALS

We shall denote the lieterals by a, b, c, x, y, z, m, n etc.

1. Addition:

(i) The sum of x and 8 is $x+8$ (ii) The sum of x and y is $x+y$

(iii) For any literals, a, b, c we have

I. $a+b=b+a$ II. $a+0=0+a$ III. $(a+b)+c=a(b+c)$

2. Subtraction:

(i) 6 less than x is $x-6$ (ii) y less than x is $x-y$.

3. Multiplication:

(i) 7 times x is $7 \times x$, written as $7x$ (ii) The product of x and y is xy

(iii) For any literals, a, b, c we have

I. $ab=ba$ II. $a \times 0 = 0 \times a = 0$

III. $(ab)c = a(bc)$ IV. $a(b+c) = ab+ac$

4. Division:

(i) 5 divided by x is written as $\frac{5}{x}$ (ii) x divided by 6 is written as $\frac{x}{6}$

(iii) x divided by y is written as $\frac{x}{y}$

Algebraic Expression:

A combination of constants and variables, connected by the symbols +, -, × and ÷ is called an algebraic expression.

Example: $5x+6y+2xy$ is an algebraic expression.

Terms: The several parts of an expression separated by the sign + or - are called the terms of the expression.

Examples:

(i) The expression $2x-5y+3xyz$ has three terms, namely $+2x, -5y$ and $+3xyz$

(ii) The expression $a^2b-2ab^3+5b^2a-8$ has four terms, namely $+a^2b-2ab^3$, $+5b^2a$ and -8

(iii) The expression abc has only one term.

Various Types of Algebraic Expressions

i. Monomials: An algebraic expression which contains only one term is called a monomial.

Examples: Each one of the expressions $5x, 9xy, 8a^2bc, -2z^3, 6, \frac{5}{x}$ is a monomial.

ii. Binomials: An algebraic expression which contains two terms is called a binomial.

Examples: Each one of the expressions $5+2x, 1-3xyz, x^2+a^2, a+\frac{1}{a}$ is a.

iii. Trinomials: An algebraic expression which contains three terms is called a trinomial.

Examples: Each one of the expressions $2x+3y-4z, 5-a-bc, a^2+b^2-2ab$ is a trinomial.

iv. Multinomials: An algebraic expression containing two or more terms is called a multinomial.

Factors of a Term:

When numbers and literals are multiplied to form a product, then each quantity multiplied is called a factor of the product.

A constant factor is called a numerical factor while a variable factor is called a literal factor.

Examples: (i) In $7ab$, the numerical factor is 7 and the literal factors are a, b and ab.

(ii) In $-9x^2y$, the numerical factor is -9 and the literal factors are x, x^2, y, xy and x^2y.

Constant Term:

A term of the expression having no literal factor is called the constant term.

Examples: (i) In the expression $3x-4y+2$, the constant term is 2.

(ii) In the expression $a^2+b^2-3ab-5$ the constant term is -5

Coefficients:

Any of the factors of a term is called the coefficient of the product of other factors. In particular, the constant part is called the numerical cvoefficient of the term and the remaining part is called the literal coefficient of the term.

Examples:

In the term $-2xyz^2$:

Numerrical coefficient $=-2$;

Literal coefficient $=xyz^2$;

Coefficient of $x=-2yz^2$;

Coefficient of $y=-2xz^2$.

Coefficient of $z^2=-2xy$ etc.

Like Terms:

Two terms having csame literal factors are known as like terms. Otherwise, they are known as unlike terms.

Examples: (i) $3xy,-5xy$ are like terms.

(ii) $2a^2b,3ab^2$ are unlike terms.

(iii) $6ab^2,9b^2a$ are like terms [Since $ab^2=b^2a$].

Polynomials:

An algebraic expression in which the powers of the variables involved are non-negative integers, is called a polynomial.

The highest power of the gvariable in a polynomial is called its degree.

Examples:

(i) $3x+7$ is a polynomial in x of degree 1.

(ii) $2y^2-5y+1$is a polynomial in y of degree 2.

(iii) z^3+4z^2+3z-6 is a polynomial in z of degree 3.

(iv) $x+\frac{1}{x}$ is not a polynomial, since $\frac{1}{x}=x^{-1}$, i.e., power of x is negative integer.

Note that $x+\frac{1}{x}$is a binomial expression but it is not a polynomial.

Polynomials in Two or More Variables:

An algebraic expression involving two or more variables with non-negative integral power is called a polynomial in these variables.

The degree of any term of a polynomial is the sum of the powers of all the variables in that term.

The degree of the highest degree term in a polynomial is called the degree of the polynomial.

Examples:

i. $x+y+xy$ is a polynomial in x and y whose terms are of degree 1, 1 and 2 respectively. So, it is a polynomial of degree 2.

ii. $a^2b+ab^2+3ab+5$ is a polynomial in a and b whose terms are of degree 3, 3, 2 and 0 respectively. So, it is a polynomial of degree 3.

iii. $y+z$ is a polynomial in y and z whose terms are of degree 1 and 1 respectively. So, it is a polynomial of degree 1.

Zero Value: The values which are satisfying the given polynomial.

Example: $f(x)=x+3$. -3 is zero value of $f(x)$.

WORK SHEET - 1

SINGLE ANSWER TYPE

1. The value of the expression $\frac{n^2}{2}+\frac{n}{2}$ when n = 12 is

   1) 76 2) 74 3) 78 4) 72

2. If $\frac{7x}{3}-\frac{7}{6}$ is a polynomial, then the zero of the polynomial is

   1) $\frac{1}{2}$ 2) $-\frac{1}{2}$ 3) 0 4) – 2

3. If the zero of the polynomial in 'x' is $-\frac{5}{4}$, then the polynomial is

   1) 4x – 5 2) 5x – 4 3) 5x + 4 4) 4x + 5

4. If A = $-8x^2-6x+10$, then its value when 'x' $=\frac{1}{2}$ is

   1) 6 2) 4 3) 5 4) 7

5. The third degree polynomial among the following is

   1) $2x^{3-1}+3x^{2-1}+5$ 2) $3x^{4-1}+2x^{3-1}+6x^{2-1}+8$

   3) $3x^{-2-1}+4x^{-2}+5$ 4) $2x^{5-3}+3x^{4-3}+7$

6. Among the following the expression which is not a monomial is

   1) $\frac{4a^3b^2c^5}{23}$ 2) $-147\,x^3y^2$ 3) $\frac{2}{7}x^{-2}y^5z$ 4) $x^3y^5z^{12}$

7. If $x=\frac{a}{2}$, then the value of $4x^2+8x+18$ is

   1) a^2+2a+8 2) $a^2+3a+18$ 3) $a^2+4a+18$ 4) $a^2+5a+18$

8. The value of the expression $\frac{-26}{3}-\frac{13x}{27}$ when $x=\frac{9}{13}$ is

1) – 8 2) – 10 3) – 9 4) – 11

9. Degree of the polynomial $p + q\,x^m + rx^{m+2} + 5x^{m+3} + x^{m+4}$ is

1) m 2) m + 2 3) m + 3 4) m+ 4

10. If $\frac{n(n+1)(2n+1)}{6}$ represents sum of the squares of first 'n' natural numbers, then its value when n = 10 is

1) 365 2) 375 3) 395 4) 385

11. Degree of the polynomial $\frac{1}{2}x^5+3x^4+2x^3+3x^2+6$ is

1) 4 2) 3 3) 5 4) 2

12. Degree of the monomial $\frac{3}{5}x^2y^6z^7$ is

1) 15 2) 9 3) 8 4) 13

13. In a polynomial 3x + 5 where x = a + 2, then its value when a = 8 is

1) 25 2) 45 3) 35 4) 40

MULTI ANSWER TYPE

14. Which of the following is/are true?

1) The coefficient of 'x' in 9xy is –9y 2) The coefficient of 'a' in –7abc is –7bc

3) The coefficient of 'xyz' in –xyz is –1 4) The coefficient of 'b' in –abc is –ac

15. In $6x^2y + 5xy^2 - 8xy^2 - 7yx^2$, like terms are

1) $6x^2y, -7x^2y$ 2) $5xy^2, -8xy^2$ 3) $6x^2y, -5xy^2$ 4) $-7yx^2, 8xy^2$

16. Which of the following is/are false?

a) 3 more than a number 'x' is x + 3

b) One third of the sum of x and y is (x + y)/3

c) The quotient of x by y added to the product of x and y is (x + y)+ x/y

d) 5 less than the quotient of x by y is (x/y) + 5

17. a) The degree of $x^2 + xy^2 + y^3$ is 3 b) The degree of $m^2n^3 + mn^2 + 4$ is 5

c) The degree of $p^2q^2 + pq^2 + 1$ is 4

which of the above is/are true?

1) a 2) b 3) c 4) all of these

18. Which of the following statement is/are false?

a) $x^3-\frac{1}{x^3}+3x^2-\frac{3}{x^2}+8$ is a polynomial.

b) $p^3+p^2q-\frac{4p}{q}+8$ is a polynomial.

c) $a^3+b^3+c^3-abc$ is a polynomial.

1) a 2) b 3) c 4) both 1 & 2

19. The degree of the polynomial $2x^{3^2\times2^3} + 3x^{4^2\times3^2} + 5x^{4^2\times3^2} + 5x^{4^2\times2^3}$ is
1) 12^2 2) 146 3) 144 4) 148

20. If $A = \frac{1}{2}(m+n)p$ where m = 12.25, n= 108.35, p = 3.5, then the value of A is less than
1) 211.05 2) 211.50 3) 211.00 4) 211.105

21. If a = 1 and b = $\frac{1}{2}$, then the value of $(25a^4b)\times-(-2a^2b^2)\times(-2.1a^3b^3)$ is
1) 131/32 2) – 105/32 3) 128/17 4) –105/64

22. If a = 7, b = 5, then the value of (a + b) (a + b) – (a – b) (a – b) + ($a^2 - b^2$)
1) 41×2^3 2) 41×2 3) 41×2^2 4) 41×2^4

REASONING ANSWER TYPE

23. *Statement I :* The value of $(a + b)^2 + (a – b)^2 + (a^2 – b^2)$ when a = 3, b = 2 is 30
Statement II : $(a + b)^2 = a^2 + b^2 + 2ab$, $(a – b)^2 = a^2 + b^2 – 2ab$, $a^2 – b^2 = (a + b) (a – b)$
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

24. *Statement I :* If 10 oranges are taken out from a basket containing 'x' oranges and added to another basket containing y + 20 oranges, then the total number of oranges in the two baskets is x + y + 30.
Statement II : The sum of 'p' and 10 is subtracted from sum of 5 more than 4 times 'q' and 'r', then the resultant is (4q + r) – (p + 5)
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

25. *Statement I :* If A = $4x^{2m}y^{4n}z^{3p}$ where 2m = 4n = 3p = 24, then the degree of polynomial A is 74.
Statement II : In case of polynomials in more than one variable the sum of the power of the variable in each term is taken and the highest sum is the degree of the polynomial.
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

26. *Statement I :* $2m^2n, -4nm^2, \frac{-8}{3}m^2n$ are like terms.

Statement II : Monomials having different literal factors are like terms.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

27. *Statement I :* The value of $(5a^6) \times (-10ab^2) \times (-2.1a^2b^3)$ when a = 1, b = 1/2 is 105/32.

Statement II : The value of an expression depends on the given values of the variable.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

28. *Statement I :* If x = 2, y = – 2 and z = 3, then $x^2 + y^2 + z^2 - 2xy - 2yz - 2zx = 25$

Statement II : If p = 3, q = – 5 and r = 4, the $p^2 + q^2 + r^2 - pq - qr - pr = 73$

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup-1:

If $A = 18x^3y^2z^4$, $B = 12x^2y^3z^3$, $C = x^4y^3$

29. a) A × C in simplified form is $18x^7y^7z^7$
b) A × C in simplified form is $18x^6y^7z^3$
Which of the following is/are true?
1) a 2) b 3) both (1) & (2) 4) none

30. B × C in product form is
1) $12x^6y^6z^3$ 2) $-12x^6y^6z^3$ 3) $12x^5y^5z^3$ 4) $12x^6y^5z^3$

31. A × B × C in product form is
1) $216x^9y^8z^7$ 2) $216x^8y^9z^7$ 3) $216x^7y^8z^7$ 4) $216x^9y^8z^6$

Writeup-2:

$A = 6a^{p+2} + 5a^{2p+3} + 7a^{3p+4}$ and $B = 4b^{q+3} + 5b^{3q+2} + 8b^{4q+3}$ where p = 2, q = 3

32. The degree of polynomial A is
1) 10 2) 7 3) 6 4) 11

33. The degree of polynomial B is
1) 10 2) 15 3) 11 4) 12

34. Which polynomial has higher degree?
1) A 2) B 3) both 1 & 2 4) none

Writeup-3:

(i) An algebraic expression of the form $a + bx + cx^2 + dx^3 + \ldots\ldots$ where a, b, c, d etc are constants is a polynomial in one variable. Here the highest power of x is the degree of the polynomial.

(ii) An algebraic expression in two or more variables is a polynomial if every variable is a polynomial if every variable in it has only positive integral powers. Here the sum of the variables in each term is taken and the highestsum is the degree of the polynomial.

35. Which of the following is a polynomial in one variable ?

1) $x^3 - \frac{1}{x^3}$ 2) $x^{-3} + 2$ 3) $\frac{y^3}{x}$ 4) $\frac{4}{7}t - t$

36. The degree of the Polynomial $\frac{3}{5}x^2 - \frac{5}{4}x + \frac{2}{3}$ is _____.

1) 3/5 2) 2 3) 3 4) Not a Polynomial

37 The degree of the polynomial $2p^2q + pq^2 + 3p^3 - p^2q^2$ is _____.

1) 2 2) 3 3) 4 4) Not a Polynomial

Writeup-4:

If $A = \frac{V}{W(R^2 - r^2)}$ where V = 115.5, W = 22/7, R = 2.6, r = 2.3, then

38. The value of $R^2 - r^2$ is

1) 1.48 2) 1.44 3) 1.46 4) 1.47

39. The value of V/W is

1) $\frac{143}{4}$ 2) $\frac{149}{4}$ 3) $\frac{141}{4}$ 4) $\frac{147}{4}$

40. The value of A is

1) 2.5 2) 25 3) 0.25 4) None

Writeup-5:

The value of the expression $ax^2 + bx + c$ at x = k is $(ak^2 + bk + c)$

41. The value of the expression $2x^2 + (7/2)xy + 5y^2$ at x=1, y = 2 is

1) 92 2) 29 3) –29 4) 19

42. The value of the expression $a^2 - bc + c^2 - b^2$ at a = 0, b = 1 c = 2 is ___

1) 1 2) 2 3) 3 4) 4

43. The value of the expression $x^3 + \frac{xy}{3} + \frac{7}{2}y^2$ at x = 2, y = 3 is ___

1) 75 2) 72/5 3) 75/2 4) 57/2

MATRIX MATCHING TYPE

44.

Column-I	**Column-II**
a) a.25 = 25.a	1) associative law in multiplication
b) 3 × (5 + x) = 3 × 5 + 3 × x	2) associative law in addition
c) 4 + (5 + x) = (4 + 5) + x	3) distributive law
d) 5 × (7 × x) = (5 × 7) × x	4) commutative law in multiplication

45.

Column-I	**Column-II**
a) 7 times x increased by 5 gives Quotient of 11 by 2	1) $2x - 9 = 23$
b) 7 less than the quotient of x by 11 equals 2	2) $\frac{x}{11} - 7 = 2$

c) Twice x decreased by 9 gives 23 3) $2 + x - 9 = 23$

d) 2 times x exceeds 9 by 23 4) $7x + 5 = \frac{11}{2}$

5) $\frac{x}{7} - 11 = 2$

46.

Column-I **Polynomials**	**Column-II** **Degree**
a) $5x$	1) 5
b) $15x^2 - x + 2$	2) 4
c) $-x^4 + 2x + 1$	3) 2
d) $x^2 - x^5$	4) 1

47.

Column-I	**Column-II**
a) If $l = 5$ and $m = 3$, then $2l + 3m =$ _____	1) 1
b) If $x = 3$, then $x^2 - 4x + 4 =$_____	2) 13^2
c) If $x = 5$, $y = 12$, then $x^2 + y^2 =$ ___	3) 19
d) If $x = 4$, $y = 3$ & $z = -2$, then $xy + yz + zx =$____	4) – 2
	5) 169

INTEGER ANSWER TYPE

48. 6 less than the quotient of x by 3 equals 2. Their x = _____.

49. The degree of the polynomial $p^3q^2 + 2p^2q + pq^2 + 5p^4 + 8q^3$ is _____.

50. If a = +1, b = – 2 and c = – 3, then the value of $\frac{a^3 + b^3 + c^3 - 3abc}{ab + bc + ca - (a^2 + b^2 + c^2)}$ is_____

SYNOPSIS - 2

Addition of polynomials:

1. 5x, – 3x, 4x, $\frac{7}{6}x$ are like terms.

2. $-\frac{3}{2}y$, 6x, $-7x^2$, $8x^3$ are unlike terms.

3. Like terms can be added and their sum can be simplified.
   E.g. $7x - 9x + 6x = x(7 - 9 + 6) = 4x$.

4. If no two terms are alike in a polynomial, then it is said to be in the simplified standard form.
   Eg : $2x^3 - 8x^2 - 6x + 9$

5. If an expression is
   a) in ascending order, then its terms are arranged in increasing order of powers in the expression.
   b) in descending order, then its terms are arranged in decreasing order of powers in the expression.

6. The sum or difference of two rational polynomials is also a polynomial with rational coefficients.

WORK SHEET - 2

SINGLE ANSWER TYPE

1. The sum of $\frac{3}{4}x^3, \frac{5}{6}x^3, -\frac{2}{3}x^3$ and $\frac{7}{2}x^3$ is

   1) $\frac{12}{53}x^3$ 2) $-\frac{53}{12}x^3$ 3) $\frac{53}{12}x^3$ 4) $-\frac{12}{53}x^3$

2. The simplified form of $3x^3 - 2x^2 - 8x - 6x^2 + 7x^3 + 9x + 8x^3 - 9x^2 + 6x$ is
   1) $-18x^3 - 17x^2 + 7x$ 2) $18x^3 - 17x^2 - 7x$
   3) $18x^3 + 17x^2 - 7x$ 4) $18x^3 - 17x^2 + 7x$

3. The ascending order of the polynomials $-3x^3 + 7x^2 - 9x^4 + 6x - 8$ is
   1) $-8 + 6x + 7x^2 - 3x^3 + 9x^4$ 2) $-8 - 6x - 7x^2 - 3x^3 - 9x^4$
   3) $-8 + 6x + 7x^2 - 3x^3 - 9x^4$ 4) $8 + 6x + 7x^2 + 3x^3 + 9x^4$

4. If $A = -7x - 3x - 5x$ and $B = 9x + 3x + 2x$, then $A + B$ is

   1) $2x$ 2) $-2x$ 3) $-x$ 4) $-3x$

5. If $\frac{1}{2}x - \frac{1}{3}x = A$ and $\frac{1}{3}x - \frac{1}{4}x = B$, then $A - B$ is

   1) $\frac{1}{12}x$ 2) $-\frac{1}{12}x$ 3) $-2x$ 4) 0

6. The equivalent expression of $2x^3 - 3x^2 - 8x - 3$ is
   1) $3x^3 - 5x^3 + 7x^2 - 5x^2 - 8x + 10x - 4 + 1$
   2) $3x^3 - x^3 - 5x^2 + 2x^2 - 9x + x - 7 + 4$
   3) $4x^3 - 6x^2 - 3x^3 + 3x^2 + x^2 - 9x + 3x + 6 - 3$
   4) $4x^3 - 2x^3 + 3x^2 - 5x^2 - 8x + 6x + 4 - 1$

7. The descending order of $4x^2 - 9x^3 + 3x^2 - 9x^4 + 3x^3 - 9x^2 + 6x - 3x + 5 - 3$ is
   1) $-9x^4 + 6x^3 - 2x^2 + 3x + 2$ 2) $-9x^4 - 6x^3 + 2x^2 - 3x + 2$
   3) $-9x^4 - 6x^3 - 2x^2 + 3x + 2$ 4) $-9x^4 + 6x^3 - 2x^2 + 3x - 2$

8. If $-\frac{7}{5}x^3 + \frac{3}{4}x^3 + \frac{7}{2}x^3 + \frac{9}{3}x^3$ is added to $\frac{9x^3}{60}$, then the result is

   1) $-6x^3$ 2) $6x^3$ 3) $60x^3$ 4) $16x^3$

9. If $2x - 3x + 5x = P$, $Q = -8x + 3x + 9x$ and $R = -8x - 6x - 7x$, then $(P + Q) - R$ is

   1) $27x$ 2) $28x$ 3) $29x$ 4) $26x$

10. If $A = -3x^3 - 2x^3 + 4x^2 - 2x^2$, $B = -3x^2 + 5x^2 - 8x + 3x$ and $C = 2x - 9x - 7 + 8$, then $A + B + C$ in simplified form is
    1) $-5x^3 + 4x^2 - 12x + 1$ 2) $5x^3 - 3x^2 - 12x + 1$
    3) $-5x^3 - 4x^2 - 12x - 1$ 4) $5x^3 + 3x^2 + 12x + 1$

11. If $4x^3y^2 + 3x^2y^3 - 8x^2y^5$ is added $-9x^2y^3 + 6x^2y^5 - 9x^3y^4$, then the result is

    1) $4x^3y^2 + 5x^2y^3 - 2x^2y^5 - 9x^3y^4$ 2) $4x^3y^2 - 6x^2y^3 - 2x^2y^5 - 9x^3y^4$
    3) $4x^3y^2 - 6x^2y^3 + 2x^2y^5 - 9x^3y^4$ 4) $-4x^2y^2 - 6x^2y^3 - 2y^2y^5 - 9x^3y^4$

12. If $0.5x^3 + 1.85x^3 + 2.96x^3 - 4.71x^3$ is added to $(1.25x^4 - 2.5x^5 + 3.6x^4 - 4.71x^4)$, then the result is
1) $0.6x^3 + 2.36x^4$ 2) $-0.6x^3 - 2.36x^4$
3) $0.6x^3 - 2.36x^4$ 4) $-0.6x^3 + 2.36x^4$

MULTI ANSWER TYPE

13. The sum of $5x^2 - \frac{1}{3}x + \frac{5}{2}$; $-\frac{1}{2}x^2 + \frac{1}{2}x - \frac{1}{3}$ and $-2x^2 + \frac{1}{5}x - \frac{1}{6}$
1) $\frac{5}{4}x^2 + \frac{11}{30}x + 2$ 2) $\frac{5}{4}x^2 - \frac{11}{30}x + 2$ 3) $\frac{5}{2}x^2 + \frac{11}{30}x + 2$ 4) $\frac{5}{2}x^2 + \frac{11}{30}x - 2$

14. If the lengths of the three sides of a triangle in centimetres are $\frac{7}{2}x^3 - \frac{1}{2}x^2 + \frac{5}{3}$, $\frac{3}{2}x^3 + \frac{7}{4}x^2 - x + \frac{1}{3}$ and $\frac{3}{2}x^2 - \frac{5}{2}x - 2$, then its perimeter is
1) $5x^3 - \frac{11}{4}x^2 + \frac{7}{2}x$ 2) $5x^3 - \frac{11}{4}x + \frac{7}{2}x^2$
3) $5x^3 + \frac{11}{4}x^2 - \frac{7}{2}x$ 4) $5x^3 + \frac{7}{2}x^2 - \frac{11}{4}x$

REASONING ANSWER TYPE

15. *Statement I :* If $A = 5x^2 - \frac{1}{3}x + \frac{5}{2}$, $B = -\frac{1}{2}x^2 + \frac{1}{2}x - \frac{1}{3}$, $C = -2x^2 + \frac{1}{5}x - \frac{1}{6}$, then
$$A + B + C = \frac{5}{2}x^2 - \frac{11}{30}x - 2$$
Statement II : Two or more algebraic expression can be added by arranging their terms and combining like terms.
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

16. *Statement I :* The sum of $8p^2 - 9q^2$ and $-6p^2 + 5q^2$ is $2p^2 - 4q^2$
Statement II : The sum can be found by adding the dissimidar terms in both the expressions.
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup-1:

$A = 7x^2 - 4x + 5$, $B = -3x^2 + 2x - 1$, $C = 5x^2 - x + 9$

17. The value of A + B is
1) $4x^2 - 2x + 4$ 2) $4x^2 + 2x - 4$ 3) $4x^2 - 2x - 4$ 4) $4x^2 + 2x + 4$

18. The value of B + C is
1) $2x^2 - x - 8$ 2) $2x^2 + x + 8$ 3) $2x^2 - x + 8$ 4) $2x^2 + x - 8$

19. The value of 2A + B + C is
1) $16x^2 + 7x + 18$ 2) $16x^2 - 7x - 18$ 3) $16x^2 + 7x - 18$ 4) $16x^2 - 7x + 18$

Writeup-2:

The sum can be found by adding the simmilar terms in the expressions.

20. If a = 2a – 5b + 4c, B = 5a – 2b + 2c, then A + B = ____
1) 7(a – b + c) 2) 7(a – b) + 6c 3) a – b + 6c 4) 7(a – b) + c

21. If A = x – y +1, B = – 2x + 7y + 3, then (2/5)A + B/5 =_____
1) 5y + 1 2) y + 5 3) y – 5 4) y + 1

22. If A = – 3x – y + 5, B = x + 2y + 3, then 3A – 5B =_____
1) 14x – 13y 2) 13x – 14y 3) –13x + 14y 4) – 14x – 13y

MATRIX MATCHING TYPE

Add the two expressions

23.

Column-I	**Column-II**
a) 3a – 4b, 7a – 2b	1) 3ab – 3bc – ac
b) 3a + 5b – 4c, 2a – 5b – bc	2) 10a – 6b
c) 2ab – 5bc + 4ca, ab + 2bc – 5ac	3) – 2a + 8b – 6
d) 2a + 3b – 1, – 4a + 5b – 5	4) 5a – 10c
	5) 5(a – 2c)

INTEGER ANSWER TYPE

24. If $B = 2x^3 + 6x^2 - 7x + 8$ and A + B = B, then A is
1) –1 2) 1 3) B 4) 0

SYNOPSIS - 3

Subtraction of polynomials :

1. Subtraction is the inverse process of addition.
2. To every positive rational number there exists a negative rational number such that their sum is zero i.e., A + (–A) = 0.
Here, the letter (–A) is called the additive inverse of A.
Eg : $A = -2x^2 - 8x + 7$
\ Its additive inverse is $2x^2 + 8x - 7$.
3. If A + B = 0, then B is called the additive inverse of A.
Eg: $A = -2x^4 + 3x^2 + 5x$
$B = 2x^4 - 3x^2 - 5x$ Þ $A + B = -2x^4 + 3x^2 + 5x + 2x^4 - 3x^2 - 5x = 0$.
\ B is the additive inverse of A.
4. Sum of a polynomial and its additive inverse is zero.
Eg : $A = 4x^3 - 4x^2 + 3x + 7$
Þ Additive inverse is $B = -4x^3 + 4x^2 - 3x - 7$
\ $A + B = 4x^3 - 4x^2 + 3x + 7 - 4x^3 + 4x^2 - 3x - 7 = 0$.

WORK SHEET - 3

SINGLE ANSWER TYPE

1. If B = $-9x^2 + 3x - 7$, then the additive inverse of B is
   1) $9x^2 - 3x - 7$ 2) $9x^2 - 3x + 7$ 3) $-9x^2 - 3x - 7$ 4) $-9x^2 + 3x + 7$

2. If A = $\frac{-3x^2}{4} + \frac{2}{3}x + 7$ and B = $\frac{1}{4}x^2 - \frac{1}{3}x + 8$, then A – B is
   1) $x^2 - x + 1$ 2) $-x^2 - x - 1$ 3) $-x^2 + x - 1$ 4) $x^2 + x + 1$

3. If P = $2x^3 - 3x^2 - 5x + 6$ and Q = $\frac{1}{3}x^3 - \frac{3}{4}x^2 - \frac{5}{2}x + \frac{7}{3}$, then Q – P is

   1) $\frac{5x^3}{3} + \frac{9x^2}{4} + \frac{5x}{2} - \frac{11}{3}$ 2) $\frac{-5x^3}{3} - \frac{9x^2}{4} + \frac{5x}{2} - \frac{11}{3}$

   3) $\frac{-5x^3}{3} - \frac{9x^2}{4} - \frac{5x}{2} - \frac{11}{3}$ 4) $\frac{5x^3}{3} + \frac{9x^2}{4} + \frac{5x}{2} - \frac{11}{3}$

4. If $A = -\frac{3}{2}x^3 - \frac{9}{7}x^2 + \frac{6x}{7} + 2$ and A + B = 0, then polynomial B is

   1) $\frac{-3x^3}{2} - \frac{9}{2}x^2 + \frac{6x}{7} + 2$ 2) $\frac{3x^3}{2} + \frac{9}{2}x^2 + \frac{6x}{7} + 2$

   3) $\frac{-3x^3}{2} - \frac{9}{2}x^2 - 6x - 2$ 4) $\frac{3x^3}{2} + \frac{9}{7}x^2 - \frac{6x}{7} - 2$

5. If A = $2x^3 - 9x^2 - 6x + 7$ and A + B = $5x^3 - 6x^2 - 8x + 9$, then the polynomial (A + 2) – A is 1) $3x^3 - 3x^2 - 2x + 2$ 2) $3x^3 + 3x^2 - 2x + 2$
   3) $3x^3 + 3x^2 + 2x + 2$ 4) $-3x^3 - 3x^2 - 2x + 2$

6. If A = $4x^3 - 9x^2 - 9x - 8$ and A – B = $-2x^3 - 8x^2 - 6x - 2$, then the polynomial B = A – (A – 2) is
   1) $6x^3 - x^2 - 3x - 6$ 2) $6x^3 + x^2 + 3x + 6$
   3) $6x^3 + x^2 + 3x - 6$ 4) $-6x^3 - x^2 - 3x - 6$

7. Given A = $2x^3 - 3x^2 + 6x + 7$ and B = $4x^3 - 9x^2 - 3x + 7$, If C, D are additive inverses of A and B, then D – C is

   1) $-2x^3 + 6x^2 + 9x$ 2) $-2x^3 + 5x^2 + 9x$
   3) $-2x^3 - 6x^2 + 9x$ 4) $-2x^3 - 6x^2 - 9x$

8. If A – B = $2x^3 - 3x^2 + 8x - 7$ and B = $5x^3 - 9x^2 + 6x - 8$, where A = (A – 2) + B, then the polynomial A is

   1) $7x^3 - 12x^2 + 14x + 18$ 2) $7x^3 - 12x^2 + 14x - 15$
   3) $7x^3 - 12x^2 - 14x + 15$ 4) $-7x^3 + 12x^2 - 14x - 15$

9. Given $\mathbf{C = \frac{-5}{6}x^2 - \frac{7}{6}x + \frac{3}{2}}$ and C + A = 0. If $\mathbf{B = \frac{x^2}{6} - \frac{1}{6}x + \frac{1}{2}}$ is added to A, then the result is

1) $x^2 - x + 1$ 2) $-x^2 - x - 1$ 3) $x^2 + x - 1$ 4) $x^2 - x + 1$

10. If $A = 7x^3 - 2x^2 - 9x + 6$, $B = 2x^3 - 8x^2 + 3x - 5$, $C = 2x^3 - 4x^2 - 8x + 7$, and $D = -3x^3 - 5x^2 + 6x + 7$, then $(A - 3) - (B - 4)$ is

1) $5x^2 - 2x - 11$ 2) $5x^2 + 2x + 11$ 3) $5x^2 - 2x + 11$ 4) $-5x^2 - 2x - 11$

MULTI ANSWER TYPE

11. On multiplication of $\left(3x - \frac{4}{5}y^2x\right)$ by $\frac{1}{2}xy$, the result is

1) $\frac{3}{2}x^2y + \frac{5}{2}x^2y^3$ 2) $x^2y(\frac{3}{2} - \frac{2}{5}y^2)$

3) $\frac{3}{2}x^2y - \frac{2}{5}x^2y^3$ 4) $\frac{5}{2}x^2y + \frac{3}{2}yx^2$

12. The product of $100x \times (0.01\,x^4 - 0.01\,x^2)$ is

1) $0.01\,x^4 - x^3$ 2) $0.5\,x^5 - x^3$ 3) $x^5 - x^3$ 4) $x^3 - x^5$

13. Which of the following must be subtracted from a^2+b^2+2ab to get $-4ab+2b^2$

1) $2b^2 - 4ab$ 2) $a^2 - b^2 + 6ab$

3) $a^2 - b(b + 6a)$ 4) $a^2 + b(-b + 6a)$

REASONING ANSWER TYPE

14. *Statement I :* If a = 1 and b = 0.5, then the value of $2.3a^5b^2 \times 1.2a^2b^2$ is 0.1725

Statement II : In a given expression, the process of replacing each variable by a given value of it is called substitution.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

15. *Statement I : The perimeter ofa triangle is $14a^2+20a+13$. Two of its sides are $3a^2+5a+1$* and $a^2 + 10a - 6$, then its 3rd side is $10a^2 + 5a + 18$

Statement II : The perimeter of a triangle is sum of its three sides.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup-1

$A = \frac{6}{5}x^2 - \frac{4}{5}x^3 + \frac{5}{6} + \frac{3}{2}x$, $B = \frac{x^3}{3} - \frac{5x^2}{2} + \frac{3}{5}x + \frac{1}{4}$

16. The simplified form of (B – A) is

1) $\frac{17x^3}{15} - \frac{37x^2}{10} - \frac{9x}{10} - \frac{7}{12}$ 2) $\frac{17x^3}{15} + \frac{37x^2}{10} + \frac{9x}{10} - \frac{7}{12}$

3) $\frac{17x^3}{15} - \frac{37x^2}{10} + \frac{9x}{10} + \frac{7}{12}$ 4) $\frac{17x^3}{15} + \frac{37x^2}{10} + \frac{9x}{10} + \frac{7}{12}$

17. If $C = B - A + \frac{17x^3}{15} + \frac{37x^2}{10} + \frac{9x}{10} - \frac{7}{12}$, then the C =

1) $\frac{34x^3}{15} - \frac{7}{6}$ 2) $\frac{34x^3}{15} - \frac{7}{12}$ 3) $\frac{34x^3}{15} - \frac{6}{12}$ 4) none

18. The simplified form of (A + C) is

1) $\frac{22x^3}{15} - \frac{1}{3} - \frac{6}{5}x^2 + \frac{3}{2}x$ 2) $\frac{22x^3}{15} + \frac{1}{3} + \frac{6}{5}x^2 + \frac{3}{2}x$

3) $-\frac{22x^3}{15} + \frac{1}{3} + \frac{6}{5}x^2 - \frac{3}{2}x$ 4) $\frac{22x^3}{15} + \frac{1}{4} + \frac{6}{5}x^2 + \frac{3}{2}x$

Writeup-2

If $A = (x^2y - 1)$, $B = -6x^2 + 15x^2y^3$, $C = 6x^2 - 15y^2$, $D = -2x^4y + x^2y^3$

19. A×C =_____

1) $6x^4y + 15x^2y^3 - 6x^2 + 15y^2$ 2) $6x^4y - 15x^2y^3 - 6x^2 + 15y^2$

3) $-6x^4y - 15x^2y^3 - 6x^2 - 15y^2$ 4) $6x^4y + 15x^2y^3 + 6x^2 + 15y^2$

20. (A × C) – B =____

1) $-2x^2y(4x^2 + 7y^2)$ 2) $3y(2x^4 + 5y)$ 3) $2y(3x^4 + 5y)$ 4) $-3x^2y(2x^2 - 5y^2)$

21. D – (A × C) + B = ___

1) $-2x^2y(4x^2 + 7y^2)$ 2) $2x^2y(4x^2 + 7y^2)$ 3) $-2y(4x^4 + 7y)$

4) $-3x^2y(2x^2 - 5y^2)$

MATRIX MATCHING TYPE

22.

Column-I	**Column-II**
a) (x – y) – (2x + y)	1) – (– 2y – x)
b) (3x + 2y) + (– 4x – 4y)	2) – (– 2y + x)
c) (8y – 7x) – (6y – 8x)	3) – x – 2y
d) 2(x + y)	4) 4y + 2x
	5) 2y + x

INTEGER ANSWER TYPE

23. If $x = 2a^2 - 5a + 3$, $y = -3a^2 + a + 8$ and $z = 5a^2 - 6a - 5$, then the value of x – (y – z) at

a = – 1 is___

KEY & HINTS

WORK SHEET – 1 (KEY)				
1) 3	**2)** 1	**3)** 3	**4)** 3	**5)** 2
6) 3	**7)** 3	**8)** 2	**9)** 3	**10)** 4
11) 3	**12)** 1	**13)** 3	**14)** 2,3,4	**15)** 1,2
16) 3,4	**17)** 1,2,3	**18)** 4	**19)** 3	**20)** 2,4
21) 2	**22)** 3	**23)** 4	**24)** 4	**25)** 4
26) 4	**27)** 1	**28)** 2	**29)** 4	**30)** 1
31) 1	**32)** 1	**33)** 2	**34)** 2	**35)** 4
36) 2	**37)** 3	**38)** 4	**39)** 4	**40)** 2
41) 2	**42)** 1	**43)** 3	**44)** A-4 B-3 C-2 D-1	**45)** A-4 B-2 C-1 D-1
46) A-4 B-3 C-2 D-1	**47)** A-3 B-1 C-2,5 D-4	**48)** 24	**49)** 5	**50)** 1

1. Substitute n = 12 in $\frac{n^2}{2}+\frac{n}{2}$

$\Rightarrow \frac{n^2}{2}+\frac{n}{2} = \frac{12^2}{2}+\frac{12}{2}=\frac{144}{2}+\frac{12}{2}=72+6=78$

$\therefore$ Value of the expression is 78.

2. $\frac{7}{3}x-\frac{7}{6}=0$

Transpose $-\frac{7}{6}$ to RHS

$\Rightarrow \frac{7x}{3}=\frac{7}{6}$

Transpose $\frac{7}{3}$ to RHS

$\Rightarrow x = \frac{7}{6} \times \frac{3}{7} = \frac{1}{2}$

$\therefore$ Zero of the given polynomial is $\frac{1}{2}$

3. $x = -\frac{5}{4} \Rightarrow 4x = -5$

$\therefore$ $4x + 5$ is the required polynomial

4. $A = -8x^2 - 6x + 10$

Put $x = \frac{1}{2} \Rightarrow A = -8 \times \left(\frac{1}{2}\right)^2 - 6 \times \frac{1}{2} + 10$

$= -8 \times \frac{1}{4} - 6 \times \frac{1}{2} + 10 = -2 - 3 + 10 = 5$

5. $3x^{4-1} + 2x^{3-1} + 6x^{2-1} + 8 = 3x^3 + 2x^2 + 6x + 8$ is a 3^{rd} degree polynomial

6. $\frac{2}{7}x^{-2}y^5z$

7. Put $x = \frac{a}{2}$ in $4x^2 + 8x + 18$

$\Rightarrow 4x^2 + 8x + 18 = 4 \times \left(\frac{a}{2}\right)^2 + 8 \times \frac{a}{2} + 18 = 4 \times \frac{a^2}{4} + 8 \times \frac{a}{2} + 18 = a^2 + 4a + 18$

8. Put $x = \frac{9}{13}$ in $\frac{-26}{3} - \frac{13x}{27}$

$\Rightarrow \frac{-26}{3} - \frac{13x}{27} = \frac{-26}{3} - \frac{13}{27} \times \frac{9}{13} = -\frac{26}{3} - \frac{1}{3} = \frac{-27}{3} = -9$

9. Degree of the polynomial is $m + 4$

10. Put $n = 10$ in $\frac{n(n+1)(2n+1)}{6}$

$\Rightarrow \frac{n(n+1)(2n+1)}{6} = \frac{10(10+1)(2\times10+1)}{6} = \frac{10 \times 11 \times 21}{6} = 385$

11. The polynomial is $\frac{1}{2}x^5 + 3x^4 + 2x^3 + 3x^2 + 6$

$\therefore$ The degree of the polynomial is 5.

12. Degree of the monomial $\frac{3}{5}x^2y^6z^7$ is 2 + 6 + 7 = 15

13. x = a + 2 and a = 8 $\Rightarrow$ x = 10
$\therefore$ The value of 3x + 5 = 3 × 10 + 5 = 35

14. Key: (2,3,4) ; Sol:- The coefficient of x in 9xy is '9y'
The coefficient of 'a' in (–7abc) is (–7bc) ; The coefficient of 'xyz' on (–xyz) is –1
The coefficient of b in –abc is (–ac)

15. Key: (1,2) ; Sol:- In $6x^2y+5xy^2-8xy^2-7yx^2, 6x^2y, -7x^2y$ are like terms
Also $5xy^2, -8xy^2$ are like terms

16. Key: (3, 4) ; Sol:- 1. 3 more than x = x + 3 (True)

2. One third of sum of x and y = one third of (x + y) = $\frac{1}{3}(x+y)$ (True)

3. The quotient of x by y = $\frac{x}{y}$; product of x and y = xy

now the quotient of x by y added to the product of x and y = $\frac{x}{y}+xy$

but it is given that $x+y+\frac{x}{y}$ $\therefore(3)$ is false

4.The quotient of x by y = $\frac{x}{y}$;Now 5 lessthan $\frac{x}{y}=\frac{x}{y}-5$; but it is given that $\frac{x}{y}+5$

$\therefore(4)$ is false.

17. Key: (1,2,3); Sol:- The degre of $x^2+xy^2+y^3$ is 3 (True)
The degree of $m^2n^3+mn^2+4$ is 5 (True) ; The degree of $p^2q^2+pq^2+1$ is 4 (True)

18. Key: 4 ; Sol:- Clearly (a) and (b) are not polynomials only (c) is a polynomials
$\therefore$ (a) and (b) are false

19. Key: 3 ; Sol:- $2x^{3^2\times2^3}+3x^{4^2\times3^2}+5x^{4^2\times3^2}+5x^{4^2\times3^3}=2x^{54}+3x^{144}+5x^{144}+5x^{128}$
$\therefore$ degree = 144.

20. Key: 2, 4 ; Sol:- A = (m+n)p/2 = (120.6)(3.5)/2 = 211.05
Clearly, A < 211.50.& Also, A < 211.105

21. Key: 2 ; Sol:- $\left(25a^4b\right)\times-\left(-2a^2b^2\right)\times\left(-2.1a^3b^3\right)=-105\times a^{4+2+3}b^{1+2+3}=-105\times a^9b^6$

putting a = 1 and b = $\frac{1}{2}$ we get ,$-105a^9b^6=-105(1)^9(1/2)^6=-105/64$

22. Key: 3; Sol:- $(a+b)(a+b)-(a-b)(a-b)+(a^2-b^2) = (7+5)(7+5)-(7-5)(7-5)+(7^2-5^2)$

$=12\times12-2\times2+49-25 = 144-4+24 = 164.$

23. Key: 4 ; Sol:- Clearly statement 2 is true (by conceptual formulae)

Statement - 1: $(a+b)^2+(a-b)^2+\left(a^2-b^2\right)$

$=a^2+b^2+2ab+a^2-2ab+b^2+a^2-b^2=3a^2+b^2$

$=3(3)^2+(2)^2\ (\because a=3, b=2)$

$=37+4=31$ ----------> statement - 1 is false.

24. Key: 4 ; Sol:- Statement I: (x – 10) + (y + 20) + 10 = x + y + 20

$\therefore$ Statement I is False.

Statement II: [(4 × q) + 5 + r] – (p + 10) = 4q + 5 + r – p – 10 = 4q + r – p – 5

$\therefore$ Statement 2 is True.

25. Key: 4 ; Sol:- Clearly statement - 2 is true

St-1 : $A=4x^{2m}y^{4n}z^{3p}$; Since 2m = 4n = 3p = 24 $\Rightarrow$ m = 12, n = 6, p = 8

$\therefore$ Degree of A = 2m + 4n + 3p = 2(12) + 4(6) + 3(8) = 24 + 24 + 24 = 72

$\therefore$ statement - 1 is false.

26. Key: 4 ; Sol:- Conceptual.

27. Key: 1 ; Sol:-Clearly, St-2 is true.

$5a^6\times(-10)ab^2\times(-2.1)a^2b^3 = 105a^9b^5 = 105\times(1)^9(1/2)^5 = 105/32$------>St-1 is true.

And St-2 is correct explanation of St-1

28. Key: 2; Sol:- $x^2+y^2+z^2-2xy-2yz-2zx = (2)^2+(-2)^2+(3)^2-2(2)(-2)-2(-2)(3)-2(3)(2)=25$ st-1 is ture; $p^2+q^2+r^2-pq-qr-pr=(3)^2+(-5)^2+(4)^2-(3)(-5)-(3)-(-5)(4)-(4)(3)=73$ st-2 is true. But st-2 is not correct explanation of st-1

29. Key: 4 ; Sol:- Given $A = 18x^3y^2z^4$, $B = 12x^2y^3z^3$ and $C = x^4y^3$;

$\therefore A\times C=\left(18x^3y^2z^4\right)\times\left(x^4y^3\right)=18x^7y^5z^4$ -------> So, Both (a) & (b) is false

30. Key: 1 ; Sol:- $B\times C = \left(12x^2y^3z^3\right)\times\left(x^4y^3\right)=12x^6y^6z^3$

31. Key: 1 ; Sol:- $A\times B\times C=\left(18x^3y^2z^4\right)\times\left(12x^6y^6z^3\right)=216x^9y^8z^7$

32. Key: 1 ; Sol:- Given $A=6a^{p+2}+5a^{2p+3}+7a^{3p+4}$; Since p = 2, q = 3

$\therefore A=6.a^{2+2}+5.a^{2(2)+3}+7.a^{3(2)+4} \Rightarrow A=6a^4+5a^7+7a^{10}$; $\therefore$ degree of A = 10

33. Key: 2 ; Sol:- Since $B=4b^{q+3}+5b^{3q+2}+8b^{4q+3}$; Given q = 3

$\therefore B=4.b^{3+3}+5.b^{3(3)+2}+8.b^{4(3)+3} \Rightarrow 4.b^6+5.b^{11}+8.b^{15}$; $\therefore$ degree of B = 15

34. Key: 2 ; Sol:- Clearly, degree of A < degree of B. i.e., 10 < 15

35. Key: 4 ; Sol:- Conceptual.

36. Key: 2 ; Sol:- Conceptual.

37. Key: 3 ; Sol:- Conceptual.

38. Key: 4 ; Sol:- $R^2 - r^2 = (R + r)(R - r) = (2.6 + 2.3)(2.6 - 2.3) = 4.9 \times 0.3 = 1.47$.

39. Key: 4 ; Sol:- $(V/W) = 115.5/(22/7) = 115.5\times(7/22) = (73.5/2) = (147/4)$

40. Key: 2 ; Sol:- $A = \dfrac{115.5}{\frac{22}{7}\left[(2.6)^2 - (2.3)^2\right]} = \dfrac{115.5\times 7}{22\times(6.76-5.29)}$

$= \dfrac{808.5}{22\times 1.47} = \dfrac{808.5}{32.34} = 25$

41. Key: 2; Sol:- $2x^2+(7/2)xy+5y^2=2(1)^2+(7/2)(1)(2)+5(2)^2= 29$

42. Key: 1; Sol:- $a^2-bc+c^2-b^2=(0)^2-(1)(2)+(2)^2-(1)^2=1$

43. Key: 3; Sol:- $x^3-xy/3+7/2\ y^2= (2)^3-2(3)/3+7/2(3)^2= 75/2$

44. Key: a $\to$ 4; b $\to$ 3; c $\to$ 2; d $\to$ 1 ; Sol:- Conceptual

45. (a) $\to$ 4, (b) $\to$ 2, (c) $\to$ 1, (d) $\to$ 1 ; Sol:- Conceptual.

46. Key: a $\to$ 4; b $\to$ 3; c $\to$ 2; d $\to$ 1 ;

Sol:- a) degree of 5x is 1 b) degree of $15x^2 - x + 2$ is 2

c) degre of $-x^4 + 2x + 11$ is 4 d) degree of $x^2 - x^5$ is 5.

47. key: a–3, b –1, c–2,5, d–4

Sol:- a) $2l+3m= 2(5)+3(3)=10+9=19$;

b) $x^2-4x+4=(x-2)^2=(3-2)^2=1$

c) $x^2+y^2= 5^2+12^2=25+144=169$;

d) $xy+yz+zx= 4(3)+(3)(-2)+(-2)(4) = 12-6-8=-2$

48. Key: (24) ; Sol:- $\dfrac{x}{3} - 6 = 2 \Rightarrow \dfrac{x}{3} = 8 \Rightarrow x = 24$.

49. Key: 5 ; Sol:- Conceptual.

50. Key: 1;

Sol:- $\dfrac{(+1)^3 + (-2)^3 + (-3)^3 - 3(1)(-2)(-3)}{(1)(-2)+(-2)(-3)+(-3)(1)-(1+4+9)} = \dfrac{1-8-27-18}{-2+6-3-14} = \dfrac{1-53}{6-19} = \dfrac{-52}{-13} = 4$

WORK SHEET – 2 (KEY)				
1) 3	**2)** 2	**3)** 1	**4)** 3	**5)** 1
6) 1	**7)** 3	**8)** 2	**9)** 3	**10)** 1
11) 2	**12)** 3	**13)** 3	**14)** 3	**15)** 4
16) 3	**17)** 1	**18)** 2	**19)** 4	**20)** 2
21) 4	**22)** 4	**23)** A-2 B-4,5 C-1 D-3	**24)** 4	

1. $\frac{3}{4}x^3+\frac{5}{6}x^3-\frac{2}{3}x^3+\frac{7}{2}x^3 = \frac{9x^3+10x^3-8x^3+42x^3}{12} = \frac{x^3}{12}(9+10-8+42)=\frac{53x^3}{12}$

2. $3x^3 + 7x^3 + 8x^3 - 2x^2 - 6x^2 - 9x^2 - 8x + 9x + 6x$
   $= x^3 (3 + 7 + 8) + x^2 (- 2 - 6 - 9) + x(- 8 + 9 + 6)$
   $= 18x^3 - 17x^2 + 7x$

3. Ascending order of $- 3x^3 + 7x^2 - 9x^4 + 6x - 8$ is $- 8 + 6x + 7x^2 - 3x^3 - 9x^4$

4. $A = x(-7 - 3 - 5) \Rightarrow A = - 15x$
   $B = x (9 + 3 + 2) \Rightarrow B = 14x$
   $\therefore$ $A + B = - 15x + 14x = - x$

5. $A=\frac{1}{2}x-\frac{1}{3}x=x\left(\frac{1}{2}-\frac{1}{3}\right)=x\left(\frac{3-2}{6}\right)=\frac{1}{6}x$

   $B=\frac{1}{3}x-\frac{1}{4}x=x\left(\frac{1}{3}-\frac{1}{4}\right)=x\left(\frac{4-3}{12}\right)=\frac{1}{12}x$

   $\therefore\ A-B=\frac{1}{6}x-\frac{1}{12}x=x\left(\frac{1}{6}-\frac{1}{12}\right)=x\left(\frac{2-1}{12}\right)=\frac{1}{12}x$

6. $3x^3 - x^3 - 5x^2 + 2x^2 - 9x + x - 7 + 4$
   $= 2x^3 - 3x^2 - 8x - 3$

7. The descending order of the given expression is $- 9x^4 - 6x^3 - 2x^2 + 3x + 2$

8. $\frac{-7}{5}x^3+\frac{3}{4}x^3+\frac{7}{2}x^3+\frac{9x^3}{3}+\frac{9x^3}{60}$

   $=\frac{-84x^3+45x^3+210x^3+180x^3+9x^3}{60}=\frac{360}{60}x^3=6x^3$

9. $P = 2x - 3x + 5x = 4x$, $Q = - 8x + 3x + 9x = 4x$
   $R = - 8x - 6x - 7x = - 21x$
   $\therefore$ $(P + Q) - R = (4x + 4x) - (-21x)$
   $= 8x + 21x = x (8 + 21) = 29x$

10. $A = - 5x^3 + 2x^2$
    $B = 2x^2 - 5x$
    $C = - 7x + 1$
    $\therefore$ $A + B + C = - 5x^3 + 2x^2 + 2x^2 - 5x - 7x + 1$
    $= - 5x^3 + x^2 (2 + 2) + x (- 5 - 7) + 1$
    $= - 5x^3 + 4x^2 - 12x + 1$

11. $4x^3y^2 + 3x^2y^3 - 9x^2y^3 - 8x^2y^5 + 6x^2y^5 - 9x^3y^4$
    $= 4x^3y^2 - 6x^2y^3 - 2x^2y^5 - 9x^3y^4$

12. $x^3(0.5 + 1.85 + 2.96 - 4.71) + x^4 (1.25 - 2.5 + 3.6 - 4.71)$
    $0.6x^3 - 2.36x^4$

13. Key: 3; Sol:- Required sum

$$=\left(5x^2-\frac{1}{3}x+\frac{5}{2}\right)+\left(-\frac{1}{2}x^2+\frac{1}{2}x-\frac{1}{3}\right)+\left(-2x^2+\frac{1}{5}x-\frac{1}{6}\right)$$

$$=5x^2-\frac{1}{2}x^2-2x^2-\frac{1}{3}x+\frac{1}{2}x+\frac{1}{5}x+\frac{5}{2}-\frac{1}{6}-\frac{1}{3}$$

$$=\left(5-\frac{1}{2}-2\right)x^2+\left(-\frac{1}{3}+\frac{1}{2}+\frac{1}{5}\right)x+\left(\frac{5}{2}-\frac{1}{6}-\frac{1}{3}\right)$$

$$=\frac{5}{2}x^2+\frac{11}{30}x+2$$

14. Key: 3; Sol:-$\left(\frac{7}{2}+\frac{3}{2}\right)x^3+\left(\frac{-1}{2}+\frac{7}{4}+\frac{3}{2}\right)x^2+\left(\frac{-5}{2}-1\right)x+\left(\frac{5}{3}+\frac{1}{3}-2\right)$

$=\left(\frac{10}{2}\right)x^3+\left(\frac{-2+7+6}{4}\right)x^2+\left(\frac{-7}{2}\right)x+\left(\frac{+6-6}{3}\right)=5x^3+\frac{11}{4}x^2-\frac{7}{2}x$

15. Key: 4; Sol:- Clearly, St-2 is true.

$A+B+C=(5x^2-\frac{1}{3}x+\frac{5}{2})+(-\frac{1}{2}x^2+\frac{1}{2}x-\frac{1}{3})+(-2x^2+\frac{1}{2}x-\frac{1}{6})=(\frac{5}{2}x^2+\frac{11}{30}x+2)$

So, St-1 is false.

16. Key: 3;; Sol:- clearly st-2 is false ; st-1 $8p^2-9q^2-6p^2+5q^2=2p^2-4q^2$ st-1 is true

17. Key: 1 ; Sol:- $A+B=(7x^2-4x+5)+(-3x^2+2x-1)=4x^2-2x+4$

18. Key: 2; Sol: $B+C=(-3x^2+2x-1)+(5x^2-x+9)=2x^2+x+8$

19. Key: 4; Sol:- $2A+B+C=2(7x^2-4x+5)+2x^2+x+8=16x^2-7x+18.$

20. key: 2; Sol:- $A+B=2a-5b+4c+5a-2b+2c=7a-7b+6c$

21. key: 4; Sol:- $2/5A+B/5=\frac{2A+B}{5}=\frac{2(x-y+1)+(-2x+7y+3)}{5}=\frac{5(y+1)}{5}=Y+1$

22. key: 4; Sol:- $3A-5B=3(-3x-y+5)-5(x+2y+3)=-9x-3y+15-5x-10y-15=-14x-13y$

23. Key: a–2; b–(4,5), c–1, d–3

; Sol:-a) $3a-4b+7a-2b=10a-6b$; b) $3a+5b-4c+2a-5b-6c=5(a-2c)$

c) $2ab-5bc+4ca+ab+2bc-5ac=3ab-3bc-ac$ d) $2a+3b-1-4a+5b-5=-2a+8b-6$

24. Key: 4; Sol:- $A+B=B \Rightarrow A=0$

WORK SHEET – 3 (KEY)				
1) 2	**2)** 3	**3)** 2	**4)** 4	**5)** 2
6) 1	**7)** 1	**8)** 2	**9)** 3	**10)** 2
11) 2,3	**12)** 3	**13)** 2,4	**14)** 1	**15)** 1
16) 1	**17)** 1	**18)** 4	**19)** 2	**20)** 2
21) 3	**22)** A-2,3 B-2,3 C-1,5 D-4	**23)** 12		

1. $B = -9x^2 + 3x - 7$,
   \ Additive inverse of B is $9x^2 - 3x + 7$.

2. $A - B = -\frac{3}{4}x^2 - \frac{1}{4}x^2 + \frac{2}{3}x + \frac{1}{3}x + 7 - 8 = -\frac{4x^2}{4} + \frac{3}{3}x + 7 - 8 = -x^2 + x - 1$

3. $Q - P = \frac{1}{3}x^3 - 2x^3 - \frac{3}{4}x^2 + 3x^2 - \frac{5}{2}x + 5x + \frac{7}{3} - 6 = \frac{-5x^3}{3} - \frac{9x^2}{4} + \frac{5x}{2} - \frac{11}{3}$

4. B is the additive inverse of A. ($\because$ A + B = 0)

   Þ $A = -\frac{3}{2}x^3 - \frac{9}{7}x^2 + \frac{6x}{7} + 2$

   \ $B = \frac{3}{2}x^3 + \frac{9}{7}x^2 - \frac{6x}{7} - 2$

5. $A + B = +5x^3 - 6x^2 - 8x + 9$
   $A = +2x^3 - 9x^2 - 6x + 7$
   $\quad\quad - \quad + \quad + \quad -$
   ———————————
   $\therefore$ $(A + B) - A = 3x^3 + 3x^2 - 2x + 2$

6. $B = A - (A - B)$
   $A = 4x^3 - 9x^2 - 9x - 8$
   $A - B = -2x^3 - 8x^2 - 6x - 2$
   $\quad\quad + \quad + \quad + \quad +$
   ———————————
   $\therefore$ $B = A - (A - B) = 6x^3 - x^2 - 3x - 6$
   ———————————

7. D is the additive inverse of B and C is the additive inverse of A

$D = -4x^3 + 9x^2 + 3x - 7$

$C = -2x^3 + 3x^2 - 6x - 7$

$+ \quad - \quad + \quad +$

$\therefore D - C = -2x^3 + 6x^2 + 9x$

8. $A = (A - B) + B$

$\Rightarrow A - B = 2x^3 - 3x^2 + 8x - 7$

$B = 5x^3 - 9x^2 + 6x - 8$

$\therefore A = (A - B) + B = 7x^3 - 12x^2 + 14x - 15$

9. A is the additive inverse of C. $(\because C + A = 0)$

$$A = \frac{5}{6}x^2 + \frac{7}{6}x - \frac{3}{2}, \quad B = \frac{x^2}{6} - \frac{1}{6}x + \frac{1}{2}$$

$$\therefore A + B = \frac{5x^2}{6} + \frac{x^2}{6} + \frac{7}{6}x - \frac{1}{6}x - \frac{3}{2} + \frac{1}{2} = \frac{6x^2}{6} + \frac{6x}{6} - \frac{2}{2} = x^2 + x - 1$$

10. $A - C = 7x^3 - 2x^2 - 9x + 6 - (2x^3 - 4x^2 - 8x + 7) = 5x^3 + 2x^2 - x - 1$

$B - D = 2x^3 - 8x^2 + 3x - 5 - (-3x^3 - 5x^2 + 6x + 7) = 5x^3 - 3x^2 - 3x - 12.$

$A - C = 5x^3 + 2x^2 - x - 1$

$B - D = 5x^3 - 3x^2 - 3x - 12$

$- \quad + \quad + \quad +$

$\therefore (A - C) - (B - D) = 5x^2 + 2x + 11$

11. Key: (2,3); Sol:- $\left(3x - \frac{4}{5}y^2x\right) \times \frac{1}{2}xy = \frac{3}{2}x^2y - \frac{2}{5}x^2y^3 = x^2y\left(\frac{3}{2} - \frac{2}{5}y^2\right)$

12. Key: 3 ; Sol:- $100x \times 0.01\,x^4 - 100x \times 0.01x^2 = (100 \times 0.01)x^5 - (100 \times 0.01)x^3$

$$= \left(100 \times \frac{1}{100}\right)x^5 - \left(100 \times \frac{1}{100}\right)x^3 = x^5 - x^3$$

13. Key: (2,4) ; Sol: $a^2 + b^2 + 2ab - x = -4ab + 2b^2 \Rightarrow a^2 + b^2 + 2ab + 4ab - 2b^2 = x$

$\Rightarrow x = a^2 - b^2 + 6ab$

14. key: 1 ; Sol:- Clearly St- 2 is true. Now, $2.3a^5b^2 \times 1.2a^2b^2 = (2.3) \times (1.2)a^7b^4$

$= (2.3) \times (1.2) \times (1)^7(0.5)^4 = 0.1725$

So, St-1 is true & St- 2 is correct explanation of St- 1 .

15. Key: 1; Sol:- Clearly st-2 is true; $(3a^2+5a+1)+(a^2+10a-6)=4a^2+15a-5$

Now $(14a^2+20a+13)-(4a^2+15a-5) = 10a^2+5a+18$ so, st-1 is true and st-2 is correct explanation of st-2

16. Key: 1 ;
Sol:- $B - A = \left(\frac{x^3}{3}-\frac{5x^2}{2}+\frac{3}{5}x+\frac{1}{4}\right)-\left(\frac{6}{5}x^2-\frac{4}{5}x^3+\frac{5}{6}+\frac{3}{2}x\right)=\frac{17x^3}{15}-\frac{37x^2}{10}-\frac{9x}{10}-\frac{7}{12}$.

17. Key: 1 ; Sol:- $C=\frac{17x^3}{15}-\frac{37x^2}{10}-\frac{9x}{10}-\frac{7}{12}+\frac{17x^3}{15}+\frac{37x^2}{10}+\frac{9x}{10}-\frac{7}{12}=\frac{34x^3}{15}-\frac{7}{6}$

18. Key: 4 ; Sol:- $A+C=\left(\frac{6}{5}x^2-\frac{4}{5}x^3+\frac{5}{6}+\frac{3}{2}x\right)+\frac{34x^3}{15}-\frac{7}{6}=\frac{22x^3}{15}+\frac{1}{4}+\frac{6}{5}x^2+\frac{3}{2}x$

19. Key: 2; Sol:- $A \times C = (x^2y - 1) \times (6x^2 - 5y^2) = 6x^4y - 15x^2y^3 - 6x^2 + 15y^2$

20. Key 2; Sol:- $(A \times C) - B = 6x^4y - 15x^2y^3 - 6x^2 + 15y^2 + 6x^2 + 15x^2y^3 = 3y(2x^4 + 5y)$

21. Key: 3; Sol:- $D-(A \times C) + B = D - [(A \times C) - B] = -2x^4y - 6x^4y - 15y^2$
$= -8x^4 - 14y^2 = -2y(4x^4 + 7y)$

22. Key: a® (2,3) ; b® (2,3) ; c® (1,5); d® 4;
Sol:- a) $(x - y) - (2x + y) = x - y - 2x - y = -x - 2y$
b) $(3x + 2y)(-4x - 4y) = 3x + 2y - 4x - 4y = -x - 2y$
c) $(8y - 7x) - (6y - 8x) = (8y - 6y) - 7x + 8x = 2y + x$
d) $2(x + 2y) = 2x + 4y$

23. Key: 12 ; Sol:- $y-z=(-3a^2 + a + 8)-(5a^2 - 6a - 5)=-8a^2 +7a +13$
$x - (y - z) = (2a^2 - 5a + 3) -(-8a^2 +7a +13)= 10a^2 - 12a - 10$
if $a = -1$, then $x - (y - z) = 10(-1)^2 - 12(-1) - 10 = 12$. $\therefore$

LINEAR EQUATIONS

SYNOPSIS - 1

FUNDAMENTAL CONCEPTS:

1) Expressions of the form 9 + 2, 11 - 7, $4\times 20, \frac{33}{7}$ etc., are called ' **numerical expressions'.**

2) If two numerical expresssions are joined or connected by ' is equal to' (=) or ' is greater than' (>) or 'is less than' (<) etc., then they are called **'mathematical sentences'.**

Example: 9 + 3 < 15.

3) A mathematical sentence that can be verified either true or false but not both, is called a **'mathematical statement'.**

Example: 9 + 7 > 9.

4) A true mathematical statement containing the sign "=" is called as an **equality**.

Example: 9 × 2 = 18.

5) Sentences which cannot be verified either true or false are called **'open sentences'**.

Example: (i) 2x + 3 = 5, (ii) 4x + 1 < 8

6) A particular number written in the place of a variable in an open sentence is called **'replacement'.**

EQUATION: If two numerical expressins are joined or connected by the symbol "is equal to(=)" , then the combination is called as an equation.

or

An open sentence containing the sign '=' is called an equation.

L.H.S. and R.H.S. Notations : The sign of equality '=' in an equation divides it into two sides namely, the left hand side and the right hand side, written as L.H.S. and R.H.S. respectively.

Example: 6x + 2 = 9x – 5 here, L.H.S = 6x + 2 R.H.S = 9x -5

Solution of an Equation : The value of a variable which satisfies(L.H.S = R.H.S) the equation is called the solution or root of an equation.

Example: 6x + 2 = 9x - 4 . Here LHS = 6x + 2 and RHS = 9x -4

Above equation is true only when x = 2 i.e if x = 2, then

LHS = 6 × 2 + 2 = 14 RHS = 9×2 – 4 = 14 Hence, LHS = RHS

LINEAR EQUATION: An equation in which the highest power of a variable (index) is one called 'linear equation'.

Example: 2x + 3y + 5 = 0 and 9x – 7 = 2010

LINEAR EQUATION IN ONE VARIABLE: Linear equation which involves one variable is called 'linear equation in one variable' or 'simple equation'.

Example: (i) 4x -3 = x + 7 (ii) y + 7 = 11

Note: ax + b = 0 is the general form of linear equation in one variable, where ($a \neq 0$) and a, b are real numbers.

L.H.S. AND R.H.S. NOTATIONS: The sign of equality '=' in an equation divides it into two sides namely, the left hand side and the right hand side, written as L.H.S. and R.H.S. respectively.

Example: 7x + 8 = 9x - 10 here, L.H.S = 7x + 8 and R.H.S = 9x - 10

Solution of an Equation: The value of a variable which satisfies(L.H.S = R.H.S) the equation is called the solution or root of an equation.

Example: $2x + 6 = 10$ here, L.H.S. $= 2x + 6$ R.H.S. $= 10$

Above equation is true only when $x = 2$ i.e., $x = 2 \Rightarrow$ L.H.S. $= 2 \times 2 + 6 = 10$ R.H.S. $= 10$

$\therefore$ L.H.S = R.H.S.

$\therefore$ Root of $2x + 6 = 10$ is 2.

Note: Method of finding the solution for the given equation is called 'solving an equation'.

DOMAIN OF THE VARIABLE: The replacement set of the variable of an equation is called the 'Domain of the variable'.

Types of Finding the Solutions of Linear Equations :

1) Trail and error method 2) Guess method

3) Systematic method 4) Transposition mehod.

Trial and Error method: Finding the root or solution or true value of the given equation from its domain is called the Trial and error method.

Note: Under trial and error method, trying all values of the variable of the equation takes too much of time. It becomes impossible when the domain contains infinite number of elements such as **N** or **W** or **Z**. So, guessing some times helps up to solve an equation easily.

Example: Domain of the equation $2x + 3 = 7$ is {1, 2, 3.....}, where 2 is the root of the given equation.

Systematic method for solving an equation:

In this case we compare the equation with a balance, by using the following rules.

1) We can add the same number on both sides of the equation.

2) We can subtract the same number from both sides of the equation.

3) We can multiply both sides of the equation with the same number.

4) We can divide both sides of the equation by the same non-zero number.

5) If $\frac{ax+b}{cx+d} = \frac{p}{q}$, then $q(ax + b) = p(cx + d)$. This process is called Cross Multiplication.

Transposition: Any term of an equation may be taken to the other side with a change in its sign. This process is called transposition.

Examples: i) $x - 5 = 7 \Rightarrow x - 5 + 5 = 7 + 5 \Rightarrow x = 12$

ii) $x + 2 = 4 \Rightarrow x + 2 - 2 = 4 - 2 \Rightarrow x = 2$

iii) $\frac{x}{7} = 12 \Rightarrow x = 12 \times 7 \Rightarrow x = 84$

iv) $2x = 40 \Rightarrow \frac{2x}{2} = \frac{40}{2} \Rightarrow x = 20$

Law of cancellation: If $ac = bc$ provided $c \neq 0$ then $a = b$ i.e., both sides of an equality can be divided by the same non-zero number.

Note: A linear equation in one variable 'x' is solved by getting all terms containing 'x' on one side and every thing else on the other side.

WORK SHEET - 1

SINGLE ANSWER TYPE

1. If two numerical expressions are joined by '=' or '$\geq$' or '<' then they are known as
   1) mathematical sentences 2) Theorens
   3) Axioms 4) None of these
2. Sentences which cannot be verified for their truth or false hood are called _____ sentences
   1) true 2) false 3) open 4) closed
3. If $x+9=12$, then the value of x
   1) 1 2) 2 3) 3 4) 4
4. If $123 > x+11$, then one of the value sutiable to the variable x is
   1) 112 2) 113 3) 117 4) 111
5. If 4 times a number m is 96, then the value of $m \times 24$ is _____
   1) 576 2) 676 3) 558 4) 658
6. If $\frac{x}{4}+\frac{x+2}{3}+\frac{x+3}{2}=0$ then the value of x
   1) - 1 2) - 3 3) - 2 4) - 4
7. If $x+3=9, x+y=14, y+z=20$ then the value of $x+y+z$ is _____
   1) 6 2) 12 3) 20 4) 26
8. If $(x-4)(x+4)=(x+4)(x-7)+33$, then the value of x is
   1) 7 2) 6 3) 5 4) 8
9. If $\frac{6}{3m+1}=\frac{9}{5m-3}$ then the value of $2m+1$ is _____
   1) 15 2)17 3) 19 4) 23
10. If $\frac{0.4^{2-3}}{1.5z+10}=\frac{7}{5}$ then the value of z is
    1) 3 2) - 4 3) 1.3 4) - 10
11. If 24 is added to 6 times a number, then the result is 10 less than four times the number, then the number is _____
    1) –17 2) 27 3) –23 4) 19
12. Solution of $\frac{2}{3}x+1=5$ is _____
    1) 2 2) 4 3) 6 4) 8
13. Solution of 0.5m = 0.65 is _____
    1) 13 2) 1.3 3) 130 4) 0.13

14. Finding the root or solution or true volue of the given equation from its domain is called _____.
1) Trial and Error Method 2) Gauss Method
3) Systematic Method 4) Transposition Method

15. If 11x + 5 = 137, then x = _____
1) 11 2) 12 3) 13 4) 14

16. If $\frac{1}{m+1}=\frac{5}{8m-1}$, then the possible value of 'm' is _____
1) 9 2) –5 3) –3 4) 2

17. If $\frac{2x}{3}-\frac{x-8}{6}=2\frac{(2x+9)}{9}$, then the solution for x is _____
1) 45 2) 52 3) 27 4) 39

18. If $\frac{x-3}{x+5}=\frac{x-2}{x+2}$, then the solution for x is _____
1) 0 2) 1 3) 2 4) 4

19. IF $\frac{0.5m+4}{1.2m+6}=\frac{5}{3}$, then the possible value of 'm' is _____
1) $\frac{11}{5}$ 2) –4 3) $\frac{9}{5}$ 4) –6

20. If (2 + x) : (7 + x) : (10 + x) : (25 + x), then 'x' is _____
1) Even prime 2) Odd prime
3) Leavst Natural number 4) Least whole number

21. If $5x-\frac{1}{3}(x+1)=6\left(x+\frac{1}{30}\right)$, then the possible value of 'x' is _____
1) $\frac{-2}{5}$ 2) $\frac{-4}{5}$ 3) $\frac{3}{5}$ 4) $\frac{-6}{5}$

MULTI ANSWER TYPE

22. If $P<175+194$, then the value of the variable 'p' from the following is
1) 369 2) 367 3) 366 4) 370

23. If $(18-8)^2=P,(28-4)^2=Q$ then P + Q is
1) 24^2+10^2 2) 6 + 6 3) 26^2 4) 34^2

24. If $\frac{x+2}{x-2}=\frac{7}{3}$, then x = _____.
1) 5 2) 10 3) $\sqrt{25}$ 4) $\sqrt{100}$

25. If $\frac{13k-1}{6}+\frac{2k+5}{3}=\frac{5}{9}$, then the possible value of 'K' is _____
1) –1 2) 1 3) Least Natural number 4)Greatest negative integer

26. If $\frac{2}{3}(4x-1)-\left(2x-\frac{1+x}{3}\right)=\frac{x}{3}+\frac{4}{3}$, then the solution for 'x' is _____

1) $1\frac{1}{2}$ 2) $2\frac{1}{2}$ 3) $\frac{3}{2}$ 4) $\frac{5}{2}$

REASONING ANSWER TYPE

27. *Statement I:* If $x-2=10$ then value of x is 12

Statement II: If a number satisfies an equation, then the numbers is known as a root of the equation.

1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

28. *Statement I:* If $2\frac{1}{2}-\frac{x-2}{4}=\frac{x}{2}$ then the value of x is 3

Statement II: If $\frac{x+1}{3}-\frac{x-1}{4}=1$ then the value of x is $\frac{11}{12}$

1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

29. Statement I : If 3x + 5 = 15x – 11, then x = 4/3

Statement II : If the domain of the equation 7x + 3 = 17 is {1, 2, 3,---------}, then '2' is the root of the opiven equation.

1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

30. Statement I : If $\frac{5}{x+2}-\frac{3}{x-2}=\frac{3}{2}$, then the possible value of x is '0'

Statement II : The value of the variable for which LHS = RHS is the root of the equation.

1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup-1:

The root of the equation is satisfies the equation

31. If $3x+7=28$ then the root of the equation is

1) 7 2) 8 3) 9 4) 6

32. If $3p-5=19$ then the root is

1) 2 2) 9 3) 8 4) 6

33. $2p-5=5$ then the value of p is

1) 2 2) 3 3) 4 4) 5

Writeup-2:

$\frac{3x_1-1}{4\frac{1}{2}}-\frac{x_1-1}{2}=0$ and $\frac{4}{5}\left(x_2+\frac{5}{6}\right)-\frac{2}{3}\left(x_2-\frac{1}{4}\right)=\frac{10}{9}$

34. Then value of $3x_1-1$ is

1) $-5/3$ 2) $3/5$ 3) - 6 4) 2

35. Value of $\frac{12x_2}{25}$ is

1) 1 2) 2 3) 3 4) 4

36. Value of $(3x_1-1)+\frac{12x_2}{25}$ is

1) - 5 2) 3 3) 4 4) None

Writeup-3:

Under trial and error method, trying all volues of the variable of the equation takes too much tirne. If becomes impossible when the domain contains infinte number of elements such as N or W or Z. so. guessing some times helps up to solve the equation easily.

37. 18a + 216 = 0, then a $\in$ _____

1) Z 2) N 3) W 4) All of these

38. Solution for 2m + 8 = 2 is _____

1) –5 2) –1 3) –3 4) –2

39. In x + 3 = 5, the root x = 2 is a _____.

MATRIX MATCHING TYPE

40.

Column-I	Column-II
a) $x_1-9=11$	1) 42
b) $x_2\times 3=63$	2) 19
c) $x_3+3=22$	3) 20
d) $x_4\div 6=7$	4) 21

41.

Column-I	Column-II
a) $\frac{1}{2}(x+1)+\frac{1}{3}(x+4)=\frac{1}{6}(x-1)$	1) 9
b) $\frac{1}{3}(x+5)-\frac{1}{2}(x+2)=\frac{1}{3}(x+5)$	2) - 2
c) $\frac{2}{3}(x-4)=5-\frac{1}{6}(x+1)$	3) - 7/3
d) $\frac{2}{5}(x-6)+(x+1)=\frac{7}{2}(x+1)$	4) - 3

42.

Column-I	Column-II
a) If 3(x – 3) = 5(2x + 1), then x = ____	1) 1
b) If 2(x – 5) + 3(x – 2) = 8 + 7(x – 4)___ then x = _____.	2) –2
c) If $\frac{3y-2}{7}-\frac{5y-8}{4}=\frac{1}{4}$, then y = _____	3) –1
d) If $\frac{5x-3}{2}-\frac{3x-2}{3}=\frac{2}{3}$, then x = _____	4) 2
	5) –3

43.

Column-I	Column-II
a) 12 is a root of the equation_____	1) $\frac{3x+5}{2x+1}=\frac{1}{3}$
b) 8 is a root of the equation _____	2) $\frac{x}{4}+\frac{x}{6}=x-7$
c) '–2' is a root of the equation _____	3) $\frac{2x}{3}+1=\frac{7}{3}$
d) '2' is a root of the equation _____	4) $\frac{y+6}{4}+\frac{y-3}{5}=\frac{5y-4}{8}$
	5) 5x + 7 = 2x + 1

INTEGER ANSWER TYPE

44. If $\frac{m}{5}=6$ and $p-4=8$ then the value of $m+p=$_____

45. If $\frac{2x+1}{3x-1}=\frac{3}{2}$, then the possible value of 'x' is _____

SYNOPSIS - 2

Simple equations are useful in solving simple practical problems, these problems are generally given in words.

STEPS TO BE FOLLOWED IN SOLVING A VERBAL PROBLEMS:

i) Read the problem carefully and note down the asked quantity.

ii) Select a letter x or y or z etc., to represent the asked quantity.

iii) Write an equation in the letter selected, showing the relationship in the problem.

iv) Solve the equation obtained in step (iii).

v) Check the answer to make sure that it satisfies the given conditions in the problem.

To solve practical problems given in words, we must first change the word statements into symbolic statements.

Example–1: 5 added to a certain number gives 11. Find the number.

Solution: Let the required number be 'x'

If 5 is added to 'x' we get 5 + x.

According to the problem this is equal to 11

$\therefore$ Equation is 5 + x = 11

By guess method or trial and error method, we find that x = 6 is a solution.

Veritication: If 5 is added to 6 we get 11, satistying the condition given in the problem

Example–2: One number is 3 times the another number. If 15 is added to both the numbers, then one of the new numbers becomes twice that of the other new number. Find the numbers.

Solution: Let one number be 'x'.

Then the other number = 3x.

By the given condition, one number +15 = 2 (other number + 15)

i.e., $3x + 15 = 2(x + 15) \Rightarrow 3x + 15 = 2x + 30 \Rightarrow 3x - 2x = 30 - 15 \Rightarrow x = 15.$

Hence, one number is 15 and the other number = $3 \times 15 = 45$.

WORK SHEET - 2

SINGLE ANSWER TYPE

1. The solution for a + b = 5 is _____.

   1) (1, 4) 2) (5, 3) 3) (6, 7) 4) (4, 2)

2. If 2k + 3 = 3k + 7, then k = _____.

   1) –1 2) –2 3) –3 4) –4

3. If $\frac{8-3x}{5x-3} = \frac{2}{3}$, then x = _____.

   1) $\frac{86}{19}$ 2) $\frac{28}{19}$ 3) $\frac{58}{19}$ 4) $\frac{75}{19}$

4. If 0.5x _ (0.8 – 0.2x) = 0.2 – 0.3x, then x = _____ .

   1) 0 2) 1 3) 2 4) 3

5. Two complementary angles differ by 10°, the larger angle is = _____.
   1) 60° 2) 50° 3) 64° 4) 54°
6. A dealer earned a profit of 5% by selling a radio for Rs. 714. Then the cost price of the radio is Rs _____.
   1) 680 2) 540 3) 720 4) 960
7. If $\frac{3}{x-2}-\frac{2}{x-3}=\frac{4}{x-3}-\frac{3}{x-1}$, then the root of equation is _____
   1) $\frac{5}{3}$ 2) $\frac{3}{2}$ 3) $\frac{7}{5}$ 4) $\frac{8}{3}$

MULTI ANSWER TYPE

8. In x + 3 = 5, x = 2 is called
   1) Root of the equation 2) Zero of the inequation
   3) Solution of equation 4) All of these
9. The value of 'x' which satisfis the equation 2.4 (3 – x) – 0.6 (2x – 3) = 0 is_____.
   1) $\frac{5}{2}$ 2) $\frac{3}{2}$ 3) 2.5 4) 1.5
10. The ages of A and B are in the ratio 5 : 3. After 6 years their ages will be in the ratio 7 : 5, then the resent ages of A and B respectively are _____.
    1) 10 years 2) 20 years 3) 15 years 4) 9 years
11. Three numbers are in the ratio 4 : 5 : 6 and their sum is 135. Then the numbers are _____
    1) 36 2) 45 3) 54 4) 63

REASONING ANSWER TYPE

12. Statement I : The volue of 'x' which satisfies the equation 0.3x + 0.4 = 0.28x + 1.16 is 38.
    Statement II : The value of the variable which makes the equation a true statement is called the solution or root of the equation.
    1) Both Statement-I and Statement-II are true.
    2) Both Statement-I and Statement-II are false.
    3) Statement I is true, Statement II is false.
    4) Statement I is false, Statement II is true.
13. Statement I : Sum of two consecutive multiples of 3 is 69 one of the numbers is 33
    Statement II : Mathematical representation of " the sum of two consecutive multiples of 3 is 69 " is x + (x + 3) = 69 where 'x' is multiples of '3'.
    1) Both Statement-I and Statement-II are true.
    2) Both Statement-I and Statement-II are false.
    3) Statement I is true, Statement II is false.
    4) Statement I is false, Statement II is true.

COMPREHENSION TYPE

If father is 7 times as old as his son. Two years ago, the father was 13 times as old as his son, then

14. Age of son, 2 years age is _____
    1) 2 years 2) 4 years 3) 6 years 4) 8 years
15. Age of father, 3 years age is _____
    1) 20 years 2) 23 years 3) 25 years 4) 28 years
16. The present age of father is _____
    1) 23 years 2) 25 years 3) 28 years 4) 31 years

MATRIX MATCHING TYPE

17.

Column-I	Column-II
a) $\frac{3x-1}{5}-\frac{x}{7}=\frac{3}{35}$	1) 1
b) $\frac{2-x}{3}-\frac{2x}{6}+\frac{1}{3}$	2) 3
c) $\frac{2}{7}(x-9)+\frac{x}{3}=3$	3) 5/8
d) (6.5) x + $\frac{x}{3}$ = (0.25) x + 7 ____	4) 3/4
	5) 12

INTEGER ANSWER TYPE

18. The root of the equation t –(2t + 5) –5 (1 – 2t) = 2(3 + 4t) –3 (t – 4) is _____.

WORK SHEET – 1 (KEY)				
1) 1	**2)** 3	**3)** 3	**4)** 4	**5)** 1
6) 3	**7)** 4	**8)** 4	**9)** 3	**10)** 4
11) 1	**12)** 3	**13)** 2	**14)** 1	**15)** 2
16) 4	**17)** 2	**18)** 2	**19)** 2	**20)** 1
21) 1	**22)** 2,3	**23)** 1,3	**24)** 1,3	**25)** 1,4
26) 2,4	**27)** 1	**28)** 4	**29)** 1	**30)** 4
31) 1	**32)** 3	**33)** 4	**34)** 3	**35)** 1
36) 1	**37)** 1	**38)** 3	**39)** 4	**40)** 3,4,2,1
41) 4,2,1,3	**42)** 2,4,4,1	**43)** 2,4,(1,5),3	**44)** 42	**45)** 1

WORK SHEET – 2 (KEY)				
1) 1	**2)** 4	**3)** 1	**4)** 2	**5)** 2
6) 1	**7)** 1	**8)** 1,3	**9)** 1,3	**10)** 3,4
11) 1,2,3	**12)** 5	**13)** 1	**14)** 1	**15)** 3
16) 3	**17)** 3,1,2,5	**18)** 7		

LINEAR INEQUATIONS

SYNOPSIS - 1

INTERODUCTION OF INEQUALITIES:

1) Numerical expression joined by "is equal to' or greater than or "is lessthan"' etc, are called mathematical sentences.

2) A mathematical sentences that can be verified as either true or false but not both is called a mathematical statement.

3) A true statement containing the sign " is equal to" is called an equality.

4) A true mathematical statement containing the sign " greater than" or "less than" is called an inequality.

Example: 1) $-6 < -4$ 2) $8 + 6 > 6 + 4$ 3) $2 \times 3 < 4 \times 5$

5) Inequality sign always pointed towards the lesser number.

6) $x > 0$ means x is a positive number.

7) $x < 0$ means x is a negative number.

8) Some times two or more inequalities are written in one sentence.

Example: $3 < 5 < 8$ means $3 < 5$ and $5 < 8$ or 5 lies between 3 and 8.

Inequation: An open sentence containing one of the signs $\neq$, $<$, $\leq$, $>$ or $\geq$ is called inequations. or

A relationship between two algebraic expressions which are not equal and written by symbols $\neq$, $<$, $>$, $\leq$, or $\geq$ is called an inequation.

Example: 1) $x + 2 > 5$ 2) $x + 3 \geq 13.5$ 3) $2x + 1 > 9$

Linear inequation in one variable: An inequation which involves only one variable is called 'linear inequation in one variable' or 'simple inequation'.

General forms of an Inequation : A statement of any of the forms

1) $ax + b > 0$ 2) $ax + b < 0$ 3) $ax + b \geq 0$ 4) $ax + b < 0$

Where a and b are real numbers and $a \neq 0$.

Roots of the inequation: The replacement numbers which make the inequation statement true are called roots of the inequation. An inequation may have a single root, more than one root or no root at all.

Domain of the variable or replacement set: The set from which the values of the variable x are replaced in an inequation, is called the domain of the variable or the replacement set.

Properties of Inequations:

1) Adding the same number to each side of an inequation does not change the inequality

Example: $x + 2 < 5 \Rightarrow x + 2 + 3 < 5 + 3$

2) Substracting the same number from each side of an inequation doesnot change the inequality.

Example: $3x + 4 < 9 \Rightarrow 3x + 4 - 2 < 9 - 2$

3) Multiplying each side of an inequation by the same positive number doesnot change the inequality

Example: $\frac{x}{6} < 3 \Rightarrow \frac{x}{6} \times 6 < 3 \times 6$

4) Multiplying each side of an inequation by the same negative number, reverses the inequality

Example: $\frac{x}{5} < 10 \Rightarrow \frac{x}{5} \times (-5) > 10 \times (-5)$

5) Dividing each side of an inequation by the same positive number doesnot change the inequality

Example: $x + 4 < 9 \Rightarrow \frac{x+4}{3} < \frac{9}{3}$

6) Dividing each side of an inequation by the same negative number, reverses the inequality

Example: $x + 2 < 4 \Rightarrow \frac{x+2}{-2} > \frac{4}{-2}$

WORK SHEET - 1

SINGLE ANSWER TYPE

1. The solution set of x < 5, where x $\in$ N is ____
   1) { 0,1,2,3 } 2) { 1,2,3,4 } 3) { 2,3,4 } 4) { 0,1,2,3,4 }
2. The root of inequation x + 2 $\leq$3, where x $\in$ N is ____
   1) 4 2) 3 3) 2 4) 1
3. The solution set of 3x + 4 < 15, x $\in$ N is ____
   1) { 2,3,4 } 2) { 3,4,5 } 3) { 4,5,6 } 4) { 1,2,3 }
4. The solution set of 1 - 3x < -4, x $\in$ N is _____
   1) { 1,2 } 2) { 1 } 3) { 1,2,3 } 4) { 2,3,------ }
5. If 2x < 12 an inequation, then the number of solutions if x $\in$ N is ___
   1) 2 2) 4 3) 5 4) 6
6. The domain of the inequation 6x-7 $\geq$29 where x $\in$ N is ___
   1) {6,7,8,.....} 2) {3,4,5,....} 3){0,1,2,3,4,5} 4) {0,1,2,3}
7. If 7x >18 + x, then the value of x is greater than _____
   1) 4 2) 5 3) 7 4) 3
8. If A = { -3,-2,-1,0,1,2,3} then the solution for x of 2x - 1< 4 in A is
   1) { -3,-2,-1,0,1,2,3 } 2) { -3,-2,-1,0,1,2 }
   3) { 0,1,2,3 } 4) { -3,-2,-1}
9. The domain of 2(3x - 1)<5, x$\in$N is _____
   1) { 1} 2) 1 3) (0, 1) 4) (0, 2)
10. In an inequality the vertex of a inequality symbol is always lies towards ___ quantity.
    1)smaller 2) greater 3)equal 4) 1 and 3
11. If 5 < x-2,then ___
    1) x < 7 2) x > 7 3) x < $\frac{5}{2}$ 4) x > $\frac{5}{2}$

12. If $5 + \{ 2x + (4x - 2) - 2 \} = 0$, then x is

1) $\frac{-1}{2}$ 2) $\frac{-1}{6}$ 3) $\frac{1}{6}$ 4) $\frac{1}{2}$

13. If $(x+2)(x-2)=(x+3)(x-5)+12$, then x is

1) $\frac{1}{2}$ 2) $\frac{3}{2}$ 3) $\frac{2}{3}$ 4) $\frac{1}{4}$

14. Any term of an equation may be taken to the other side with the sign changed.This process is called

1) transposition 2) domain 3) variable 4) root

15. If $\frac{x+1}{x-1} = \frac{3}{5}$, then x is

1) 2 2) -6 3) -4 4) 5

16. If $(x + 5) + (2x+5) = 70$, then x is _____

1) 20 2) 25 3) 30 4) 35

17. If $0.2x-3.2 = 0.7x-3.7$, then x is

1)0.2 2)1.2 3)1.0 4) 1.23

18. If $\frac{3}{5}(x+3)-\frac{1}{5}(2x-4) = 3$, then x is _____

1) 2 2) 3 3) 5 4) 6

19. The domain of the equation $\frac{2x+4}{4} \geq -5$ is

1) $x \leq -14$ 2) $x \leq -13$ 3) $x \geq -12$ 4) $x \leq 20$

20. If $25a^2 + (20 + m)ab + 16b^2$ is a perfect square then the value of m is ---

1) 20 2) 4 3) 10 4) 5

21. If $\frac{x-2}{3} + \left[\frac{2x-1}{3} - \left(\frac{1-2x}{2} + 5\right)\right] = \frac{x-2}{6}$, then x is

1) $\frac{12}{7}$ 2) $\frac{37}{11}$ 3) $\frac{35}{12}$ 4) $\frac{16}{19}$

22. If the angles of a triangle are 2x+20,x and 3x-20 then the largest angle is _____ degrees.

1) 70° 2) 80° 3) 90° 4) 75°

MULTI ANSWER TYPE

23. Which of the following statements are true ?
    1) If a > b, then a + c > b + c
    2) If a > b, then a - c < b - c
    3) If a > b and c > 0, then ac > bc
    4) If a > b and c < 0, then ac > bc

24. Which of the following statements are not false ?
    1) A statements of ineuality between two expressions involving a single variable ' x' with highest power 1 is called a linear inequation.
    2) If reciprocals are taken to quantities of the same sign on both sides of an inequality, then the order of the inequality is changed.
    3) In number line the greater number always lies to the right of the lesser one.
    4) In number line the smaller number always lies to the left of the greater one.

25. If two sides of an equilateral triangle are 5x+1 and 4x+3 units,then
    1) x = 2 units
    2) x = 3 units
    3)third side is 11 units
    4) third side is 15 units

26. If $3x + 4 < 15$, $x \in N$ then the solution set is
    1) {1,2,3 }
    2) $\{x : x \in N, x \leq 3\}$
    3) $\{x : x \in N, x \geq 3\}$
    4) {1,2}

REASONING ANSWER TYPE

27. Statement I: Consider -3,5 and 7 If -3 < 5, 5 < 7 then -3 < 7
    Statement II: If in three numbers, the first is less than the second and the second is less than the third,then the first is less than the third.
    1) Both Statement-I and Statement-II are true.
    2) Both Statement-I and Statement-II are false.
    3) Statement I is true, Statement II is false.
    4) Statement I is false, Statement II is true.

28. Statement I: If the inequality 21 > 15, dividing each side by -3 then the inequality is -7 < -5
    Statement II: Dividing each side of an inequality by a negative number, reverses the inequality.
    1) Both Statement-I and Statement-II are true.
    2) Both Statement-I and Statement-II are false.
    3) Statement I is true, Statement II is false.
    4) Statement I is false, Statement II is true.

29. Statement I: If 5y + 3 = 2y + 6,then y is 1.
    StatementII:Changing a term from one side of an equation to the other side is called transposition.
    1) Both Statement-I and Statement-II are true.
    2) Both Statement-I and Statement-II are false.
    3) Statement I is true, Statement II is false.
    4) Statement I is false, Statement II is true.

30. Statement I:If $(5.5)^2-(4.5)^2$ is 10

Statement II: $a^2-b^2=(a+b)(a-b)$

1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup:1

Dividing each side of an inequality by a positive number, does not change the inequality.

Dividing each side of an inequality by a negative number, reverses the inequality.

31. If a > b and c<0 then

1) $\frac{a}{c}>\frac{b}{c}$ 2) $\frac{a}{c}\geq\frac{b}{c}$ 3) $\frac{a}{c}<\frac{b}{c}$ 4) $\frac{a}{c}\leq\frac{b}{c}$

32. If a < b and c > 0 then

1) $\frac{a}{c}>\frac{b}{c}$ 2) $\frac{a}{c}\geq\frac{b}{c}$ 3) $\frac{a}{c}<\frac{b}{c}$ 4) $\frac{a}{c}\leq\frac{b}{c}$

33. If a > b and c > 0 then

1) $\frac{a}{c}>\frac{b}{c}$ 2) $\frac{a}{c}\geq\frac{b}{c}$ 3) $\frac{a}{c}<\frac{b}{c}$ 4) $\frac{a}{c}\leq\frac{b}{c}$

Writeup:2

The replacement set of the varible of an equation is called the domain of the varible.

34. If $\frac{3x}{5}+2\leq 17$ domain of the inequation is

1) $x>25$ 2) $x\geq 25$ 3) $x\geq 25$ 4) $x\leq 25$

35. The domain of the inequation $\frac{2x+4}{4}\geq -5$ is

1) $x\leq -13$ 2) $x\leq -14$ 3) $x\geq -12$ 4) x=12

36. The domain of the inequation $\frac{6(x+2)}{2}\geq 8$ is

1) x=1 2) $x\geq\frac{2}{3}$ 3) $x\geq 0$ 4) $x\leq 0$

Writeup:3

One number is 5 less than the other and their sum is 25, then

37. The smallest number is
1) 5 2) 10 3) 15 4) 12

38. The greatest number is
1) 10 2) 20 3) 5 4) 15

39. The product of the numbers is
1) 150 2) 156 3) 100 4) 126

Writeup:4

The cost of 17 pens and 29 pencils is Rs 217, while the cost of 29 pens and17 pencils is Rs 289

40. cost of a pen is
1) Rs 10 2) Rs 8.50 3) Rs 2.50 4) Rs 8

41. cost of a pencil is
1) Rs 4.50 2) Rs 2 3) Rs 3.50 4) Rs 2.50

42. Let the cost of pen is x and pencil is y then 2x + 3y is
1) Rs 24.50 2) Rs 25 3) Rs 25.50 4) Rs 24

MATRIX MATCHING TYPE

43.

Column-I	Column-II
a) If a > b and c > 0, then	1) ab < bc
b) If a < b and c > o, then	2) ab > bc
c) If a > b and c < 0, then	3) ac < bc
d) If a < b and c < 0, then	4) ac > bc
	5) ac $\leq$ bc

44.

Column-I	Column-II
a) $\{x : x \leq 1, x \in I\}$	1) { -3,-2,-1,0,1 }
b) $\{x : x > 0, x \leq 2, x \in I\}$	2) { 1,2,3,4 }
c) $\{x : x \geq 1, x \in Q\}$	3) { 0,1,2 }
d) $\{x : x \leq 1, x \in Q\}$	4) { -3,-2,-1,0,1,2 }
	5) { 1,2,3,4,5 }

45.

Column-I	Column-II
a) If $2\left(x-\frac{1}{2}\right)+2 = 0$, then x is	1) $\frac{4}{5}$
b) If $\frac{x}{2}-\frac{1}{2}=x+\frac{1}{3}$, then x is	2) 12
c) If $\frac{1}{x}+\frac{3}{x}=5$, then x is	3) $-\frac{1}{2}$

d) If $\frac{2x}{3}-\frac{x}{2}=2$, then x is

4) $-\frac{5}{3}$

5) 1

46.

Column-I	Column-II
a) If 0.3(x - 0.6) = x-1.16 then x is	1)100
b) If $0.5x-2.5=77.5-0.3x$ then x is	2) 51/7
c) If $-\frac{17}{3}+\frac{7x}{6}=\frac{x}{2}-\frac{x}{9}$ then x is	3)symmetry
d) By which property 24=8x can b written as 8x=24	4) reflex
	5) 7/5

INTEGER ANSWER TYPE

47. If x $\in$ N,then the number of solutions of inequation 7x + 3 $\leq$ 17 is _____

48. If x$\in$N, then the root of the equation 4x-3=21 is _____

WORK SHEET - 2

SINGLE ANSWER TYPE

1. The variable in the equation 6x+2=5 is
   1) 6 2) x 3) 2 4) 6x
2. If 'm' is a natural number and m(m+1)=30 then 'm' is equal to
   1) 5 2) 6 3) -5 4) -6
3. Write L.H.S and R.H.S of 2x+y=2(x+y)
   1) 2x+y 2) 2(x+y) 3) x+y 4) both 1 and 2
4. If $\frac{ax+b}{cx+d}=\frac{m}{n}$ then n(ax+b) =
   1) (cx+d) 2) m(c+d) 3) m(cx-d) 4)m(cx+d)
5. If 5x-17=2x-8 then x =
   1) -3 2) 3 3) $6\div2$ 4) both (2) and (3)
6. If p-$1\frac{1}{2}=2\frac{1}{2}$ then the value of p^2+p is_____.
   1) 4 2) 16 3) 20 4) 8X5
7. A number increased by '9' gives 43 then number is
   1) 43 2) 34 3) 52 4) 25
8. The value which the variable takes 3(x-1)$\leq$ 2(x+3) in { 8, 9,10, 11} is
   1) x=8 2) x=10 3) x=9 4) both (1) and (3)

9. The value which the variable takes $\frac{3x-5}{2} \geq 4$ in { 5, 6, 7 } is

1) x=5 2) x=6 3) x=7 4) All of the above

10. A number exceeds four-sevenths by 18. Then the number is

1) 24 2) 42 3) 18 4) 72

11. The length of a rectangular park is seven times to it's breadth. If the perimeter of the park is 256 m, then the dimensions are

1) 112 m 2) 16 m 3) 16 cm 4) both (1) and (2)

MULTI ANSWER TYPE

12. If x+5=20 then x is

1) 25 2) 15 3) $\frac{30}{2}$ 4) 5×5

13. which of the following are linear equations.

1) x+y =11 2) m^3 =64 3) x+y+z = 100 4) p+12 =15

14. A man purchased some pens at Rs 8 each and some pencils at Rs.2.50 each. If the total number of pens and pencils purchased is 27 and their total cost is Rs. 150, how many pencils did he buy?

1) 15 2) $\sqrt{225}$ 3) 25 4) $\sqrt{625}$

REASONING ANSWER TYPE

15. *Statement I: The equation x+3=3 then x=0*

Statement II: The root of an equation is in 'N'

1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

16. *Statement I: Two complementary angles differ by* 8°. *Then the angles are* 41° *and* 49°

Statement II: A number exceeds 20% of itself by 40. The number is 50

1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup:1

Equations are (1) 2y+1=11 (2) $\frac{p}{2}$=18 (3) 5x=0 then

17. The value of y in equation (1) is

1)-5 2) 11 3) 5 4) 4

18. The root of equation (2) is

1) 18 2) 18X2 3) 18+2 4)18-2

19. The root of equation (3) is

1) 0 2) 5 3) -5 4) Undefined

Writeup:2

Two equal sides of a triangle are each 5m less than twice the third side. If the perimeter of the triangle is 55m. Then

20. The length of the third side is

1) 13 m 2) 21 m 3) 12 cm 4) 10 cm

21. The length of equal side is

1) 13 m 2) 31 cm 3) 21 m 4) 12 m

22. If each side is doubled then the perimeter is

1) 110 m 2) 100 m 3) 120 m 4) 90 m

MATRIX MATCHING TYPE

23.

Column-I	Column-II
a) If 3y+4=8y-1, then y =	1) 1
b) If $\frac{3}{x}=1\frac{1}{2}$, then x =	2) 8
c) If $\frac{t}{2}=8\frac{1}{2}$, then t =	3) 17
d) If $\frac{1}{2}$x = 4 , then x =	4) 2
	5) -17

INTEGER ANSWER TYPE

24. The R.H.S part of 12-y=25 is _____

KEY & HINTS

WORK SHEET – 1 (KEY)				
1) 2	**2)** 4	**3)** 4	**4)** 4	**5)** 3
6) 1	**7)** 4	**8)** 2	**9)** 1	**10)** 1
11) 2	**12)** 2	**13)** 1	**14)** 1	**15)** 3
16) 1	**17)** 3	**18)** 1	**19)** 3	**20)** 1
21) 2	**22)** 2	**23)** 1,2,3	**24)** 1,2,3,4	**25)** 1,3
26) 1,2	**27)** 1	**28)** 1	**29)** 1	**30)** 1
31) 3	**32)** 3	**33)** 1	**34)** 4	**35)** 3
36) 2	**37)** 2	**38)** 4	**39)** 1	**40)** 2
41) 4	**42)** 1	**43)** 4,3,3,4	**44)** 1,3,2,1	**45)** 3,4,1,2
46) 5,1,2,3	**47)** 2	**48)** 6		

WORK SHEET – 2 (KEY)				
1) 2	**2)** 1	**3)** 1	**4)** 4	**5)** 4
6) 3	**7)** 2	**8)** 1	**9)** 4	**10)** 2
11) 2	**12)** 2,3	**13)** 1,3,4	**14)** 1	**15)** 3
16) 1	**17)** 3	**18)** 2	**19)** 1	**20)** 1
21) 3	**22)** 1	**23)** 1,4,3,2	**24)** 25	

1) conceptual

2) if m=5 then 5(5+1)=30 $\Rightarrow$ 5X6=30 $\Rightarrow$ 30=30

3) conceptual

4) n(ax+b)=m(cx+d)

5) 5x-2x=-8+17 3x=9 x=3

6) p-$\frac{3}{2}=\frac{5}{2}$ p=$\frac{5}{2}+\frac{3}{2}=\frac{8}{2}$=4 $\therefore p^2+p=16+4=20$

7) The number is x.it is increased by 9 is x+9 the result is 43

$\therefore$ x+9=43 x=34

8) if x=8 3x7$\leq$2x11 21$\leq$22(true)

if x=9 3x8$\leq$2x12 24$\leq$24(true)

if x=10 3x9$\leq$2x13 27$\leq$26(false)

if x=11 3x10$\leq$2x14 30$\leq$28(false)

9) if x=5 $\frac{15-5}{2}\geq 4$ 5$\geq$4(true) similarly verify other values

10. x=$\frac{4x}{7}+18$ $x-\frac{4x}{7}=18$ $\frac{3x}{7}=18$ x=42

11. breadth=x length=7x 2(l+b)=256 l+b=128 8x=128 x=16

12) X+5=20 X=20-5 x=15

13) conceptual

14. no.of pens bought=x no of pencils bought= 27-x

8x+(27-x)$\frac{5}{2}$=150 x=15

15) x+3=3 X=3-3 X=0 S:(1) is true

clearly,'0' is not in the set of natural numbers S:(2) is false

16) s : (1) the required angles are $x^\circ,(90-x)^\circ$ since sum of complementary angles=90° ; x-(90-x)=8 $\Rightarrow$ x-90+x=8 $\Rightarrow$ x=49

s : (2) let the number=x 20% of itself=$\frac{20}{100}Xx=\frac{x}{5}$

$\therefore x = \frac{x}{5} + 40 \qquad x - \frac{x}{5} = 40 \qquad \therefore$ x=50

17) 2y+1=11 $\Rightarrow$ 2y=10 $\Rightarrow$ y=5

18) P/2=18 P=2X18

19) X=0/5=0

21) let third side=x two sides are (2x-5),(2x-5) perimeter=2x-5+2x-5+x=5x-10=55, 5x=65, x=13 sides are 13m,21m,21m

23) a) 3Y-8Y=-1-4 -5Y=-5 Y=1 b) $\frac{3}{x} = \frac{3}{2}$ $\therefore$ x=2

c) $\frac{t}{2} = \frac{17}{2} \therefore$ t=17 d) $\frac{1}{2}$x=4 x=8

24) conceptual

RATIO & PROPORTION

SYNOPSIS - 1

RATIO

Suppose Meena's height is 135 cm and her sister Kamla's height is 150 cm.

We may write, $\frac{\text{Meena's height}}{\text{Kamla's height}} = \frac{135}{150} = \frac{9}{10}$

We say that the heights of Meena and Kamla are in the ratio 9:10.
The symbol ':' stands for 'is to'.
We define ratio as under.

Ratio: The ratio of two quantities of the same kind in the same units is the fraction that one quantity is of the other.

Thus, the ratio a is to b is the fraction $\frac{a}{b}$ written as $a:b$. In the ratio $a:b$, we call a as the first term or antecedent and b, the second term or consequent.
Thus, in the ratio 7:4, we have
First term or antecedent = 7, Second term or consequent = 4.

Facts About Ratio:

1. The ratio between two quantities of the same kind and in same units is obtained on dividing the first quantity by the second.

   Examples: (i) Ratio between 125 cm and 175 cm $\frac{125}{175} = \frac{5}{7} = 5:7$

   (ii) Ratio between 18 years and 24 years $= \frac{18}{24} = \frac{3}{4} = 3:4$

2. Ratio is a fraction. It has no unit.
3. The quantities to be compared to form a ratio should be of the same kind.
   We cannot have a ratio between 16 years and Rs. 40.
   Similarly, 25 cm and 200 gms cannot form a ratio.
4. To find a ratio between two quantities of the same kind, both the quantities should be taken in the same unit.
   Example: (i) Ratio between 75 gm and 1 kg
   = Ratio between 75 gm and 1000 gm

   $$\frac{75}{1000} = \frac{3}{40} = 3:40$$

   (ii) Ratio between 65 cm and 1 m = Ratio between 65 cm and 100 cm

   $$= \frac{65}{100} = \frac{13}{20} = 13:20$$

5. If each term of a ratio be multiplied or divided by the same non-zero number, the ratio remains the same.

Examples: (i) $3:4=\frac{3}{4}=\frac{3\times2}{4\times2}=\frac{6}{8}=6:8$ (ii) $8:12=\frac{8}{12}=\frac{8\div4}{12\div4}=\frac{2}{3}=2:3$

Ratio In Simplest Form (or in Lowest Terms)

A ratio a:b is said to be in simplest form, if H.C.F. of a and b is 1.

Examples: (i) The ratio 3:4 is in simlest form, since H.C.F. of 3 and 4 is 1.

(ii) The ratio 12:16 is not in simplest form, since H.C.F. of 12 and 16 is 4.

Rule: To convert a ratio a:b in simplest form, divide a and b by the H.C.F. of a and b.

Comparison of Ratios:

Since ratios are fractions, they can be comlpared similar to the way we compare fractions i.e. by converting them into equivalent like fractions, or by the cross product method.

Increase of Decrease in a Ratio:

Suppose a quantity increases or decreases in the ratio a:b.

Then, new quantity = $\frac{b}{a}$ of the original quantity.

WORK SHEET - 1

SINGLE ANSWER TYPE

1. If $A:B=5:7$ and $B:C=6:11$, then $A:B:C$ is.

1) $55:77:66$ 2) $30:42:77$ 3) $35:49:42$ 4) None of these

2. If $A:B=3:4$ and $B:C=8:9$, then $A:C$ is.

1) $1:3$ 2) $3:2$ 3) $2:3$ 4) $1:2$

3. If $A:B=8:15, B:C=5:8$ and $C:D=4:5$, then $A:D$ is equal to.

1) $2:7$ 2) $4:15$ 3) $8:15$ 4) $15:4$

4. If $2A=3B=4C$, then $A:B:C$ is.

1) $2:3:4$ 2) $4:3:2$ 3) $6:4:3$ 4) $20:15:2$

5. If $\frac{A}{3}=\frac{B}{4}=\frac{C}{5}$, then $A:B:C$ is.

1) $4:3:5$ 2) $5:4:3$ 3) $3:4:5$ 4) $20:15:2$

6. If $2A=3B$ and $4B=5C$, then $A:C$ is.

1) $4:3$ 2) $8:15$ 3) $15:8$ 4) $3:4$

7. The ratio of $4^{3.5}:2^5$ is same as.

1) $2:1$ 2) $4:1$ 3) $7:5$ 4) $7:10$

8. If $\frac{1}{5}:\frac{1}{x}=\frac{1}{x}:\frac{1}{125}$, then the value of x is.

1) 1.5 2) 2 3) 2.5 4) 3.5

9. If $x:y=5:2$, then $(8x+9y):(8x+2y)$ is.

1) $22:29$ 2) $26:61$ 3) $29:22$ 4) $61:26$

10. If $(x:y)=2:1$, then $(x^2-y^2):(x^2+y^2)$ is.

1) $3:5$ 2) $5:3$ 3) $1:3$ 4) $3:1$

11. If $x^2+4y^2=4xy$, then $x:y$ is.

1) $2:1$ 2) $1:2$ 3) $1:1$ 4) $1:4$

12. If $\frac{x}{5}=\frac{y}{8}$, then $(x+5):(y+8)$ is equal to.

1) $3:5$ 2) $13:8$ 3) $8:5$ 4) $5:8$

13. If $\frac{a}{3}=\frac{b}{4}=\frac{c}{7}$, then $\frac{a+b+c}{c}$ is equal to.

1) 7 2) 2 3) $\frac{1}{2}$ 4) $\frac{1}{7}$

14. If $(a+b):(b+c):(c+a)=6:7:8$ and $(a+b+c)=14$, then the value of c is

1) 6 2) 7 3) 8 4) 14

15. If Rs. 782 be divided into three parts, proportional to $\frac{1}{2}:\frac{2}{3}:\frac{3}{4}$, then the first part is.

1) Rs. 182 2) Rs. 190 3) Rs. 196 4) Rs. 204

16. Two numbers are in the ratio $1:2$ If 7 is added to both, their ratio changes to $3:5$. The greatest number is.

1) 24 2) 26 3) 28 4) 32

17. The ratio of three numbers is $3:4:5$ and the sum of their squares is 1250. The sum of the numbers is.

1) 30 2) 50 3) 60 4) 90

MULTI ANSWER TYPE

18. The Sum of two numbers is 1500/-. If the numbers are in the ratio 4 : 2, then the numbers are

1) 1000 2) 900 3) 500 4) 100

19. The sides of a triangle are in the ratio 2:3:4. If the perimeter is 189 cm, then the 3 sides measurements are

1) 42 cm 2) 63cm 3) 84 cm 4) 48cm

20. If the ratio of angles of a scalene triangle is 3 : 4 : 8 and the largest angle is 96^0, then the other two angles are__
1) 98^0 2) 48^0 3) 36^0 4) 94^0

21. The ratio of red balls, green balls and yellow balls in a bag is 5 : 3 : 2. If the number of yellow balls is 12, then the total number of balls is
1) 12 × 5 2) 90 3) 60 4) 15 × 6

REASONING ANSWER TYPE

22. *Statement I :* If x + 20 : x + 30 = 7 : 8, then the value of x is 50.

Statement II : If a : b = c : d, then $\frac{a}{b}=\frac{c}{d}$ and a × d = b × c.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

23. *Statement I :* A gets 5 times as much as B and B gets 4 times as much as C. If you divide Rs.1000/- among A, B and C, then the share of A and B are Rs.800/- and Rs.160/-.

Statement II : If a certain sum Rs. P/- is divided in the ratio a : b : c, then the shares of

A and B are $\frac{a}{a+b+c}\times P$ and $\frac{b}{a+b+c}\times P$ respectively.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

In a cash box, the ratio of number of 50p, 25p and 10p coins is 5 : 9 : 4. If the total value of the coins is Rs.206/-, then

24. The value of 50 paise coins is____
1) Rs. 100/- 2) Rs. 110/- 3) Rs. 90/- 4) Rs. 80/-

25. The number of 10 paise coins are
1) 160 2) 170 3) 150 4) 180

26. The value of 25 paise coins is____
1) 80/- 2) 95/- 3) 90/- 4) 85/-

MATRIX MATCHING TYPE

27.

Column-I	**Column-II**
a) Rs. 150/- : Rs. 350/-	1) 1 : 5
b) Rs. 1 : 15 paise	2) 3 : 7
c) 2 scores : 3 dozens	3) 20 : 3
d) 240m : $1\frac{1}{5}$ km	4) 10 : 9
	5) 2 : 10

INTEGER ANSWER TYPE

28. Two numbers are in the ratio 7 : 3. If their difference is 324 then the sum of two numbers is_____

SYNOPSIS - 2

VARIOUS PROPERTIES OF RATIO

Types of Ratios :

1. In a ratio, order of terms is very important.
2. Since ratio is a fraction, the ratio will remain unchanged if each term of the ratio is multiplied or divided by the same non - zero number.

$$\frac{a}{b}=\frac{ma}{mb}=\frac{a\div m}{b\div m} \qquad m\neq 0$$

3. Ratio always exists between quantities of the same kind which are expressed in same units.
4. Ratio has no unit.
5. To compare two or more ratios, we either convert them to equivalent like fractions or convert them to the decimal form.
6. A ratio $a:b=\frac{a}{b}$ is in its lowest term if H.C.F. of a and b is 1.
7. If a quantity increases or decreases in the ratio a : b, then new quantity $=\frac{b}{a}$ of the original quanity. $\frac{b}{a}$ is called the multiplying ratio.
8. ***Compounded ratio :-*** The compounded ratio of the two ratios $a : b$ and $c : d$ is the ratio $ac : bd$, and that of $a : b$, $c : d$ and e:f is the $ace : bdf$.
9. ***Duplicate ratio :-*** The duplicate ratio of the ratio $a : b$ is the ratio $a^2 : b^2$
10. ***Triplicate ratio:-*** The triplicate ratio of the ratio $a : b$ is the ratio $a^3 : b^3$.
11. ***Sub duplicate ratio:-*** The sub duplicate ratio of the ratio $a : b$ is the ratio $\sqrt{a}:\sqrt{b}$. So, the sub duplicate ratio of the ratio $a^2 : b^2$ is the ratio $a : b$.
12. ***Sub triplicate ratio:-*** The sub triplicate ratio of the ratio $a : b$ is the ratio $\sqrt[3]{a}:\sqrt[3]{b}$.

    So, the sub triplicate ratio of the ratio $a^3 : b^3$ is the ratio $a : b$.
13. ***Reciprocal ratio:-*** The reciprocal ratio of the ratio $a : b$ $(a\neq 0, b\neq 0)$ is the ratio $\frac{1}{a}:\frac{1}{b}$

WORK SHEET - 2

SINGLE ANSWER TYPE

1. The sub duplicate ratio of 484 : 361 is_____
   1) 21 : 19 2) 22 : 18 3) 22 : 19 4) 22 : 17
2. The sub triplicate ratio of 1000 : 512 is___
   1) 5 : 2 2) 5 : 4 3) 5 : 8 4) 5 : 1
3. The receprocal ratio of $4:\frac{1}{9}$ is_____
   1) 36 : 1 2) 1 : 36 3) 1 : 6 4) 6 : 1
4. The reciprocal of compound ratio of 5 : 6 and 10 : 9 is___
   1) 25 : 27 2) 27 : 25 3) 9 : 4 4) None
5. If $\frac{x}{8}=\frac{y}{3}$, then triplicate ratio of x : y is___
   1) 512 : 64 2) 512 : 125 3) 512 : 27 4) 512 : 1
6. The compound ratio of 3x : 4y and $ab^2 : c^2$ and $c : b^2$ is
   1) 3ax : 4cy 2) 3cx : 4ay 3) cxy : 4cx 4) 3ac : 4xy
7. If $\frac{7x-4y}{3x+y}=\frac{5}{13}$, then $y^2 : x^2$ is____
   1) 9 : 16 2) 16 : 9 3) 3 : 4 4) 4 : 3
8. If A : B is the duplicate ratio of A + x : B + x, then
   1) $x^2 = A - B$ 2) $x^2 = A + B$ 3) $x^2 = AB$ 4) $x^2 = \frac{A}{B}$
9. If 2x : 3y be the duplicate ratio of 2x – m : 3y – m, then which of the following is correct?
   1) $m^2 = 2xy$ 2) $m^2 = 3xy$ 3) $m^2 = xy$ 4) $m^2 = 6xy$
10. If 25 is the duplicate ratio of $\frac{5n+4}{2n-1}$, then the value of n is
    1) $\frac{9}{5}$ 2) $\frac{1}{5}$ 3) 9 4) None
11. If x + y : x – y is equal to the duplicate ratio of 3 : 1 then
    1) 125 : 64 2) 25 : 16 3) 5 : 4 4) 8 : 1
12. The compound ratio of $x^2-y^2 : x^2+y^2$ and $x^4-y^4 : (x+y)^4$
    1) $\frac{(x-y)^2}{(x+y)^2}$ 2) $\frac{(x+y)^2}{(x-y)^2}$ 3) $\frac{x^2+y^2}{x^2-y^2}$ 4) $\frac{x^2-y^2}{x^2+y^2}$
13. The duplicate ratio of 25:4 is
    1) 5:2 2) 125:8 3) 625:16 4) 25:4
14. The triplicate ratio of 8:11 is
    1) 64:121 2) 512:2 3) 8:11 4) $3\sqrt{8} : 3\sqrt{11}$
15. The sub-duplicate ratio of 9:16 is
    1) 81:256 2) 27:64 3) 9:16 4) 3:4

16. The sub triplicate ratio of 343:729 is

1) 343:729 2) 7:9 3) 49:81 4) $\sqrt{343} : 27$

Key : 3, 2, 4, 2

Sol.

13. Duplicate ratio of a:b is $a^2 : b^2$

14. Triplicate ratio of $a : b$ is $a^3 : b^3$

15. Sub-duplicate ratio of a:b is $\sqrt{a} : \sqrt{b}$

16. Sub-triplicate ratio of a:b is $\sqrt[3]{a} : \sqrt[3]{b}$.

MULTI ANSWER TYPE

13. If a, b, c, d are in proportion then

1) $\frac{a}{b} = \frac{c}{d}$ 2) ad = bc 3) $d = \frac{bc}{a}$ 4) $b = \frac{ad}{c}$

14. If a, b, c, d are in proportion, then which of the following are true?

1) the 1st and 4th terms are called extremes.
2) the 1st and 4th terms are called means.
3) the 2nd and 3th terms are called means.
4) the 2nd and 3rd terms are called extremes.

15. Which of the following are in continued proportion ?

1) 20, 18, 5, 6 2) 3.6, 0.4, 4.5, 0.5 3) 51, 68, 85, 102 4) 1.5, 2.5, 3.6, 6

16. The compound ratio of duplicate ratio of 5 : 6; the reciprocal ratio of 25 : 32 and sub duplicate ratio of 81 : 64 is_____

1) 2 : 1 2) 3 : 3 3) 4 : 2 4) 1 : 1

REASONING ANSWER TYPE

17. *Statement I :* If 36, x, 16 are in continued proportion, then x = 36.

Statement II : If a, b, c are in continued proportion, then $b = \sqrt{ac}$.

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

18. *Statement I :* If $\frac{1}{9} : x :: \frac{1}{3} : \frac{1}{4}$, then $x = \frac{1}{12}$

Statement II : If a : b :: c : d then ab = cd

1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

A sum of money is divided among 160 males and some females in the ratio 16 : 21. Individually each male gets Rs. 4 and each famale gets Rs. 3.

19. The number of females are

1) 280 2) 198 3) 284 4) 270

20. The ratio of earnings of 15 males and 3 females is_____

1) 9 : 20 2) 20 : 9 3) 20 : 7 4) 20 : 3

21. If there were 60 less men and 120 more females, then the ratio males of females is_____

1) 4 : 1 2) 1 : 4 3) 3 : 4 4) 2 : 4

MATRIX MATCHING TYPE

22. 2a = 3b = 4c = 12

Column-I	**Column-II**
a) 4th proportional to a,b,c	1) 8/3
b) 3rd proportional to b, c	2) $2\sqrt{6}$
c) Mean proportional between a & b	3) 9/4
d) 3rd proportional to a, b	4) 2
	5) $\sqrt{24}$

SYNOPSIS - 3

PROPORTION

Proportion: A statement of equality of two ratios is called a proportion.

Example: We know that $18:45=2:5$.

We write it as 18:45 :: 2:5, where the symbol : : stands for 'is as'.

We say that 18, 45, 2, 5 are in proportion.

Thus, four quantities a, b, c, d are said to be in proportion if $a:b=c:d$

i.e. if $\frac{a}{b}=\frac{c}{d}$ i.e., if $ad=bc$

Facts About proportion:

1. In a proportion:
   (i) The first and fourth terms are called the extremes.
   (ii) The second and third terms are known as the means.
   (iii) Product of means = Product of extremes
2. If $a:b::c:d$ then d is called the fourth porportional to a,b,c.
3. If $a:b=b:c$, then we say that
   (i) a,b,c are in continued proportion.
   (ii) c is the third porportional to a and b.
   (iii) b is the mean proportion between a and c.

   Now, we have $:a:b=b:c\Rightarrow\frac{a}{b}=\frac{b}{c}$

$$\Rightarrow ac = b^2 \Rightarrow b = \sqrt{ac}$$

Hence, mean proportion between a and $c = \sqrt{ac}$.

Example:

Check whether the following quantities are in proportion or not:

(i) 20, 18, 5, 6 (ii) 3.6, 0.4, 4.5, 0.5

Sol. (i) We have : 20 : 18 $= \frac{20}{18} = \frac{10}{9}$. And $5:6 = \frac{5}{6}$

$\therefore 20:18 \neq 5:6$

Hence, 20, 18, 5, 6 are not in proportion.

Alternative Method:

Product of extreme terms $= 20 \times 6 = 120$.

Product of middle terms $= 18 \times 5 = 90$

Thus, product of extreme terms $\neq$ product of middle terms.

Hence, 20, 18, 5, 6 are not in proportion.

ii) $3.6:0.4 = \frac{3.6}{0.4} = 9$. And $4.5:0.5 = \frac{4.5}{0.5} = 9$

$\therefore 3.6:0.4 = 4.5:0.5$

Hence, 3.6, 0.4, 4.5, 0.5 are in proportion.

Alternative Method:

Product of extreme terms $= 3.6 \times 0.5 = 1.8$

Product of middle terms $= 0.4 \times 4.5 = 1.8$

Thus, product of extremes = product of means.

Hence, 3.6, 0.4, 4.5, 0.5 are in proportion.

WORK SHEET - 3

SINGLE ANSWER TYPE

1. If 1st, 2nd and 4th terms of a proportion are respectively 5.2, 3.9 and 3, then its third term is___

   1) 6 2) 2 3) 4 4) 3

2. If 16, x, 36 are in proportion, then the mean proportional is___

   1) 28 2) 26 3) 24 4) 22

3. If 15, 30, y are in proportion, then the third proportional is____

   1) 80 2) 70 3) 50 4) 60

4. If $2\frac{1}{2} : x = 12\frac{1}{2} : 6\frac{1}{4}$, then the value of x is __

   1) $\frac{5}{8}$ 2) $\frac{5}{2}$ 3) $\frac{5}{4}$ 4) $\frac{5}{16}$

5. The number that should be added to each of the numbers 8, 20, 12, 28 to make the new numbers proportional

1) 8 2) 6 3) 4 4) 2

6. Two number whose mean proportional is 28 and the third proportional is 224 are

1) 14, 28 2) 28, 56 3) 42, 56 4) 14, 56

7 The third proportional to x + y, 2x + 3y when x = 3, y = 2 is_____

1) $\frac{145}{7}$ 2) $\frac{142}{7}$ 3) $\frac{143}{7}$ 4) $\frac{144}{5}$

8. If b is the mean proportional of 9, 49**;** c is the third proportional to 7, 49 d is the fourth proportional to 14, 49, 35, then the 4th proportional to b, c, d is

1) $\frac{12015}{6}$ 2) $\frac{12005}{6}$ 3) $\frac{12025}{6}$ 4) $\frac{11535}{6}$

9. If $2x - 5 = \frac{y+4}{2} = z \div \frac{5}{2} = 5$, then to mean proportional of x + y and y + z is

1) $\sqrt{\frac{37\times11}{2}}$ 2) $\sqrt{\frac{37\times2}{11}}$ 3) $\sqrt{\frac{37}{2\times11}}$ 4) None

MULTI ANSWER TYPE

10. If x, 5, 10 and 5, 10, y are in proportion, then the value of x and y are

1) $x = 20, y = 2\frac{1}{2}$ 2) $x = \frac{5}{2}, y = 20$ 3) $x = 5\frac{1}{2}, y = 20$ 4) $x = 2\frac{1}{2}, y = 20$

11. If $a : c :: (a^2 + b^2) : (b^2 + c^2)$, then which of the following is corect?

1) $a^2 = bc$ 2) $\frac{b}{a} = \frac{c}{b}$ 3) $\frac{a}{b} = \frac{b}{c}$ 4) $b^2 = ac$

12. If the fourth proportion to 2.1m, 1.5m, 6.3m is 'x' and the third proportional to 1m 60cm, 40cm is 'y', then the mean proportion between x and y is _____

1) $\sqrt{4500}$cm 2) $30\sqrt{5}$cm 3) $30\sqrt{5}$m 4) $5\sqrt{30}$cm

13. The fourth proportion to 1.8, x, 2.4 is 6. The 3rd proportional to $\frac{1}{9}$ and $\frac{2}{3}$ is y and the mean proportion between $\frac{2}{3}$ and $\frac{8}{27}$ is z then the square root of the fourth proportional to x, y, z is

1) $\frac{8}{81}$ 2) $\sqrt{\frac{32}{81}}$ 3) $\frac{4\sqrt{2}}{9}$ 4) $\frac{2\sqrt{2}}{9}$

REASONING ANSWER TYPE

14. *Statement I :* 18, 45, 2, 5 are in proportion.
Statement II : Four quantities a, b, c, d are said to be in proportion if a : b = c : d.
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

15. *Statement I :* The fourth proportional to 3hrs 12min, 24min, 2min 8sec is 1min 6sec.
Statement II : If a:b: : c:d, then d is fourth proportional to a, b, c.
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

If a : b = b : c, then we say that (i) a, b, c are in continued proportion, (ii) c is 3rd proportional to 'a' and 'b'. (iii) b is the mean proportion between 'a' and 'c'.

16. If 36, 24 and x are in continued proportion, then x = _____
1) 6 2) 26 3) 16 4) 106

17. The third proportional to 25 and 15 is _____
1) 35 2) 20 3) 9 4) 5

18. The mean proportion between 2.5 and 0.9 is
1) 15 2) 1.5 3) 0.15 4) 11.5

MATRIX MATCHING TYPE

19.

Column-I	**Column-II**
a) If 3.6 : x : : 0.4 : 0.5, then x =	1) 2
b) If x : 1.6 : : 2.1 : 8.4, then x =	2) $\frac{1}{12}$
c) If $\frac{1}{9} : x : : \frac{1}{3} : \frac{1}{4}$, then x =	3) 4.5
d) If 42 : 12 : : 7 : x, then x =	4) 0.4
	5) 0.083

INTEGER ANSWER TYPE

20. If x, 8, 16 are in proportion, then the value of x is_____

CUMULATIVE

SINGLE ANSWER TYPE

1. A school spends Rs.6000 per month towards wheat when the cost of the wheat is Rs.20 per kg. If the price goes up to Rs.25 per kg, then the amount of money spent on wheat is___ 1) 7600/-
   2) 7400/- 3) 7200/- 4) 7500/-

2. If $22\frac{1}{2}$ m of silk costs Rs. 675, then the cost of $6\frac{1}{4}$ metres is__
   1) Rs.186.5 2) Rs.188.5 3) Rs.187.5 4) Rs.182.5

3. If 15 post cards cost Rs.11.25, then cost of 36 post cards is___
   1) 28/- 2) 26/- 3) 27/- 4) 29/-

4. If 15 iron balls of the same size weight 10kg 50gms, then 4.690 kg is the weight of
   1) 5 2) 6 3) 7 4) 9

5. There are 120 students in a mess. The food is enough for 75 days. If 60 more students join the Mess, then the food will last for
   1) 60 2) 40 3) 50 4) 75

6. The amount of energy produced in human body is directly proportional to the amount of fats burnt. If burning of 24gms of fat energy produced 144 calories, then the amount of fats consumed to release 252 calories of energy is
   1) 48 gms 2) 36 gms 3) 42 gms 4) 40 gms

7. The pressure P exerted at any point on the base of a tank filled with liquid varies directly as the depth D of the liquid. The pressure exerted by the liquid 40 cms deep on the base of a tank is 80 grams/sq.cm. If the 25cm, then the pressure exerted is
   1) 100 gm/cm^2 2) 25 gm/cm^2 3) 75 gm/cm^2 4) 50 gm/cm^2

8. The distance d that an object will fall freely from rest varies directly as the square of times. An object fall 128metres in 4 seconds. If it falls in 16 seconds, then the height through where it will fall is
   1) 2048 m 2) 2046 m 3) 2044 m 4) 2042 m

9. 100 people can construct a bridge in 150 days. If the bridge has to be constructed in 50 days, then the number of extra men required to complete the bridge is
   1) 250 2) 150 3) 200 4) 225

10. A publisher prints 32 lines in each page and takes 400 pages to print the matter. If the number of pages are restricted to 320 pages, then the number of line s printed in each page is
    1) 40 2) 60 3) 50 4) 56

11. The rate of vibrations (n) of a wire in tension is inversely proportional to its length (l) when the length of the wire is 160 cm, the vibrations are 400 per second. If the length is 100 cm, then the number of vibrations is
    1) 650 2) 630 3) 640 4) 620

12. England team scored 8 runs per over (R) in 50 overs (O). If India has to win in 40 overs, then the number of runs to be scored by them to win the match is_____(runs/over)
1) 10 2) 20 3) 30 4) 40

MULTI ANSWER TYPE

13. A train travels at 150 kmph and takes 8 hours to reach the distance. If it travels at 225 kmph, then the time taken by it is
1) $6\frac{1}{3}$hrs 2) $4\frac{1}{3}$hrs 3) $5\frac{1}{3}$hrs 4) $\frac{16}{3}$hrs

14. y varies inversely as a and a = 24, when y = 6. If y = 108, then the value of a is
1) $\frac{1}{3}$ 2) $\frac{2}{3}$ 3) $\frac{4}{3}$ 4) $\frac{5}{3}$

15. The square of the period of oscillation (T^2) of a simple pendulum is directly proportional to the length *(l)* of the simple pendulum when T = 8, l = 49cm. If l= 64, then the value of T is
1) $\frac{64}{7}$ sec 2) $\frac{66}{7}$ sec 3) 9.143 sec 4) $9\frac{1}{7}$ sec

16. It is known that current (i) in circuit is inversely proportional to resistance (R). When the resistance is 20 ohms current is 8 amperes. If the resistance is 15 ohms, then the current flow in the circuit is
1) 10.33 amperes 2) $10\frac{2}{3}$ amperes 3) $10\frac{1}{3}$ amperes 4) 10.66 amperes

REASONING ANSWER TYPE

17. *Statement I :* If the cost of 15 Maths Olympiad books is Rs.1500, then the cost of 25 Maths Olympiad books is Rs.2500.
Statement II : If two variables x and y vary directly, then x = k . y
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

18. *Statement I :* In an army camp provisions are enough for 72 days for 800 people. If after 22 days, 400 people join the garrison, then the number of days provisions will last is 100/3 days
Statement II : Some workers working 10 hrs a day can complete the work in 60 days. If they work 15hours per day, then the number of days they take to complete the work is 40 days
1. Both Statements are true, Statement II is the correct explanation of Statement I.
2. Both Statements are true, Statement II is not correct explanation of Statement I.
3. Statement I is true, Statement II is false.
4. Statement I is false, Statement II is true.

COMPREHENSION TYPE

Two quantities 'x' and 'y' are in (1) Directly proportional, if x = ky. (2) Inversely proportional, if xy = k. Where k is proportionality constant.

19. Two quantities 'x' and 'y' are in directly proportional such that x = 102 and y = 170. Then proportionality constant, k = _____
    1) 0.6 2) 6 3) 60 4) 0.06
20. Given x = 20, y = 15 and $x \propto y$. If x = 4, then y = _____
    1) 16 2) 3 3) 9 4) 4
21. Given $x \propto \frac{1}{y}$, x = 185 and y = 4. If y = 10, then x = _____
    1) 76 2) 75 3) 74 4) 73

MATRIX MATCHING TYPE

22.

Column-I	Column-II
a) $x \propto y$ and x =9, when y =3. If y = 8, then x =___	1) 14
b) $x \propto y$ and x =9, when y =3. If x = 42, then y =____	2) 2
c) $y \propto \frac{1}{x}$ and x = 6, when y = – 3 If x = – 9, then y =	3) 24 ___
d) $y \propto \frac{1}{x}$ and x = 6, when y = – 3 If y = 2, then x = _____	4) – 9 5) 9

INTEGER ANSWER TYPE

23. If a lorry can carry 600 bags each weighing 8 kg. If each bag contains 12 kg, then the number of bags it can carry is_____
24. 80 horses can graze a field in 30 days. If there were 120 horses, then the number of days horse can graze it is_____

KEY & HINTS

WORK SHEET – 1 (KEY)				
1) 2	**2)** 3	**3)** 2	**4)** 3	**5)** 3
6) 3	**7)** 2	**8)** 3	**9)** 3	**10)** 1
11) 1	**12)** 4	**13)** 2	**14)** 1	**15)** 4
16) 3	**17)** 3	**18)** 1,3	**19)** 1,2,3	**20)** 2,3
21) 1,3	**22)** 1	**23)** 1	**24)** 1	**25)** 1
26) 3	**27)** A-2 B-3 C-4 D-1,5	**28)** 810		

18. **Key: 1, 3,** Given x + y = 1500 x : y = 4: 2
2y + y = 1500 x / y = 4 / 2
3y = 1500 x = 2y
y = 500 x = 2(500)
x = 1000

19. **Key: 1,2,3,** Given a : b : c = 2 : 3 : 4 $\Rightarrow$ a = 2x, b = 3x, c = 4x
Since a + b + c = 2x + 3x + 4x = 189cm $\therefore$ a= 2(21) = 42 cm
$\Rightarrow$ (2 + 3 + 4) x = 189 b= 3(21) = 63cm
$\Rightarrow$ 9x = 189 c= 4(21) = 84cm
$\Rightarrow$ x = 21cm

20. **Key: 2,3,** Given, the ratio of angles of scelene triangle = 3 : 4 : 8
$\Rightarrow \angle A : \angle B : \angle C = 3 : 4 : 8 \Rightarrow \angle A = 3x, \quad \angle B = 4x \quad \angle C = 8x$
given largest angle = 96^0 $\Rightarrow 8x = 96^0$ $\Rightarrow$ x = 12^0

$\therefore \angle A = 3x = 3(12^0) = 36^0$ and $\therefore \angle B = 4x = 4(12^0) = 48^0$

21. **Key: 1,3,** Given, the ratio of red, green and yellow balls = 5 : 3 : 2
Number of red balls = 5x; Number of green balls = 3x
Number of yellow balls = 2x; Since the number of yellow balls = 12
$\Rightarrow$2x = 12, then x = 6 $\therefore$ Total number of balls = 5x + 3x + 2x = 10x = 10(6)= 60

22. **Key: 1,** $\frac{x+20}{x+30} = \frac{7}{8} \Rightarrow 8x + 160 = 7x + 210 \Rightarrow x = 210 - 160 \Rightarrow x = 50$
St(1) is true, Clearly st (2) is true and st(2) is correct explanation of st (1)

23. **Key: 1,** Clearly St(2) is true; St(1): Let C's share = x
$\therefore$ B's share = 4x A's share = 5 times B's share
= 5(4x) = 20x

Since p = 1000/- $\therefore$ A's share $= \frac{a}{a+b+c} \times p = \frac{20x}{20x+4x+x} \times 1000 = \frac{20x}{25x} \times 1000$
= 800/-

B's share = $\frac{b}{a+b+c} \times p = \frac{4x}{25x} \times 1000 = 160/-$ so st(1) is true and st(2) is correct explanation of st (1)

24. **Key: 1,**Given the ratio of 50p, 25p, 10p coins = 5 : 9 : 4
Number of 50p Coins = 5x; Number of 25p coins = 9x; Number of 10p coins = 4x
Since (5x) (50p) +(9x)(25p) +(4x)(10p) = 206

$$\Rightarrow 5x\left(\frac{1}{2}\right) + 9x\left(\frac{1}{4}\right) + 4x\left(\frac{1}{10}\right) = 206 \Rightarrow x\left(\frac{5}{2} + \frac{9}{4} + \frac{4}{10}\right) = 206$$

$$\Rightarrow x\left(\frac{50+45+8}{20}\right) = 206 \quad \Rightarrow x = \frac{20 \times 206}{103} = 40$$

Number of 50p coins = 5x = 5 × 40 = 200; Number of 25p coins = 9x = 9 × 40 = 360

Number of 10p coins = 4x = 4 × 40 = 160; Value of 50p coins = 5x × 50p
= 200 × 1/2 = 100

25. **Key: 1,** Number of 10 paise coins = 4x = 160

26. **Key: 3,** Value of 25 paise coins = 9x × 25p
= 360 × 1/4 = 90/-

27. **Key: a → 2, b → 3, c → 4, d → 1, 5**

a) Rs 150 : Rs 350 = 150/350= 3 : 7

b) Rs 1:15 paise = 100 paise : 15paise. = 20/3 = 20 :3

c) 2 Scores : 3 dozens = 2(20) : 3(12)
= 40 : 36 = 10 : 9

d) 240m: $1\frac{1}{5}$ km = 240m : 6/5×1000m = 240 : 1200 = 2 : 10 = 1 : 5

28. **Key: 810,** Let the number be x and y

Since x : y = 7 : 3 and x – y = 324; $\frac{x}{y}=\frac{7}{3}$ and x – y = 324

$\Rightarrow x=\frac{7}{3}y$ and $\frac{7}{3}y-y=324 \Rightarrow \left(\frac{7}{3}-1\right)y=324=\frac{4}{3}y=324$

$\Rightarrow \frac{4}{3}y=324 \Rightarrow y=\frac{324\times 3}{4}=243$

$\therefore x=\frac{7}{3}(243)=567 \Rightarrow x+y=567+243=810$

WORK SHEET – 2 (KEY)				
1) 3	**2)** 2	**3)** 2	**4)** 2	**5)** 3
6) 1	**7)** 2	**8)** 3	**9)** 4	**10)** 1
11) 1	**12)** 1	**13)** 1,2,3,4	**14)** 1,3	**15)** 2,4
16) 2,4	**17)** 4	**18)** 3	**19)** 1	**20)** 4
21) 2	**22)** A-4 B-3 C-2,5 D-1			

1. **Key: 3,** Sicne sub duplicate ratio of a : b is $\sqrt{a} : \sqrt{b}$

   Sub duplicate ratio of 484 : 361 = $\sqrt{484} : \sqrt{361} = 22 : 19$

2. **Key: 2,** Since sub triplicate ratio of a : b is $\sqrt[3]{a} : \sqrt[3]{b}$

   $\therefore$ sub triplicate ratio of 1000 : 512 = $\sqrt[3]{1000} : \sqrt[3]{512}$

   $\Rightarrow (10^3)^{1/3} : (8^3)^{1/3} = 10 : 8 = 5 : 4$

3. **Key: 2,** $4 : \frac{1}{9} = 36 : 1$ Reciprocal ratio of $4 : \frac{1}{9} = 1 : 36$

4. **Key: 2,** Compund raito of a : b and c : d is ac : bd
   The compound ratio of 5 : 6 and 10 : 9 is (5 × 10) : (6 × 9) = 50 : 54 = 25 : 27
   The reciprocal ratio of above compound ratio is 27: 25

5. **Key: 3,** Given $\frac{x}{8} = \frac{y}{3} \Rightarrow \frac{x}{y} = \frac{8}{3} \Rightarrow x : y = 8 : 3$

   The tiplicat ratio of x : y = $x^3 : y^3 = 8^3 : 3^3 = 512 : 27$

6. **Key: 1,** The compound ratio of a : b, c : d and e : f is ace: bdf
   The compound ratio of 3x : 4y , $ab^2 : c^2$ and c: $b^2 = (3x)\ (ab^2)\ (c) : (4y)\ (c^2)\ (b^2) = 3xa : 4cy$

7. **Key: 2,** Since $\frac{7x - 4y}{3x + y} = \frac{5}{13} \Rightarrow 91x - 52y = 15x + 5y \Rightarrow 76x = 57y \Rightarrow \frac{x}{y} = \frac{57}{76} = \frac{3}{4}$

   $y^2 : x^2 = \left(\frac{y}{x}\right)^2 = \left(\frac{4}{3}\right)^2 = 16 : 9$

8. **Key: 3,** Duplicate ratio of (A + x : B + x) is $(A+x)^2 : (B + x)^2$
   given that, the duplicate ratio is A : B

   $= A : B = (A + x)^2 : (B + x)^2 \Rightarrow \frac{A}{B} = \left(\frac{A+x}{B+x}\right)^2$

   $\Rightarrow \frac{A}{B} = \frac{A^2 + x^2 + 2Ax}{B^2 + x^2 + 2Bx}$

   $\Rightarrow AB^2 + Ax^2 + 2ABx = BA^2 + Bx^2 + 2ABx \Rightarrow x^2 = AB$

9. **Key: 4,** Duplicate ratio of (2x – m) : (3y – m) is $(2x - m)^2 : (3y - m)^2$

   Since 2x : 3y = $(2x - m)^2 : (3y - m)^2 \Rightarrow \frac{2x}{3y} = \left(\frac{2x - m}{3y - m}\right)^2 \Rightarrow \frac{2x}{3y} = \frac{4x^2 + m^2 - 4mx}{9y^2 + m^2 - 6my}$

   $\Rightarrow 18xy^2 + 2m^2x - 12mxy = 12x^2y + 3m^2y - 12mxy \Rightarrow 6xy(2x - 3y) = m^2(2x - 3y)$
   $\Rightarrow m^2 = 6xy$

10. **Key: 1,** Duplicate raito of $\frac{5n+4}{2n-1}$ is $(5n+4)^2 : (2n-1)^2$

Given $\Rightarrow 25 = \left(\frac{5n+4}{2n-1}\right)^2 \Rightarrow 5 = \frac{5n+4}{2n-1} \Rightarrow 10n - 5 = 5n + 4 \Rightarrow 5n = 9 \Rightarrow n = 9/5$

11. **Key: 1,** Given $x+y : x - y = 9 : 1 \Rightarrow \frac{x+y}{x-y} = 9 \Rightarrow x + y = 9x - 9y \Rightarrow 8x = 10y \Rightarrow \frac{x}{y} = \frac{5}{4}$

$\therefore x^3 : y^3 = \left(\frac{x}{y}\right)^3 = \left(\frac{5}{4}\right)^3 = \frac{125}{64}$

12. **Key: 1,** Compound ratio of a : b and c : d is ac :bd.
Compound ratio of $(x^2 - y^2) : (x^2 + y^2)$ and $x^4 - y^4 : (x + y)^4$ is
$(x^2-y^2)(x^4-y^4) : (x^2+y^2)(x+y)^4$
$= (x^2-y^2)(x^2-y^2)(x^2+y^2) : (x^2+y^2)(x+y)^2(x+y)^2$
$= (x+y)^2(x-y)^2 : (x+y)^2(x+y)^2 = (x-y)^2 : (x+y)^2$

13. **Key: 1,2,3,4**,Since a,b,c,d are in proportion, Then $\frac{a}{b} = \frac{c}{d} \Rightarrow ad = bc \Rightarrow d = \frac{bc}{a}$ and $b = \frac{ad}{c}$

14. **Key: 1,3,** Since a,b,c,d are in proprotion $\Rightarrow$ ad = bc
$\Rightarrow$ a and d are called extremes and b and c are called means
so, (i) 1st and 4th terms are extremes (ii) 2nd and 3rd terms are means

15. **Key: 2, 4,** If a, b, c, d are in continued proportion.
Then ad = bc
1) $20 \times 6 = 18 \times 5 \Rightarrow 120 = 90$ (False)
2) $3.6 \times 0.5 = 0.4 \times 4.5 \Rightarrow 1.8 = 1.8$ (True)
3) $51 \times 102 = 68 \times 85 \Rightarrow 5202 = 5780$ (False)
4) $1.5 \times 6 = 2.5 \times 3.6 \Rightarrow 9 = 9$ (True)
There fore 3.6, 0.4, 4.5 and 0.5 are in continued proportion and 1.5, 2.5, 3.6 and 6 are also in continued proportion

16. **Key: 2, 4,** Duplicate ratio of 5 : 6 is 25 : 36
The reciprocal ratio of 25 :32 is 32 : 25
The sub duplicate ratio of 81 : 64 is $\sqrt{81} : \sqrt{64}$ = 9 : 8

The compound ratio of 25 : 36 , 32 : 25 and 9 : 8 is $=(25)(32)(9):(36)(25)(8)$
$=1:1$

17. **Key: 4,** Since 36, x, 16 are in continued proprotion $x=\sqrt{36\times16}\Rightarrow6\times4=24$
so St (1) is false but st(2) is true

18. **Key: 3,** a : b :: c : d $\Rightarrow$ ad = bc st (2) is false

st (1) $\frac{1}{9}:x::\frac{1}{3}:\frac{1}{4}\Rightarrow\left(\frac{1}{9}\right)\left(\frac{1}{4}\right)=(x)\left(\frac{1}{3}\right)\Rightarrow x=\frac{1}{12}$ St(1) is ture

19. **Key: 1,** Number of males = 160; Number of females = n(say)
Since, the ratio of amount of many among males and females = 16 : 21
The total amount of money among males = 16x

Since each male gets Rs. 4/-; $16x=160\times4\Rightarrow x=\frac{160\times4}{16}\Rightarrow 40/-$

The total amount of many among females = $21x\Rightarrow21(40)\Rightarrow840/-$
But each female gets Rs. 3/-;$\Rightarrow$ 3n = 840 $\Rightarrow$ n = 280
Number of females = 280

20. **Key: 4,** The ratio of earnings of 15 males and 3 females= (15×4) : (3 × 3)
= 60 : 9$\Rightarrow$ 20 : 3

21. **Key: 2,** If 60 men are less and 120 females are more
The new ratio of males and females = (160 – 60) : (280 + 120) = 100 : 400 = 1 : 4

22. **Key: a → 4, b → 3, c → (2, 5), d → 1** Since 2a = 3b = 4c =12 $\Rightarrow$a= 6, b = 4, c = 3

a) If a : b = c : d then d is 4th proortional of a,b,c $\Rightarrow$ 6 : 4 = 3 : d

$\Rightarrow \frac{6}{4}=\frac{3}{d}\Rightarrow d=2$

The 4th proportional of a, b, c is '2'

b) Let 'x' be 3rd proportinal to b, c $\Rightarrow$ b, c, x are in continued proportion

$\Rightarrow$ b : c = c : x $\Rightarrow$ 4 : 3 = 3 : x $\Rightarrow\frac{4}{3}=\frac{3}{x}\Rightarrow x=\frac{9}{4}$

c) Mean proportional between a and b = $\sqrt{ab}=\sqrt{6\times4}=\sqrt{24}=2\sqrt{6}$

d) Let 3rd proportinal to a,b, y
a, b, y are in continued proportion.

$\Rightarrow$ a : b = b : y; 6 : 4 = 4 : y $\Rightarrow\frac{6}{4}=\frac{4}{y}\Rightarrow y=\frac{8}{3}$

WORK SHEET – 3 (KEY)				
1) 3	**2)** 3	**3)** 4	**4)** 3	**5)** 3
6) 4	**7)** 4	**8)** 2	**9)** 1	**10)** 2,4
11) 2,3,4	**12)** 1,2	**13)** 2,3	**14)** 1	**15)** 4
16) 3	**17)** 3	**18)** 3	**19)** A-3 B-4 C-2,5 D-1	**20)** 4

1. **Key: 3,** Let the 3rd term be x $\Rightarrow$ $5.2:3.9 = x:3$

$\Rightarrow 3.9 \times x = 5.2 \times 3 \Rightarrow x = \frac{5.2 \times 3}{3.9} \Rightarrow x = 4.$

2. **Key: 3,** $16:x = x:36 \Rightarrow 16 \times 36 = x \times x \Rightarrow x^2 = 576 \Rightarrow x^2 = \sqrt{576} \Rightarrow x = 24$

3. **Key: 4,** $15:30 = 30:y \Rightarrow 15 \times y = 900 \Rightarrow y = \frac{900}{15} \Rightarrow y = 60$

4. **Key: 3,** $2\frac{1}{2} : x = 12\frac{1}{2} : 6\frac{1}{4} \Rightarrow$

$\frac{25}{2} \times x = \frac{5}{2} \times \frac{25}{4} \Rightarrow x = \frac{125}{8} \div \frac{25}{2} \Rightarrow x = \frac{125}{8} \times \frac{2}{25} \Rightarrow x = \frac{5}{4}$

5. **Key: 3,** Let the number added to be x $\Rightarrow$ $8+x : 20+x = 12+x : 28+x$

$\Rightarrow (8 + x)(28 + x) = (12 + x)(20 + x) \Rightarrow 224+8x+28x+x^2 = 240+12x+20x+x^2$

$\Rightarrow 36x - 32x + x^2 - x^2 = 240 - 224 \Rightarrow 4x = 16 \Rightarrow x = \frac{16}{4} \Rightarrow x = 4.$

6. **Key: 4,** Let the number be a, b given mean proportional of a,b is $\sqrt{ab} = 28$
Let 'c' be 3rd proportional ie c = 224, Since 'c' is 3rd proportinal of a, b

$\Rightarrow a : b = b : c \Rightarrow \frac{a}{b} = \frac{b}{c} \Rightarrow b^2 = ac \Rightarrow b^3 = abc \Rightarrow b^3 = (28)^2(224) = (28)^2 \times (8 \times 28)$

$\therefore$ b = 56; Since ab = $(28)^2 \Rightarrow$ a (56) = (28)$^2 \Rightarrow$ a(28 × 2) = 28 × 28 $\Rightarrow$ a = 14
$\therefore$ Required two numbers are 14 and 56

7. **Key: 4,** Since x = 3, y = 2
$\therefore$ x + y = 3 + 2 = 5 and 2x + 3y = 2(3) + 3(2) = 12;
Let 'a' 3rd proportional to (x + y), (2x + 3y)

$\Rightarrow$ (x+y) : (2x+3y) = (2x+3y) : a $\Rightarrow$ (5 : 12 = 12 : a $\Rightarrow$ $\frac{5}{12}=\frac{12}{a} \Rightarrow a=\frac{144}{5}$

8. **Key : 2,** Since 'b' is the mean proportional of 9, 49 $\Rightarrow$ $b=\sqrt{9\times 49}$ = 3 × 7 = 21 $\Rightarrow$ b = 21

Since 'c' is 3rd proportional to 7, 49 $\Rightarrow$ 7 : 49 = 49 : c $\Rightarrow \frac{\cancel{7}}{\cancel{49}_{7}}=\frac{49}{c} \Rightarrow$ c = 343

Since 'd' is 4th proportional to 14, 49, 35 $\Rightarrow$ 14 : 49 = 35 : d $\Rightarrow$

$\cancel{14}_{2}\, d = \cancel{49}^{7}\times 35 \Rightarrow d=\frac{245}{2}$; Let 'x' be 4th proportional to b, c, d

$\Rightarrow$ b : c = d : x $\Rightarrow$ b × x = c × d $\Rightarrow x=\frac{c\times d}{b}=\frac{343\times\left(\frac{245}{2}\right)}{21}$

$\Rightarrow x=\frac{343\times 245}{21\times 2} \Rightarrow x=\frac{12005}{6}$

9. **Key : 1,** Given $2x-5=\frac{y+4}{2}=z\div\frac{5}{2}=5 \Rightarrow$ 2x – 5 = 5, $\frac{y+4}{2}=5$, $z\div\frac{5}{2}=5$

$\Rightarrow$ 2x = 10, y + 4 = 10, $\frac{z}{\left(\frac{5}{2}\right)}=5 \Rightarrow$ x = 5, y = 6, $z=\frac{25}{2}$

$\therefore$ x + y = 5 + 6 = 11; $y+z=6+\frac{25}{2}=\frac{37}{2}$

$\therefore$ Mean proportional of (x+y) (y + z) is $=\sqrt{(x+y)(y+z)}$ $=\sqrt{11\times\frac{37}{2}}$

$=\sqrt{\frac{11\times 37}{2}}$

10. **Key: 2,4,** x : 5 = 5 : 10 $\Rightarrow$ 10x = 25 $\Rightarrow x=\frac{25}{10} \Rightarrow x=\frac{5}{2}$

5 : 10 = 10 : y $\Rightarrow$ 5y = 100 $\Rightarrow y=\frac{100}{5} \Rightarrow$ y = 20.

11. **Key: 2,3,4,** Given a : c : : (a^2 + b^2) : (b^2 + c^2) $\Rightarrow$ a(b^2+c^2) = c (a^2 + b^2)

$\Rightarrow ab^2 + ac^2 = a^2c + b^2c \Rightarrow ac^2 - a^2c = b^2c - b^2a \Rightarrow b^2 = ac \Rightarrow \frac{b}{a} = \frac{c}{b} \Rightarrow \frac{a}{b} = \frac{b}{c}$

12. **Key: 1,2,** Since 4th proportional to 2.1m, 1.5m, 6.3m is x.

$\Rightarrow$ 2.1m : 1.5m = 6.3m : x $\Rightarrow$ (2.1)x = (1.5) (6.3) $\Rightarrow$ $x = \frac{1.5 \times 6.3}{2.1} = 4.5m \Rightarrow x = 4.5m.$

Since the 3rd proportional to 1m 60cm, 40cm is y.

$\Rightarrow$ 1m 60cm : 40cm = 40cm : y $\Rightarrow$ 160cm : 40cm = 40cm : y $\Rightarrow$ y = 10cm.

$\therefore$ The mean proportion between 'x' and 'y' is

$\sqrt{xy} = \sqrt{4.5m \times 10cm} = \sqrt{450cm \times 10cm} = \sqrt{4500}\,cm = 30\sqrt{5}\,cm.$

13. **Key: 2,3,** Since 4th proportional to 1.8, x, 2.4 is 6. $\Rightarrow \frac{1.8}{x} = \frac{2.4}{6} \Rightarrow x = \frac{1.8 \times 6}{2.4} \Rightarrow x = \frac{9}{2}.$

Since 3rd proportional to $\frac{1}{9}$ & $\frac{2}{3}$ is y. $\Rightarrow \frac{1}{9} : \frac{2}{3} = \frac{2}{3} : y \Rightarrow y = 4.$

Since the mean proportion between $\frac{2}{3}$ and $\frac{8}{27}$ is z.

$\Rightarrow z = \sqrt{\frac{2}{3} \times \frac{8}{27}} = \sqrt{\frac{16}{81}} \Rightarrow z = \frac{4}{9}.$

$\therefore$ The 4th proportional to x, y, z is $\frac{y \times z}{x} = \frac{4 \times \left(\frac{4}{9}\right)}{\left(\frac{9}{2}\right)} = 4 \times \frac{4}{9} \times \frac{2}{9} = \frac{32}{81}$ $\therefore \sqrt{\frac{32}{81}} = \frac{4\sqrt{2}}{9}.$

14. **Key: 1,** Statement-1: 18, 45, 2,5 Now 18 : 45 $= \frac{18}{45}$ $\therefore$ 18 : 45 = 2 : 5.

$\Rightarrow$ 18, 45, 2, 5 are in proportion. $\Rightarrow$ St-1: is true

and clearly St-2 : is true. $\Rightarrow$ St-2: is correct explanation of st-1

15. **Key: 4,** Clearly St-2 is True.

St-1: 3 hrs 12min = (3×60)min + 12min = 192min = 192 × 60sec = 11520sec.

24min = 24 × 60sec = 1440sec. 2min 8sec = 2× 60sec + 8sec = 128sec.

Let 'x' sec be fourth proportional of 3hr 12min, 24min, 2min 8sec.

They 11520 : 1440=128 : x $\Rightarrow$ (11520)× (x) = 1440 × 128 $\Rightarrow$

$x = \frac{1440 \times 128}{11520} = 16sec.$

St-(1) is False.

16. **Key: 3,** Since 36, 24 and x are in continued proportion.

$\Rightarrow$ 36 : 24 = 24 : x $\Rightarrow$ 36x = 24 × 24 $\Rightarrow$ x = 16.

17. **Key: 3,** The third proportional to 25 and 15 is 'x' (say) $\Rightarrow$ 25 : 15 = 15 : x

$\Rightarrow \frac{25}{15}=\frac{15}{x} \Rightarrow x=9.$

18. **Key: 3,** The mean proportion between 2.5 and 0.9

is $\sqrt{(2.5)\times(0.9)}=(0.5)\times(0.3)=0.15.$

19. **Key: a → 3, b → 4, c → (2, 5), d → 1**

a) 3.6 : x : : 0.4 : 0.5 $\Rightarrow$ (3.6) (0.5) = x (0.4) $\Rightarrow$ $x=\frac{(3.6)(0.5)}{(0.4)}=4.5.$

b) Since x : 1.6 : : 2.1 : 8.4 $\Rightarrow$ x(8.4) = (1.6) × (2.1) $\Rightarrow$ x = 0.4.

c) Since $\frac{1}{9}:x::\frac{1}{3}:\frac{1}{4}$ $\Rightarrow \frac{1}{9}\times\frac{1}{4}=\frac{1}{3}\times x \Rightarrow x=\frac{3}{9\times4}=\frac{1}{12}=0.083.$

d) Since 42 : 12 : : 7 :x, $\Rightarrow$ 42 × x = 12 × 7 $\Rightarrow$ $x=\frac{12\times7}{42}=2.$

20. **Key: 4,** x, 8, 16 are in proportion $\Rightarrow$ x : 8 = 8 : 16 $\Rightarrow \frac{x}{8}=\frac{8}{16}=x=4$

CUMULATIVE (KEY)				
1) 4	**2)** 3	**3)** 3	**4)** 3	**5)** 3
6) 3	**7)** 4	**8)** 1	**9)** 3	**10)** 1
11) 3	**12)** 1	**13)** 3,4	**14)** 3	**15)** 1,3,4
16) 2,4	**17)** 1	**18)** 2	**19)** 1	**20)** 2
21) 3	**22)** A-3 B-1 C-2 D-4	**23)** 400	**24)** 20	

1. **Key: 4,** Let money spent at 25/- per kg be x.

6000 : 20 = x : 25 $\Rightarrow$ 6000 × 25 = 20 × x $\Rightarrow x=\frac{6000\times25}{20}$ $\therefore x=7500$

2. **Key: 3,** x = $22\frac{1}{2}$m, x = $6\frac{1}{4}$m y = 675/- y = ?

$\Rightarrow \frac{x}{y} = k \Rightarrow \frac{45}{2 \times 675} = \frac{6\frac{1}{4}}{y} \Rightarrow \frac{1}{30} = \frac{25}{4y} \Rightarrow 4y = 25 \times 30 \Rightarrow y = \frac{25 \times 30}{4} \Rightarrow y =$ Rs.187.5.

3. **Key: 3,** $\frac{x}{y} = k \Rightarrow \frac{15}{11.25} = \frac{36}{y} \Rightarrow 15 \times y = 36 \times 11.25 \Rightarrow y = \frac{36 \times 11.25}{15} \Rightarrow y =$ 27.00

4. **Key: 3**

$\frac{x}{y} = k \Rightarrow \frac{15}{10.050kg} = \frac{x}{4.690} \Rightarrow x \times \frac{10050}{1000} = \frac{4690}{1000} \times 15 \Rightarrow x = \frac{4690 \times 15}{1000} \times \frac{1000}{10050} \therefore x = 7.$

5. **Key: 3,** x=120, y = 75 days $\Rightarrow$ x = 120 + 60 = 180, y = ? $\Rightarrow$ k = 120 × 75 $\Rightarrow$ xy = k Now, 180 × y = 120 × 75 $\Rightarrow y = \frac{120 \times 75}{180}$ $\therefore$ y = 50 days

6. **Key: 3,** $\frac{x}{y} = k \Rightarrow$ x = 24gms, y = 144 calories, and now, y = 252 calories

$\Rightarrow \frac{24}{144} = \frac{x}{252} \Rightarrow 144 \times x = 24 \times 252 \Rightarrow x = \frac{24 \times 252}{144} \therefore x = 42$ gms.

7. **Key: 4,** Depth=d, Pressure = p; $\frac{d}{p} = k \Rightarrow \frac{40}{80} = \frac{25}{p} \Rightarrow p = \frac{80 \times 25}{40} \Rightarrow$ p=50 gms/ sq.cm

8. **Key: 1,** $\frac{d}{f^2} = k \Rightarrow \frac{128}{4^2} = k \Rightarrow \frac{128}{16} = k \Rightarrow k = 8 \Rightarrow \frac{d}{f^2} = k \Rightarrow \frac{d}{16^2} = k$

$\Rightarrow \frac{d}{256} = k \Rightarrow \frac{d}{256} = 8 \Rightarrow d = 8 \times 256 \Rightarrow d = 2048m$

9. **Key: 3,** x = 100 people, y = 150 days $\Rightarrow$ xy = k $\Rightarrow$ 100 × 150 = k

y = 50 days, x = ? $\Rightarrow$ 100 × 150 = x × 50 $\Rightarrow x = \frac{100 \times 150}{50} = 300$

$\therefore$ The number of people required = 300 – 100 = 200

10. **Key: 1,** x = 400 pages, y = 32 lines $\Rightarrow$ x × y = k $\Rightarrow$ 400 × 32 = k
Here, x = 320 pages, y = ? $\Rightarrow$ xy = k

$\Rightarrow$ 320 × y = 32 × 400 $\Rightarrow y = \frac{32 \times 400}{320}$ $\therefore$y = 40 lines

11. **Key: 3,** l = 160 cm, n = 400; Here, l = 100 cm, n = ?

$\Rightarrow l \times n = k \Rightarrow 100 \times n = 160 \times 400 \Rightarrow n = \frac{160 \times 400}{100} \therefore n = 640$ vibrations

12. **Key: 1,** Runs per over i.e., R × O = k $\Rightarrow$ 8 × 50 = k $\Rightarrow$ R × 40 = 8 × 50

$\therefore$ R = $\frac{8\times50}{40}$ = 10 runs/over

13. **Key: 3,4,** xy = k Given, x = 150 kmph and y = 8 hours $\Rightarrow$ 150 × 8 = k

Now, x = 225 kmph, y = ? $\Rightarrow$ xy = k $\Rightarrow$ 225 × y = 150 × 8 $\therefore$ y = $\frac{150\times8}{225} = 5\frac{1}{3}$ hrs

14. **Key: 3,** a = 24, y = 6 We know ay = k $\Rightarrow$ 24 × 6 = k; Here, y = 108, a = ?

$\Rightarrow$ ay = k $\Rightarrow$ a × 108 = 24 × 6 $\Rightarrow$ a = $\frac{24\times6}{108}$ $\therefore$ a = $\frac{4}{3}$

15. **Key:1,3,4,** T = 8, T = ?; l = 49, l = 64 $\Rightarrow \frac{T^2}{\ell} = k \Rightarrow \frac{8^2}{49} = k \Rightarrow \frac{8^2}{49} = \frac{T^2}{64}$

$\Rightarrow$ 49 × T^2 = 8^2 × 64 $\Rightarrow T^2 = \frac{8^2\times64}{49} \Rightarrow T = \frac{8\times8}{7} \Rightarrow T = \frac{64}{7}$ seconds.

16. **Key: 2,4,** i = 8 amperes, R = 20 ohms Here, R = 15 ohms, i = ?

$\Rightarrow$ k = iR $\Rightarrow$ i × 15 = 8 × 20 $\Rightarrow$ i = $\frac{8\times20}{15}$ $\therefore$ i = $10\frac{2}{3}$ amperes

17. **Key: 1,** St-2 is True.

St-1: Given, the cost of 15 Maths Olympiad books = Rs.1500.

$\Rightarrow$ Each book cost = $\frac{1500}{15} = 100/-$

$\therefore$ The cost of 25 books = 25 × 100 = 2500/-

($\because$ cost and Books are in direct proportion).

18. **Key: 2,** st (1) :- x = 72 Days, y = 800 Armymen Here, x = ?, y = 1200

$\therefore$ Remaining days = 72 –22 = 50 days and Strength of army = 800 + 400 = 1200

$\Rightarrow$ xy = k $\Rightarrow$ y × 1200 = 50 × 800 $\therefore$ y = $\frac{50\times800}{1200} = 33\frac{1}{3}$ days

St (2):- x = 10 hrs, y = 60 days; x = 15 hrs, y = ?; $\Rightarrow$ xy = k $\therefore$ y = $\frac{10\times60}{15}$ = 40 days

19. **Key: 1,** Since $x \propto y \Rightarrow x = ky \Rightarrow 102 = k(170) \Rightarrow x = \frac{102}{170} = \frac{3}{5} = 0.6.$

20. **Key: 2,** Since $x \propto y \Rightarrow x = ky$ x = 20 $\Rightarrow$ y = 15 $\therefore k = \frac{x}{y} = \frac{20}{15} = \frac{4}{3}.$

If $x = 4 \Rightarrow y = \frac{x}{k} \Rightarrow y = \frac{4}{\left(\frac{4}{3}\right)} = 3.$

21. **Key: 3,** Since $x \propto \frac{1}{y} \Rightarrow xy = k$. Since x = 185, y = 4 $\Rightarrow$ K = 185 × 4 $\Rightarrow$ K = 740.

If y = 10, then $x = \frac{k}{y} \Rightarrow x = \frac{740}{10} \Rightarrow x = 74.$

22. **Key: a → 3, b → 1, c → 2, d → 4**

a) Since $x \propto y \Rightarrow x = ky$. Given x = 9, and y = 3. $\Rightarrow k = \frac{x}{y} = \frac{9}{3} = 3.$

If y = 8, then x = ky = 3 × 8 x = 24.

b) Since $x \propto y$ and x = 9, y = 3 $\Rightarrow k = \frac{x}{y} = \frac{9}{3} = 3.$ Given x = 42,

$\Rightarrow y = \frac{x}{k} = \frac{42}{3} \Rightarrow y = 14.$

c) Since $y \propto \frac{1}{x} \Rightarrow xy = k.$ Given x = 6, y = –3 $\Rightarrow$ k = –18. If x = –9

$\Rightarrow y = \frac{k}{x} = \frac{-18}{-9} = 2.$

d) Since $y \propto \frac{1}{x}$, x=6 and y = 3 $\Rightarrow$ k = -18. If y = 2 $\Rightarrow x = \frac{k}{y} = \frac{-18}{2} = -9.$

23. **Key: 400,** Given, x = 600 bags, y = 8 kg, We know xy = k $\Rightarrow$ 600 × 8 = k

Given, y = 12 kg, x = ? $\Rightarrow$ xy = k $\Rightarrow$ 12 × x = 600 × 8 $\Rightarrow$ $x = \frac{600 \times 8}{12} = 400$ bags

24. **Key: 20,** x = 80 horses, y = 30 days $\Rightarrow$ x = 120 horses, y = ?

$\Rightarrow$ xy = k $\Rightarrow$ 120 × y = 80 × 30 $\Rightarrow$ $y = \frac{80 \times 30}{120}$ $\therefore$ y = 20 days

PROFIT & LOSS

SYNOPSIS

1. Cost price is the money paid by a shopkeeper to buy goods.
2. Selling price is the price at which the shopkeeper sells the goods.
3. If cost price (CP) is less than selling (SP), then shopkeeper gets loss.
   $\therefore$ loss = CP – SP
4. If the selling price is more than the cost price the shopkeeper get profit
   $\therefore$ Profit = SP – CP
5. If SP > CP there is profit and SP < CP, then there is loss in the transaction.
6. CP = SP + loss or SP = CP – loss
   SP = CP + profit orCP = SP – profit
7. For comparison of profit or loss obtained in different transactions they are expressed as percentages since CP is the investment, that a shopkeeper makes in the transactions.

   a) Profit % = $\frac{\text{profit} \times 100}{\text{CP}}$

   b) Loss % = $\frac{\text{loss} \times 100}{\text{CP}}$

   Ex : If CP = 800/-, Profit = 15%, then find the SP and Profit.

   Sol : Profit = $\frac{15}{100} \times 800 = \text{Rs.}120$

   Total SP = CP + gain

   Total SP = 800 + 120 = Rs.920

   Ex : If CP = 1200, SP = 900, then find the loss%

   Sol : Loss = CP – SP = 1200 – 900 = 300

   $$\text{Loss\%} = \frac{\text{loss} \times 100}{\text{CP}} = \frac{300 \times 100}{1200} = 25\%$$

(i) $\text{S.P.} = \frac{(100+\text{Gain\%})}{100} \times C.P.$, when C.P. and gain % are given.

(ii) $\text{S.P.} = \frac{(100-\text{Loss\%})}{100} \times C.P.$, when C.P. and loss% are given.

Ex: Prakash bought a watch for Rs. 960. For how much should he sell it to gain 5%?

Sol. First Method:

C.P. = Rs. 960, Gain% = 5%

Gain = 5% of Rs. 960 = Rs. $\left(\frac{5}{100}\times 960\right) = Rs.48$

$\therefore$ S.P. = (C.P.) + Gain

= Rs. $(960+48) = Rs.1008$.

Second Method:

C.P. = Rs. 960, Gain% = 5%

S.P. $= \frac{(100+\text{Gain}\%)}{100}\times C.P.$

$= Rs.\left(\frac{105}{100}\times 960\right) = Rs.1008$

i. C.P. = $\frac{100}{(100+\text{Gain}\%)}\times$ S.P., when S.P. and gain% are given.

ii. C.P. = $\frac{100}{(100-\text{Loss}\%)}\times$ S.P., when S.P. and loss % are given.

Ex. Rohit sold a radio set for Rs. 1400 at a gain of 12%, For how much did he purchase it?

Sol. First Method:

Let C.P. be Rs. x.

Then, Gain = 12% of Rs. x = Rs. $\left(\frac{12}{100}\times x\right) = Rs.\left(\frac{3x}{25}\right)$

S.P. = (C.P.) + Gain

= Rs. $\left(x+\frac{3x}{25}\right) = \text{Rs.}\frac{28x}{25}$

But, S.P. = Rs. 1400 (given)

$\therefore \frac{28x}{25} = 1400 \Rightarrow x = \left(1400\times\frac{25}{28}\right) = 1250$.

Hence, Rohit purchased the radio for Rs. 1250.

Second Method (Using Formula):

S.P. = Rs. 1400, gain = 12%

$\therefore$ C.P. $= \frac{100}{(100+\text{gain}\%)}\times \text{S.P.} = \text{Rs.}\left(\frac{100}{112}\times 1400\right) = Rs.1250$.

WORK SHEET - 1

SINGLE ANSWER TYPE

1. I gain 70 paisa on Rs. 70. My gain percent is
   1) 0.1% 2) 1% 3) 7% 4) 10%
2. A shopkeeper sold an article for Rs. 2090.42. Approximately, what will be the percentage profit if he sold that article for Rs. 2602.58?
   1) 15% 2) 20% 3) 25% 4) 30%
3. Alfred buys an old scooter for Rs. 4700 and spends Rs. 800 on its repairs. If he sells the scooter for Rs. 5800, his gain percent is
   1) $4\frac{4}{7}\%$ 2) $5\frac{5}{11}\%$ 3) 10% 4) 12%
4. A shopkeepr purchased 70 kg of potatoes for Rs. 420 and sold the whole lot at the rate of Rs. 6.50 per kg. What will be his gain percent?
   1) $4\frac{1}{6}\%$ 2) $6\frac{1}{4}\%$ 3) $8\frac{1}{3}\%$ 4) 20%
5. 100 oranges are bought at the rate of Rs. 350 and solid at the rate of Rs. 48 per dozen. The percentage of profit or loss is
   1) $14\frac{2}{7}\%$ 2) 15% 3) $14\frac{2}{7}\%$ 4) 15%
6. A man buys a cycle for Rs. 1400 and sells it at a loss of 15%. What is the selling price of the cycle?
   1) Rs. 1090 2) Rs. 1160 3) Rs. 1190 4) Rs. 1202
7. A sells an article which costs him Rs. 400 to B at a profit of 20%. B then sells it to C, making a profit of 10% on the price he paid to A. How much does C pay B?
   1) Rs. 472 2) Rs. 476 3) Rs. 528 4) Rs. 532
8. Peter purchased a machine for Rs.80,000 and spent Rs. 5000 on repair and Rs. 1000 on transport and solid it with 25% profit. At what price did he sell the machine?
   1) Rs. 1,05,100 2) Rs. 1,06,250 3) Rs. 1,17,500 4) None of these
9. By selling an article for Rs. 100, a man gains Rs. 15. Then, his gain% is
   1) 15% 2) $12\frac{2}{3}\%$ 3) $17\frac{11}{17}\%$ 4) $17\frac{1}{4}\%$
10. When a commodity is sold for Rs. 34.80, there is a loss of 2%. What is the cost price of the commodity?
    1) Rs. 26.10 2) 43 3) 43.20 4) 46.40
11. When a plot is sold for Rs. 18,700, the owner loses 15%. At what price must be plot be solid in order to gain 15%?
    1) Rs. 21,000 2) Rs. 22,500 3) Rs. 25,300 4) Rs. 25,800
12. If selling price of an article is $\frac{4}{3}$ of its cost price, the profit in the transaction is
    1) $16\frac{2}{3}\%$ 2) $20\frac{1}{2}\%$ 3) $25\frac{1}{2}\%$ 4) $33\frac{1}{3}\%$

13. The ratio of the cost price and the selling price is 4:5. The profit percent is
1) 10% 2) 20% 3) 25% 4) 30%

14. If selling price is doubled, the profit triples. Find the profit percent
1) $66\frac{2}{3}$ 2) 100 3) $105\frac{1}{3}$ 4) 120

15. By selling a pen for Rs. 15, a man loses one-sixteenth of what it costs him. The cost price of the pen is
1) Rs. 16 2) Rs. 18 3) Rs. 20 4) Rs. 21

16. By selling an article, Michael earned a profit equal to one-fourth of the price he bought it. If he solid it for Rs. 375, what was the cost price?
1) Rs. 281.75 2) Rs. 300 3) Rs. 312.50 4) Rs. 350

17. If loss is $\frac{1}{3}$ of S.P., the loss percentage is
1) $16\frac{2}{3}\%$ 2) 20% 3) 25% 4) $33\frac{1}{3}\%$

18. The cost price of 19 articles is equal to the selling price of 16 articles. Gain percent is
1) $3\frac{9}{17}\%$ 2) $15\frac{15}{19}\%$ 3) $18\frac{3}{4}\%$ 4) 20%

19. If the selling price of 50 articles is equal to the cost price of 40 articles, then the loss or gain percent is
1) 20% loss 2) 20% gain 3) 25% loss 4) 25% gain

20. A man sold 18 cots for Rs. 16,800, gaining thereby the cost price of 3 cots. The cost price of a cot is
1) Rs. 650 2) Rs. 700 3) Rs. 750 4) Rs. 800

21. C.P = Rs. 240, S.P = Rs 290, profit percent is
1) 22% 2) 24% 3) 20.833% 4) 21.833%

22. C.P. = Rs. 240, S.P. = Rs. 290, profit percent is
1) 22% 2) 24% 3) 20.833% 4) 21.833%

23. Rama Krishna purchased a scooter for Rs 17,000. Due to list in petrol costs he sold it for a loss of 155 What was his S.P. ?
1) Rs 14, 440 2) Rs 14,450 3) Rs 14,460 4) Rs 14, 470

24. A shop keeper purchased a gross of pencils for Rs 216 and sold each pencil for Rs 1.75. How much did he gain or lose ?
1) 35 2) 34 3) 36 4) 37

25. Subbu purchased a bicycle for Rs 1150. After using it for a year, he sold it for Rs 900. What was his percentage of gain or loss ?
1) 21.66% 2) 21.65% 3) 21.74% 4) 21.85%

26. A shopkeeper bought 500 eggs at Rs 4 per 10 eggs. Among them 20 eggs are found broken and 30 eggs spoiled. If he sold the remaining eggs at Rs 0.55 per egg, how much did he gain or lose ? Find its percentage.

1) 45.50, $22\frac{3}{4}\%$ 2) 47.50, $23\frac{3}{4}\%$

3) 46.50, $23\frac{3}{4}\%$ 4) 46.50, $23\frac{3}{4}\%$

27. Subba raju purchased a Cow for Rs 2,250. If he wants to gain 25%, what should be his selling price ?

1) 2,812 2) 2,812.33 3) 2,812.50 4) 2,812.95

28. A shopkeeper sold two books at Rs 15. Profit of one was 25% and loss on the second was 25%. How much did he gain or loss in percentage?

1) $\frac{24}{4}\%$ 2) $\frac{26}{4}\%$ 3) $\frac{25}{4}\%$ 4) $\frac{27}{4}\%$

KEY & HINTS

WORK SHEET (KEY)				
1) 2	**2)** 3	**3)** 2	**4)** 3	**5)** 1
6) 3	**7)** 3	**8)** 3	**9)** 3	**10)** 4
11) 3	**12)** 4	**13)** 3	**14)** 2	**15)** 1
16) 2	**17)** 3	**18)** 3	**19)** 1	**20)** 4
21) 4	**22)** 3	**23)** 2	**24)** 3	**25)** 3
26) 2	**27)** 3	**28)** 3		

1. $\text{Gain}\% = \left(\frac{0.70}{70} \times 100\right)\% = 1\%$

2. Profit = Rs. (2602.58 - 2090.42) = Rs. 512.16

$\text{Profit}\% = \left(\frac{512.16}{2090.42} \times 100\right)\% = \left(\frac{512160}{209042} \times 10\right)\% = 24.5\% \approx 25\%$

3. C.P. = Rs. (4700 + 800) = Rs. 5500; S.P. = Rs. 5800

Gain % $= \left(\frac{300}{5500} \times 100\right)\% = 5\frac{5}{11}\%$

4. C.P. of 1 kg = Rs. $\left(\frac{420}{70}\right) = Rs.6$. S.P. of 1 kg = Rs. 6.50

$\therefore$ Gain % $= \left(\frac{0.50}{6} \times 100\right)\% = \frac{25}{3}\% = 8\frac{1}{3}\%$

5. C.P. of 1 orange = Rs. $\left(\frac{350}{100}\right) = Rs.3.50.$

S.P. of 1 orange $= Rs.\left(\frac{48}{12}\right) = Rs.4$

$\therefore$ Gain% $= \left(\frac{0.50}{3.50} \times 100\right)\% = \frac{100}{7}\% = 14\frac{2}{7}\%$

6. S.P. = 85% of Rs. 1400 $= Rs.\left(\frac{85}{100} \times 1400\right) = Rs.1190$.

7. C.P. for 'B' = 120% of Rs. 400 = Rs. $\left(\frac{120}{100} \times 400\right) = Rs.480$

C.P. for C = 110% of Rs. 480 = $Rs.\left(\frac{110}{100} \times 480\right) = Rs.528$

8. C.P. = Rs. $(80000 + 5000 + 1000) = Rs.86000$, Profit = 25%

$\therefore$ S.P. $= 125\%$ of Rs. 86000 = Rs. $\left(\frac{125}{100} \times 86000\right) = Rs.107500$.

9. S.P. = Rs. 100, gain = Rs. 15
$\therefore$ C.P. = Rs. (100 - 15) = Rs. 85

Gain% $= \left(\frac{15}{85} \times 100\right)\% = \frac{300}{17}\% = 17\frac{11}{17}\%$

10. C.P. $= Rs.\left(\frac{100}{75} \times 34.80\right) = Rs.46.40$

11. $85 : 18700 = 115 : x$ or $x = \left(\frac{18700 \times 115}{85}\right) = 25300$

Hence, S.P. = Rs. 25,300

12. Let C.P.= Rs. x. Then, S.P. = Rs. $\frac{4x}{3}$. Gain = Rs. $\left(\frac{4x}{3} - x\right) = Rs.\frac{x}{3}$.

$\therefore$ Gain% $= \left(\frac{x}{3}\times\frac{1}{x}\times 100\right)\% = 33\frac{1}{3}\%$

13. Let C.P. = Rs. 4x. Then, S.P. = Rs. 5x. Gain Rs. (5x - 4x) = Rs. x

$\therefore$ Gain % $= \left(\frac{x}{4x}\times 100\right)\% = 25\%$

14. Let C.P. be Rs. x and S.P. be Rs. y. Then, $3(y-x) = (2y-x) \Rightarrow y = 2x$

Profit = Rs. $(y-x) = Rs.(2x-x) = Rs.x$

$\therefore$ Profit % $= \left(\frac{x}{x}\times 100\right)\% = 100\%$

15. Let the C.P. be Rs. x. Then, $x - 15 = \frac{x}{16} \Rightarrow x - \frac{x}{16} = 15 \Rightarrow \frac{15x}{16} = 15 \Rightarrow x = 16$

$\therefore$ C.P. = Rs. 16

16. S.P. = C.P. $= +\frac{1}{4}C.P. = \frac{5}{4}C.P.$

$\therefore \frac{5}{4}C.P. = 375 \Rightarrow C.P. = Rs.\left(375\times\frac{4}{5}\right) = Rs.300$

17. Let S.P. = Rs. x. Then, Loss = Rs. $\frac{x}{3}$. C.P. = Rs. $\left(x+\frac{x}{3}\right) = Rs.\frac{4x}{3}$

$\therefore$ Loss% $= \left(\frac{x}{3}\times\frac{3}{4x}\times 100\right)\% = 25\%$

18. Let C.P. of each article be Re. 1
Then, C.P. of 16 articles = Rs. 16; S.P. of 16 articles = Rs. 19

$\therefore$ Gain % $= \left(\frac{3}{16}\times 100\right)\% = 18\frac{3}{4}\%$

19. Let C.P. of each article be Re. 1
Then, C.P. of 50 articles = Rs. 50; S.P. of 50 articles = Rs. 40

$\therefore$ Loss % $= \left(\frac{10}{50}\times 100\right)\% = 20\%$

20. (S.P. of 18 cots) - (C.P. of 18 cots) = (C.P. of 3 cots)
$\Rightarrow$ C.P. of 21 cots = S.P. of 18 cots = Rs. 16800

$\Rightarrow$ C.P. of 1 cot = Rs. $\left(\frac{16800}{21}\right) = Rs.800$.

21. Loss = C.P. - S.P

22. Profit percent = $\frac{\text{Profit}}{\text{C.P.}} \times 100$

23. Loss percent = 15% = $\frac{15}{100}$

Amount of loss = $\frac{15}{100} \times 17,000 = \text{Rs}\,2,550$

S.P. = C.P. – Loss

24. C.P. = Rs 216

S.P. = 144 × 1.75 = 252

S.P > C.P.

$\therefore$ Profit = S.P. – C.P.

25. C.P. = Rs 1150, S.P. = Rs 900,

S.P. < C.P.

$\therefore$ Loss % = $\frac{\text{Loss}}{\text{C.P.}} \times 100 = \frac{250}{1150} \times 100$.

26. C.P. = 50 × 4 = Rs 200

S.P. = 450 × 0.55 = 247.5

Profit = 47. 50

Profit% = $\frac{47.50}{200} \times 100 = 23\frac{3}{4}\%$.

27. C.P. = Rs 2,250, P% = 25%

P% = $\frac{\text{Profit}}{\text{C.P.}} \times 100$

$\Rightarrow$ Profit = 562.5

28. In this case always loss

Loss % = $\frac{25^2}{100} = \frac{25}{4} = 6\frac{1}{4}\%$.

PERCENTAGE

SYNOPSIS

The word 'per cent' means 'per hundred' or 'out of hundred'. We abbreviate per cent by p.c. and denote it by the symbol %.

Thus, 5 per cent is written as 5%

Hundredth Part : Out of 100 equal parts, each part is known as its hundredth part.

Thus, $\frac{7}{100} = 7$ hundredths, $\frac{13}{100} = 13$ hundredths and so on.

Percentage

By a certain percentage, we mean that many hundredths.

Thus, x% = x hundredths = $\frac{x}{100}$

$\therefore 9\% = \frac{9}{100}, 15\% = \frac{15}{100}, 83\% = \frac{83}{100}$, etc.

Rule 1: To express a fraction as a per cent, multiply it by 100.

Example 1: Express each of the follwing as per cent:

(i) $\frac{3}{8}$ (ii) $1\frac{1}{16}$

Sol. We have (i) $\frac{3}{8} = \left(\frac{3}{8} \times 100\right)\% = \left(\frac{75}{2}\right)\% = 37.5\%$

(ii) $1\frac{1}{16} = \left(\frac{17}{16} \times 100\right)\% = \left(\frac{425}{4}\right)\% = 106.25\%$

Rule 2: To convert a percentage into a fraction, we divide it by 100 and remove the % sign.

Example 2: Express each of the following as a fraction

(i) 12% (ii) 7.5%

Sol. We have

(i) $12\% = \frac{12}{100} = \frac{3}{25}$

(ii) $7.5 = \left(\frac{7.5}{100}\right) = \left(\frac{75}{1000}\right) = \frac{3}{40}$

Percentage as A Ratio

A percentage can be expressed as a ratio with its second term 100 and first term equal to the given percentage.

Example 3: Express each of the following as a ratio:

(i) 19% (ii) 12.5%

Sol. We have (i) $19\% = \frac{19}{100} = 19:100$

(ii) $12.5\% = \frac{12.5}{100} = \frac{125}{1000} = \frac{1}{8} = 1:8$

Rule 3: To express a given ratio as per cent, convert the given ratio into a fraction, and then multiply the fraction by 100.

Example 4: Expression each of the following ratios as a per cent:

(i) 16:25 (ii) 108:125

Sol. We have (i) $16:25 = \frac{16}{25} = \left(\frac{16}{25} \times 100\right)\% = 64\%$

(ii) $108:125 = \frac{108}{125} = \left(\frac{108}{125} \times 100\right)\% = \left(\frac{432}{5}\right)\% = 86.4\%$

Rule 4: To express a given percentage as a decimal, divide it by 100 and then convert it into decimal form.

Example 5: Express each of the following decimal:

(i) 64% (ii) 0.35%

Sol. We have (i) $64\% = \frac{64}{100} = 0.64$

(ii) $0.35\% = \frac{0.35}{100} = \frac{35}{10000} = 0.0035$.

Rule 5: To express a given decimal as per cent, multiply it by 100.

Example 6: Express each of the following as a per cent:

(i) 0.6 (ii) 0.004

Sol. We have (i) $0.6 = (0.6 \times 100)\% = 60\%$

(ii) $0.004 = (0.004 \times 100)\% = 0.4\%$.

Rule 6: To find a certain percentage of a given quantity, convert the percentage into a fraction and multiply the given quantity with the resulting fraction.

Example 7: Find (i) 15% of Rs. 80 (ii) 4% of 1 hour 15 min

Sol. We have (i) 15% of Rs. 80 $= \frac{15}{100}$ of Rs. $80 = \text{Rs.}\left(80 \times \frac{15}{100}\right) = \text{Rs. } 12.$

(ii) 4% of 1 hour 15 minutes $= \frac{4}{100}$ of 75 min. $= \left(75 \times \frac{4}{100}\right)$ min $= 3$ min.

PERCENAGE CHANGE

(i) $\text{Decrease \%} = \left(\frac{\text{Decrease in value}}{\text{Original value}} \times 100\right)\%$

(ii) $\text{Increase \%} = \left(\frac{\text{Increase in value}}{\text{Original value}} \times 100\right)\%$

Example 8: Increase 90 by 20%

Sol. $\text{Increase} = 20\% \text{ of } 90 = \frac{20}{90} \text{ of } 90 = \left(90 \times \frac{20}{100}\right) = 18$

$\therefore$ Increased value $= (90 + 18) = 108$

Example 9: Decrease 60 by 25%.

Sol. $\text{Decrease} = 25\% \text{ of } 60 = \frac{25}{100} \text{ of } 60 = \left(60 \times \frac{25}{100}\right) = 15$.

$\therefore$ Decreased value = (60 - 15) = 45.

WORK SHEET

SINGLE ANSWER TYPE

1. The ratio $5:4$ expressed as a percent equals
   1) 12.5% 2) 40% 3) 80% 4) 125%
2. 3.5 can be expressed in terms of percentage as
   1) 0.35% 2) 3.5% 3) 35% 4) 350%
3. 63% of $3\frac{4}{7}$ is
   1) 2.25 2) 2.40 3) 2.50 4) 2.75
4. 860% of $50 + 50\%$ of $860 = ?$
   1) 430 2) 516 3) 860 4) 960
5. 45% of 750 - 25% of 480 = ?
   1) 216 2) 217.50 3) 236.50 4) 245
6. 270 candidates appeared for an examination, of which 252 passed. The pass percentage is
   1) 80% 2) $83\frac{1}{2}\%$ 3) $90\frac{1}{3}\%$ 4) $93\frac{1}{3}\%$
7. 5 out of 2250 parts of earth is sulphur. What is the percentage of sulphur in earth?
   1) $\frac{11}{50}$ 2) $\frac{2}{9}$ 3) $\frac{1}{45}$ 4) $\frac{2}{45}$
8. 0.01 is what percent of 0.1?
   1) $\frac{1}{100}$ 2) $\frac{1}{10}$ 3) 10 4) 100

9. What percent of a day is 3 hours?

1) $12\frac{1}{2}\%$ 2) $16\frac{2}{3}\%$ 3) $18\frac{2}{3}\%$ 4) $22\frac{1}{2}\%$

10. Rajeev buys goods worth Rs. 6650. He gets a rebate of 6% on it. After getting the rebate, he pays sales tax % 10%. Find the amount he will have to pay for the goods.

1) Rs. 6876.10 2) Rs. 6999.20 3) Rs. 6654 4) Rs. 7000

11. Which one of the following shows the best percentage?

1) $\frac{384}{540}$ 2) $\frac{425}{500}$ 3) $\frac{570}{700}$ 4) $\frac{480}{660}$

12. 0.15% of $33\frac{1}{3}\%$ of Rs. 10,000 is

1) Re. 0.05 2) Rs. 5 3) Rs. 105 4) Rs. 150

13. What is 25% of 25% equal to

1) 0.00625 2) 0.0625 3) 0.625 4) 6.25

14. If Rs. 2800 is $\frac{2}{7}$ percent of the value of a house, the worth of the house (in Rs.) is

1) 8,00,000 2) 9,80,000 3) 10,00,000 4) 12,00,000

15. If 120 is 20% of a number, then 120% of that number will be

1) 20 2) 120 3) 360 4) 720

16. If 35% of a number is 175, then what percent of 175 is that number?

1) 35% 2) 65% 3) 280% 4) None of these

17. Two-fifth of one-third of three-seventh of a number is 15. What is 40 percent of that number?

1) 72 2) 84 3) 136 4) None of these

18. The difference between a number and its two-fifth is 510. What is 10% of that number?

1) 12.75 2) 85 3) 204 4) None of these

19. If 35% of a number is 12 less than 50% of that number, then the number is

1) 40 2) 50 3) 60 4) 80

20. If 75% of a number is added to 75, then the result is the number itself. The number is

1) 50 2) 60 3) 300 4) 400

21. A number, when 35 is subtracted from it, reduces to its 80 percent. What is fourth-fifth of that number?

1) 70 2) 90 3) 120 4) 140

22. The sum of two numbers is $\frac{28}{25}$ of the first number. The second number is what percent of the first?

1) 12% 2) 14% 3) 16% 4) 18%

23. If 25% of a number is subtracted from a second number, the second number reduces to its five-sixth. What is the ratio of the first number to the second number?

1) 1:3 2) 2:3 3) 3:2 4) Data inadequate

24. The difference of two numbers is 20% of the larger number. If the smaller number is 20, then the larger number is

1) 25 2) 45 3) 50 4) 80

25. Two numbers A and B are such that the sum of 5% of A and 4% of B is two-third of the sum of 6% of A and 8% of B. Find the ratio of A:B.
1) 2:3 2) 1:1 3) 3:4 4) 4:3

26. A student multiplied a number by $\frac{3}{5}$ instead of $\frac{5}{3}$. What is the percentage error in the calculation?
1) 34% 2) 44% 3) 54% 4) 64%

WORK SHEET - 2

SINGLE ANSWER TYPE

1. Sowjanya obtained 60 marks out of 75 mathematics. Find the percentage of marks got by her.
1) 80% 2) 81% 3) 82% 4) 83%

2. What percent of the first quantity in the second quantity in the following. 18 dozens, 6 dozens.
1) 33.33 2) 33.75 3) 33.89 4) 33.95

3. In an alloy the ratio of Copper, Zinc and Nickel is 26 : 13 : 11. Find the percentage of each metal in the alloy.
1) 52%, 27%, 22% 2) 52%, 26%, 22%
3) 52%, 27%, 23% 4) 50%, 26%, 22%

4. The number of colour T.V. Sets produced in 1987 and 1990 in India are 12 lakhs and 22 lakhs units respectively Find the percentage increase in production in 1990 over 1987.
1) 83.7% 2) 83.6% 3) 83.5% 4) 83.3%

5. Mr. Saltar deposited Rs.4,200 in a bank which pays 12% interest per annum. How much interest will be get at the end of the year ?
1) Rs 504 2) Rs 505 3) Rs 506 4) Rs 507

6. 40% of 40 liters
1) 14L 2) 15L 3) 16L 4) 17L

7. $8\frac{1}{3}$% of 4 dozens
1) 0.66 2) 0.33 3) 0.56 4) 0.76

8. A person earns Rs 3,600 per month. He spends $8\frac{1}{3}\%$ of his income towards house rent and $33\frac{1}{3}\%$ towards food. Find the amounts he spends towards each item

1) Rs 300, Rs 800 2) Rs 300, Rs 1,200

3) Rs 400, Rs 1,200 4) Rs 500, Rs 1,200

9. The total assets of an individual are worth Rs 1,50,000 from this he gave 305 to his wife, 55% to his son and the remaining to philanthropic causes. Find the amounts he gave to his wife.

1) Rs 46,000 2) Rs 48,000 3) Rs 45,000 4) Rs 49,000

10. The strength of a school is 685 out of these 26% being to B.C., 215 belong to S.C., and $\frac{1}{2}\%$ belong to S.T Remaining are forward category students. Find the number of students of S.C. category

1) 145 2) 146 3) 144 4) 143

11. Increase of 80 by 10% is

1) 90 2) 89 3) 87 4) 88

12. Increase 100km by $2\frac{1}{5}\%$

1) 102.10km 2) 102.20km 3) 102.30km 4) 102.40km

13. Decrease of Rs 50 by 5%

1) Rs 47 2) Rs 47.50 3) Rs 48 4) Rs 50

14. The cost f a bicycle is Rs 950. It's cost decreases by 5% every year due to usage. What will be its cost after a year ?

1) Rs 903.5 2) Rs 904.5 3) Rs 902.5 4) Rs 901.5

15. The present cost of a house site is Rs 15,000. After one year its cost increase by 10% at the end of second year its cost would go up 15% over the cost at the end of first year. What would be the cost of the house site at the end of second year ?

1) Rs 19, 875 2) Rs 18, 975 3) Rs 18, 900 4) Rs 18, 750

MULTI ANSWER TYPE

16. The cost price of an article 'A' is Rs. 160 and selling price of another article 'B' is Rs. 240. If the selling price of A will be equal to the cost price of B, then the profit after selling A is 20% on B, we get profit of 48 Rs. is

1) 16.66% 2) 20% profit 3) 25% profit 4) $8\frac{1}{3}$% loss

17. A man sold a radio - set for Rs. 750 and gained one ninth of its cost price. Find the cost price of the radio and the gain percent earned by the man

1) Rs. 675 and $\frac{100}{9}$% 2) Rs.675 & $\frac{100}{9}$%

3) Rs. 765 and $\frac{100}{9}$% 4) Rs.765 & $\frac{82}{9}$%

REASONING ANSWER TYPE

18. *Statement I:* A man buys an article for Rs. 27.50 and sells it for Rs. 28.60 then his gain percentage is 4%.

Statement II: The percentage of gain is $\left(\frac{\text{Gain} \times 100}{\text{C.P}}\right)$.

1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

19. *Statement I:* If the annual increase in the population be 20% and present population be 10,000 then the population after 4 years is 20,736.

Statement II: If the original population of a location be p and the annual growth rate be r%. The population after n years is $P\left(1+\frac{r}{100}\right)^n$.

1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

20. *Statement I:* A dealer buys 200 quintals of wheat at Rs. 1200 a quintal. He spends Rs. 10,000 on transportation and storage. Then he sells the wheat at Rs. 13 per kg then the profit percentage of dealer is 8%.

Statement II: Profit percentage = $\frac{\text{Profit}}{\text{C.P}} \times 100$.

1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

21. *Statement I:* If x is 10% increased and then 10% decreased the resultant value is also x.
Statement II: If x% of y = y% of x.
1) Both Statement-I and Statement-II are true.
2) Both Statement-I and Statement-II are false.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup:1

When a bicycle manufacturer reduced its selling price by 50% the number of bicycles sold radically increased to 700%. Initially the manufacturer was getting only 140% profit.

22. What is the new selling price of a bicycle if initial selling price is Rs. 480?
1) 120 2) 240 3) 360 4) 480

23. What is the percentage increase of his profit
1) 1 2) 2
3) 3 4) no increase, no decrease

24. What is the initial number of bicycles if 1400 bicycles are sold now
1) 320 2) 550 3) 1000 4) 200

Writeup:2

If the present value of an article is P which increases by R% per annum, then its value

i) after n years = $P\left(1+\frac{R}{100}\right)^n$ ii) n years ago = $\frac{P}{\left(1+\frac{R}{100}\right)^n}$

25. The value of a machine depreciates at the rate of 10% per annum. If its present value of Rs. 1,62,000, what will be its worth after 2 years?
1) 400000 2) 131220 3) 566056 4) None of these

26. From the above problem what was the value of the machine 2 years ago (in Rs.)
1) 131220 2) 5466123 3) 200000 4) 50000

27. During one year, the population of a town increased by 5% and during the next year, the population decreased by 5%. If the total population is 9975 at the end of the second year, then what was the population size in the beginning of the first year
1) 10000 2) 20000 3) 30000 4) 40000

Writeup:3

Profit percentage = $\frac{\text{Profit}}{\text{C.P}} \times 100$, loss percentage = $\frac{\text{Loss}}{\text{C.P}} \times 100$

Discount = Marked price – S.P.

28. Cost price of 12 oranges is equal to the selling price of 9 organize and the discount on 10 oranges is equal to the profit on 5 organize. What is the percentage of the profit is

1) 20 2) 22.22 3) 16.66 4) 33.33

29. From the above problem what is the percentage of discount

1) 11.11 2) 16.67 3) 33.33 4) 44.44

30. From the above problem what is the difference between the profit percentage and discount percentage

1) 20 2) 22.22 3) 16.67 4) 15

MATRIX MATCHING TYPE

31.

Column-I	Column-II
a) If the cost price of 12 shirts is equal to the selling price of 10, then the percentage profit is	1) Rs. 220
b) If the cost price of 16 copies of a book is equal to the selling price of 20, then the percentage loss is	2) 20%
c) If the cost price and the selling price of a commodity are in the ratio 5 : 6, thus the percentage profit is	3) Rs. 200
d) If a shopkeeper sells tea at Rs. 160 per kg, he makes a loss of 20%. At what rate should he sell tea to make a profit of 10% is	4) 25%

32.

Column-I	Column-II
a) Two successive discounts of 10% and 20% are equal to single discount of	1) Rs. 3645
b) If x is 30% more than y then y is __% less than x is	2) Rs. 4000
c) Three successive discounts of 10%, 10% and 10% are given on article having marked price 5000 Rs. What is the selling price?	3) 28%
d) The selling price of an article is Rs. 3600 after discount of 10%, what is its cost price	4) $23\frac{1}{13}\%$

INTEGER ANSWER TYPE

33. Abhishek and Bhanu both are dealers of KML scooters. The price of a KML scooter is Rs. 28,000. Abishek gives a discount of 10% on whole, while Bhanu gives a discount of 12% on the first Rs. 20,000 and 8% on the rest Rs. 8,000. What is the difference between their selling prices is _____

KEY & HINTS

WORK SHEET – 1 (KEY)				
1) 4	**2)** 2	**3)** 1	**4)** 3	**5)** 2
6) 4	**7)** 2	**8)** 3	**9)** 1	**10)** 1
11) 2	**12)** 2	**13)** 2	**14)** 2	**15)** 4
16) 4	**17)** 4	**18)** 2	**19)** 4	**20)** 3
21) 4	**22)** 1	**23)** 2	**24)** 1	**25)** 4
26) 2				

HINTS

1. $5:4=\frac{5}{4}=\left(\frac{5}{4}\times 100\right)\%=125\%$

2. $3.5=\frac{35}{10}=\left(\frac{35}{10}\times 100\right)\%=350\%$

3. $63\%\ \text{of}\ 3\frac{4}{7}=\left(\frac{63}{100}\times\frac{25}{7}\right)=\frac{4}{9}=2.25$

4. $\text{Given expression}=\left(\frac{860}{100}\times 50+\frac{50}{100}\times 860\right)=430+430=860$

5. $\text{Given expression}=\left(\frac{45}{100}\times 750\right)-\left(\frac{25}{100}\times 480\right)=(337.50-120)=217.50$

6. $\text{Pass percentage}=\left(\frac{252}{270}\times 100\right)\%=\frac{280}{3}\%=93\frac{1}{3}\%$

7. $\text{Required percentage}=\left(\frac{5}{2250}\times 100\right)\%=\frac{2}{9}\%$

8. $\text{Required percentage}=\left(\frac{0.01}{0.1}\times 100\right)\%=\left(\frac{1}{10}\times 100\right)\%=10\%$

9. $\text{Required percentage}=\left(\frac{3}{24}\times 100\right)\%=\frac{25}{2}\%=12\frac{1}{2}\%$

10. Rebate = 6% of Rs. 6650 = Rs. $\left(\frac{6}{100}\times 6650\right) = Rs.399$.

Sales tax = 10% Rs. (6650 - 399) = Rs. $\left(\frac{10}{100}\times 6251\right) = Rs.625.10$.

$\therefore$ Final amount = Rs. (6251 + 625.10) = Rs. 6876.10

11. $\frac{384}{540} = \left(\frac{384}{540}\times 100\right)\% = 71\frac{1}{9}\%; \frac{425}{500} = \left(\frac{425}{500}\times 100\right)\% = 85\%$;

$\frac{570}{700} = \left(\frac{570}{700}\times 100\right)\% = 81\frac{3}{7}\%; \left(\frac{480}{660}\times 100\right)\% = 72\frac{8}{11}\%$

$\therefore \frac{425}{500}$ shows the best percentage

12. 0.15% of $33\frac{1}{3}\%$ of Rs. 10,000 $= Rs.\left[\frac{15}{100}\times\frac{1}{100}\times\left(\frac{100}{3}\times\frac{1}{100}\times 10000\right)\right] = Rs.5$.

13. 25% of $25\% = \frac{25}{100}\times\frac{25}{100} = \frac{1}{16} = 0.0625$.

14. Let the worth of the house be Rs. x.

Then $\frac{2}{7}\%$ of $x = 2800 \Leftrightarrow \left(\frac{2}{7}\times\frac{1}{100}\times x\right) = 2800 \Leftrightarrow x = \left(\frac{2800\times 100\times 7}{2}\right) = 9,80,000$

15. Let the number be x.

Then, 20% of $x = 120 \Leftrightarrow \left(\frac{20}{100}\times x\right) = 120 \Leftrightarrow x = \left(\frac{120\times 100}{20}\right) = 600$

$\therefore 120\%$ of $x = \left(\frac{120}{100}\times 600\right) = 720$.

16. Let the number be x.

Then, 35% of $x = 175 \Leftrightarrow \left(\frac{35}{100}\times x\right) = 175 \Leftrightarrow x = \left(\frac{175\times 100}{35}\right) = 500$.

Now, let y% of 175 = 500

Then, $\left(\frac{y}{100}\times 175\right) = 500 \Leftrightarrow y = \left(\frac{500\times 100}{175}\right) = \frac{2000}{7} = 285\frac{5}{7}$.

17. Let the number be x. Then $\frac{2}{5}$ of $\frac{1}{3}$ of $\frac{3}{7}$ of $x = 15 \Leftrightarrow x = \left(15\times\frac{7}{3}\times 3\times\frac{5}{2}\right) = \frac{525}{2}$

$\therefore 40\%$ of $\frac{525}{2} = \left(\frac{40}{100}\times\frac{525}{2}\right) = 105$.

18. Let the number be x. Then, $x-\frac{2}{5}x=510 \Leftrightarrow \frac{3}{5}x=510 \Leftrightarrow x=\left(\frac{510\times 5}{3}\right)=850$.

$\therefore$ 10% of 850 = 85.

19. Let the number be x. Then, 50% of $x-35\%$ of $x=12$

$\Leftrightarrow \frac{50}{100}x-\frac{35}{100}x=12 \Leftrightarrow \frac{15}{100}x=12 \Leftrightarrow x=\left(\frac{12\times 100}{15}\right)=80$

20. Let the number be x. then,

75% of $x+75=x \Leftrightarrow x-\frac{75}{100}x=75 \Leftrightarrow x-\frac{3}{4}x=75 \Leftrightarrow \frac{x}{4}=75 \Leftrightarrow x=300$.

21. Let the number be x.

Then, $x-35=\frac{80}{100}x \Leftrightarrow x-\frac{80}{100}x=35 \Leftrightarrow x=\frac{35\times 100}{20}=175 \Leftrightarrow \frac{4}{5}x=140$

22. Let the numbers be x and y. Then,

$x+y=\frac{28}{25}x \Leftrightarrow y=\frac{28}{25}x-x \Leftrightarrow y=\frac{3}{25}x \Leftrightarrow \frac{y}{x}=\left(\frac{3}{25}\times 100\right)\%=12\%$

23. Let the numbers be x and y.

Then, $y-25\%$ of $x=\frac{5}{6}y \Leftrightarrow y-\frac{5}{6}y=\frac{25}{100}x \Leftrightarrow \frac{y}{6}=\frac{x}{4} \Leftrightarrow \frac{x}{y}=\frac{4}{6}=\frac{2}{3}$.

24. Let the larger number be x.

Then, $x-20=\frac{20}{100}x \Leftrightarrow x-\frac{1}{5}x=20 \Leftrightarrow \frac{4}{5}x=20 \Leftrightarrow x=\left(20\times\frac{5}{4}\right)=25$

25. 5% of A + 4% of B $\frac{2}{3}$(6% of A + 8% of B)

$\Leftrightarrow \frac{5}{100}A+\frac{4}{100}B=\frac{2}{3}\left(\frac{6}{100}A+\frac{8}{100}B\right)$

$\Leftrightarrow \frac{1}{20}A+\frac{1}{25}B=\frac{1}{25}A+\frac{4}{75}B \Leftrightarrow \left(\frac{1}{20}-\frac{1}{25}\right)A=\left(\frac{4}{75}-\frac{1}{25}\right)B$

$\Leftrightarrow \frac{1}{100}A=\frac{1}{75}B \Leftrightarrow \frac{A}{B}=\frac{100}{75}=\frac{4}{3}$

26. Let the number be x. Then, error $=\frac{5}{3}x-\frac{3}{5}x=\frac{16}{15}x$.

Error % $=\left(\frac{16x}{15}\times\frac{3}{5x}\times 100\right)\%=64\%$

WORK SHEET – 2 (KEY)				
1) 1	**2)** 1	**3)** 2	**4)** 4	**5)** 1
6) 3	**7)** 2	**8)** 2	**9)** 3	**10)** 4
11) 4	**12)** 2	**13)** 2	**14)** 3	**15)** 2
16) 1,3	**17)** 1,2	**18)** 1	**19)** 1	**20)** 4
21) 4	**22)** 2	**23)** 4	**24)** 4	**25)** 2
26) 4	**27)** 1	**28)** 4	**29)** 2	**30)** 3
31) 2,4,2,1	**32)** 3,4,1,2	**33)** 240		

1. Required percent = $\frac{60}{75}\times 100 = 80$

2. By concept

3. $\frac{26}{50}\times 100$, $\frac{13}{50}\times 100$, $\frac{11}{50}\times 100 \Rightarrow 52\%, 26\%, 22\%.$

4. $\frac{10}{12}\times 100 = 83.3\%$

5. Saltar gets at the end of the year = $\frac{12}{100}\times 4200$ = Rs 504.

6. $\frac{40}{100}\times 40$ = 16 Liters

7. $\frac{25}{3}\times\frac{1}{100}\times 4 = \frac{1}{3} = 0.33$

8. $\frac{25}{3\times 100}\times 3600 = \text{Rs}300$ (The amount spent on house)

$\frac{100}{3\times 100}\times 3600 = \text{Rs } 1{,}200$ (The amount spent on food)

9. $\frac{30}{100} \times 1,50,000$ = Rs 45,00

10. $\frac{21}{100} \times 685 = 144$

11. $\frac{10}{100} \times 80 = 8$

80 + 8 = 88

12. By concept

13. $\frac{5}{100} \times 50 = 2.5$

50 - 2.5 = 47.5

14. $\frac{5}{100} \times 950 = 47.5$

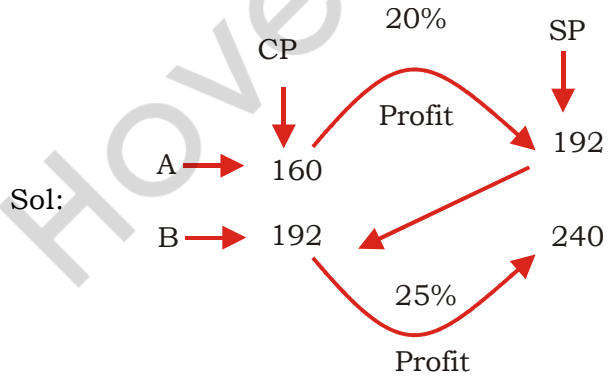
950 - 47.5 = 902.5

15. $\frac{10}{100} \times 15000 = \text{Rs } 1,500$

$\frac{15}{100} \times 16,500 = \text{Rs } 2,475$

16. Key : 1, 3

Sol:



∴ Profit of 48 Rs. and profit percentage = 25%

17. Key : 1, 2

Sol: S.P – C.P = $\frac{1}{9}$(C.P) $\Rightarrow \left(1+\frac{1}{9}\right)$xC.P = S.P

18. Key : 1
Sol: C.P = Rs. 2750, S.P = Rs. 28.60; So, gain = Rs (28.60 - 27.50) = Rs. 1.10

$\therefore$ Gain% $= \left(\frac{1.10}{27.50} x100\right)\% = 4\%$

19. Key : 1

Sol: $10,000\left(1+\frac{20}{100}\right)^4 = 10,000\left(\frac{6}{5}\right)^4 = 10,000x(1.2)^4 = 20,736$

20. Key : 4
Sol: C.P = 1200x 200 = 2,40,000
Transporation and storage cost = Rs. 10,000
Total C.P = 2,40,000 + 10,000 = 2,50,000
Total S.P = 13 x 200 x 100 = 2,60,000
Now, since SP > CP, hence thre will be profit.
Profit = Sp-CP = Rs. (2,60,000 - 2,50,000) = Rs. 10,000

Profit (%) = $\frac{\text{Profit}}{CP} x100 = 4\%$

21. Key : 4
22. Key : 2
Sol: Selling price reduced by 50% $\therefore$ New SP = 240 Rs.
23. Key : 4

Sol: CP	SP of 1 bicycle	No. of bicycles	Total profit
100(Let)	240	100(Let)	14000
100	120	700	14000

24. Key : 4
Sol: Number of bicycles sold is increased to 700%
$\therefore$ 700% $\rightarrow$ 1400 $\Rightarrow$ 100% $\rightarrow$ x $\therefore$ x = 200
25. Key : 2
Sol: Value of the machine after 2 years

$= \text{Rs.}\left[162000x\left(1-\frac{10}{100}\right)^2\right] = \text{Rs.}\left(162000x\frac{9}{10}x\frac{9}{10}\right) = \text{Rs.}131220$

26. Key : 4
Sol: Value of the machine 2 years ago

$= \text{Rs.}\left[\frac{162000}{\left(1-\frac{10}{100}\right)^2}\right] = \text{Rs.}\left(162000x\frac{10}{9}x\frac{10}{9}\right) = \text{Rs.}200000$

27. Key : 1
Sol: Population in the beging of the first year

$$= \frac{9975}{\left(1+\frac{5}{100}\right)\left(1-\frac{5}{100}\right)} = \left(9975x\frac{20}{21}x\frac{20}{19}\right) = 10000$$

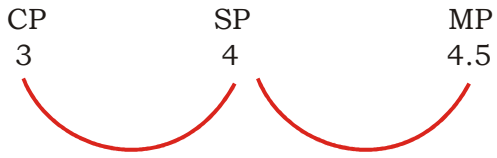
28. Key : 4

CP : SP = 3 : 4

Profit on 3 oranges = Rs. 1 (consider C.P of each organge = Rs. 1)

Profit = $\frac{1}{3}x100$ = 33.33% and discount = 11.11%

Since



Profit is double that of discount

so, the percentage point difference = 33.3% - 11.1% = 22.22% point

29. Key : 2

Profit for 5 oranges = $\frac{5}{3}$ Rs.

$\therefore$ for 10 oranges discount = $\frac{5}{3}$ and 10 oranges CP = 10

$\therefore$ Discount percentage = x (say) $\Rightarrow 10x\frac{x}{100} = \frac{5}{3} \Rightarrow x = \frac{50}{3} = 16\frac{2}{3}\%$

30. Key : 3

Sol: The percentage difference = $33\frac{1}{3} - 16\frac{2}{3} = 16\frac{2}{3}$

31. Key: a $\rightarrow$ 2; b $\rightarrow$ 4; c $\rightarrow$ 2; d $\rightarrow$ 1

Sol: CP = 5k, SP = 6K, so SP > CP $\therefore$ Profit% = $\frac{6K-5K}{5K}x100\%$

32. Key: a $\rightarrow$ 3; b $\rightarrow$ 4; c $\rightarrow$ 1; d $\rightarrow$ 2

a) $\left(a+b-\frac{ab}{100}\right)\% = \left(20+10-\frac{20\times10}{100}\right)\% = 28\%$

c) After first discount of 10% on Rs. 5000 becomes Rs. 5000 – 500 = Rs. 4500

After second discount of 10% on Rs. 4500 becomes Rs. 4500 – 450 = Rs. 4050

After third discount of 10% on Rs. 4050 becomes Rs.4050 – 405 = Rs.3645

33. Ans : 240

Sol:

Abhisehk	Bhanu
Discount $\rightarrow$ 2800	2400 + 640 = 3040

The difference in selling price is same as difference in discount whic Rs. 240 (=3040 - 2800)

AVERAGE

SYNOPSIS - 1

The term 'average' plays a vital role when it comes to comparing the performances of two or more groups of individuals with respect to a certain parameter such as number of marks secured by the students of two or more classes, number of runs scored by the players of two or more teams and so on.

We define 'Average' as:

$$\text{Average} = \frac{\text{Sum of observations}}{\text{Number of observations}}$$

Using the above formula, we may thus find, a single average value for a set of given individual values.

Average thus provides us a single mid-value of the individual scores, that serves to represent the score of the group taken as a whole.

From the above formula, it is clear that

$$\text{Sum of given observations} = (\text{Average}) \times (\text{Number of observations})$$

Example1: Rahul earned Rs. 55, Rs. 70, Rs. 82, Rs. 64, Rs. 36, Rs. 28 and Rs. 43 on consecutive days of a week. Find his average daily earning.

Sol. Sum of Rahul's earnings in 7 days

= Rs. (55 + 70 +82 + 64 + 36 + 28 + 43) = Rs. 378.

$$\therefore \text{ Rahul's average daily earning} = \frac{\text{Total earning in 7 days}}{\text{Number of days}} = Rs.\left(\frac{378}{7}\right) = Rs.54$$

Example 2: Find the average of the number 13, 17, 221, 23, 29, 32.

Sol. Sum of given numbers = (13 + 17 + 21 + 23 + 29 + 32) = 135

$$\therefore \text{Average of given numbers} = \frac{\text{Sum of the numbersw}}{\text{Number of numbers}} = \frac{135}{6} = 22.5$$

Example 3: The average height of 12 students of a class is 154 cm. Three students of heights 143 cm, 149 cm and 152 cm respectively, leave the class. Find the average height of the remaining students.

Sol. Sum of heights of 12 students $= (154 \times 12)\,cm = 1848\,cm$

Sum of heights of remaining 9 students $= (1848 - (143 + 149 + 152))$ cm

$$= (1848 - 444)\,cm = 1404\,cm$$

$$\therefore \text{ Average height of remaining 9 students} = \left(\frac{1404}{9}\right)cm = 156\,cm$$

WORK SHEET

SINGLE ANSWER TYPE

1. David obtained 76,65,82,67 and 85 marks (out of 100) in English, Mathematics, Physics, Chemistry and Biology. What are his average marks?
   1) 65 2) 69 3) 76 4) None of these
2. Find the average of 20 numbers is zero. Of them, at the most, how many may be greater than zero?
   1) 18 2) 20 3) 24 4) 30
3. The average of first five multiples of 3 is
   1) 3 2) 9 3) 12 4) 15
4. The average of the first nine prime numbers is
   1) 9 2) 11 3) $11\frac{1}{9}$ 4) $11\frac{2}{9}$
5. The average of 2, 7, 6 and x is 5 and the average of 18, 1, 6, x and y is 10.What is the value of y ?
   1) 5 2) 10 3) 20 4) 30
6. If the mean of 5 observations $x, x+2, x+4, x+6$ and $x+8$ is 11, thenthe mean of the last three observations is
   1) 11 2) 13 3) 15 4) 17
7. The average of first 50 natural numbers is
   1) 12.25 2) 21.25 3) 25 4) 25.5
8. The average of all odd numbers upto 100 is
   1) 49 2) 49.5 3) 50 4) 51
9. The average of 7 consecutive numbers is 20. THe largest of these numbers is
   1) 20 2) 22 3) 23 4) 24
10. The average of five consecutve odd numbes is 61. What is the difference between highest and lowest numbers?
    1) 2 2) 5 3) Cannot be determined 4) None of these
11. A family consists of grandparents, parents and three grandchildren. The average are of the grandparents is 67 years, that of the parents is 35 years and that of the grandchildren is 6 years. What is the average age of the family?
    1) $28\frac{4}{7}$ years 2) $31\frac{5}{7}$ years 3) $32\frac{1}{7}$ years 4) None of these
12. If the average marks of three batches of 55, 60 and 45 students respectively is 50, 55 and 60, then the average marks of all the students is
    1) 53.33 2) 54.68 3) 55 4) None of these
13. The average weight of 16 boys in a class is 50.25 kgs and that of the remaining 8 boys is 45.15 kgs. Find the average weight of all the boys in the class.
    1) 47.55 kgs 2) 48 kgs 3) 48.55 kgs 4) 49.25 kgs
14. The average of 50 numbers is 30. If two numbers, 35 and 40 are discarded, then the average of the remaining numbers is nearly
    1) 28.32 2) 28.78 3) 29.27 4) 29.68
15. The average of five numbers is 27. If one number is excluded, the average becomes 25. The excluded number is
    1) 25 2) 27 3) 30 4) 35
16. The average age of 35 studnets in a class is 16 years. The average age of 21 students is 14. What is the average age of remaining 14 students?
    1) 15 years 2) 17 years 3) 18 years 4) 19 years

17. The average score of a cricketer for ten matches is 38.9 runs. If the average for the first six matches is 42, then find the average for the last four matches.
1) 33.25 2) 33.5 3) 34.25 4) 35

18. The batting average for 40 innings of a cricket player is 50 runs. His highest score exceeds his lowest score by 172 runs. If these two innings are excluded, the average of the remaining 38 innings is 48 runs. The highest score of the player is
1) 165 runs 2) 170 runs 3) 172 runs 4) 174 runs

19. The average of runs of a cricket player of 10 innings was 32. How many runs must he make in his next innings so as to increase his average of runs by 4?
1) 2 2) 4 3) 70 4) 76

20. The average of ten numbers is 7. If each number is multiplied by 12, then the average of the new set of numbers is
1) 7 2) 19 3) 82 4) 84

21. The average monthly income of P and Q is Rs. 5050. The average monthly income of Q and R is Rs. 6250 and the average monthly income of P and R is Rs. 5200. THe monthly income of P is
1) Rs. 3500 2) Rs. 4000 3) Rs. 4050 4) Rs. 5000

WORK SHEET (KEY)				
1) 4	**2)** 2	**3)** 2	**4)** 3	**5)** 3
6) 2	**7)** 4	**8)** 3	**9)** 3	**10)** 3
11) 2	**12)** 2	**13)** 3	**14)** 4	**15)** 4
16) 4	**17)** 3	**18)** 4	**19)** 4	**20)** 4
21) 2				

1. $\text{Average} = \left(\frac{76+65+82+67+85}{5}\right) = \left(\frac{375}{5}\right) = 75$

2. $\text{Average} = \left(\frac{10+15+20+25+30}{5}\right) = \frac{100}{5} = 20$

3. $\text{Average} = \frac{3(1+2+3+4+5)}{5} = \frac{45}{5} = 9$

4. $\text{Average} = \left(\frac{2+3+5+7+11+13+17+19+23}{9}\right) = \frac{100}{9} = 11\frac{1}{9}$

5. We have $\left(\frac{2+7+6+x}{4}\right) = 5$ or $15+x=20$ or $x=5$.

Also, $\left(\frac{15+1+6+x+y}{5}\right)=10$ or $25+5+y=50$ or $y=20$.

6. We have $\left[\frac{x+(x+2)+(x+4)+(x+6)+(x+8)}{5}\right]=11$ or $5x+20=55$ or $x=7$.

So, the numbers are 7, 9, 11, 13, 15.

$\therefore$ Required mean $=\left(\frac{11+13+15}{3}\right)=\frac{39}{3}=13$

7. Sum of first n natural numbers $=\frac{n(n+1)}{2}$

So, average of first n natural numbers $=\frac{n(n+1)}{2n}=\frac{n+1}{2}$.

$\therefore$ Required average $=\left(\frac{50+1}{2}\right)=\frac{51}{2}=25.5$

8. Sum of odd numbers upto

$=(1+99)+(3+97)+(5+95)+.....+$ upto 25 pairs

$=100+100+100+.....(25 \text{ times})=2500$.

$\therefore$ Average $=\left(\frac{2500}{50}\right)=50$.

9. Let the numbers be $x, x+1, x+2, x+3, x+4, x+5$ and $x+6$.

Then $\frac{x+(x+1)+(x+2)+(x+3)+(x+4)+(x+5)+(x+6)}{7}=20$

or $7x+21=140$ or $7x=119$ or $x=17$.

10. Let the numbers be $x+x+2, x+4, x+6$ and $x+8$

Then, $\frac{x+(x+2)+(x+4)+(x+6)+(x+8)}{5}=61$ or $5x+20=305$ or $x=57$.

So, required difference $=(57+8)-57=8$

11. Required average $=\left(\frac{67\times2+35\times2+6\times3}{2+2+3}\right)$

$=\left(\frac{134+70+18}{7}\right)=\frac{222}{7}=31\frac{5}{7}$ years.

12. Required average $=\left(\frac{55\times50+60\times55+45\times60}{55+60+45}\right)$

$=\left(\frac{2750+3300+2700}{160}\right)=\frac{8750}{160}=54.68$

13. Required average $= \left(\frac{50.25\times16+45.15\times8}{16+8}\right)$

$= \left(\frac{804+361.20}{24}\right) = \frac{1165.20}{24} = 48.55$

14. Sum of 50 numbers $= 30\times50 = 1500$

Sum of remaining 48 numbers $= 1500 - (35+40) = 1425$

$\therefore$ Required average $= \left(\frac{1425}{48}\right) = \frac{475}{16} = 29.68$

15. Excluded number $= (27\times5)-(25\times4) = 135-100 = 35$

16. Sum of the ages of 14 students $= (16\times35)-(14\times21) = 560-294 = 266$

$\therefore$ Required average $= \left(\frac{266}{14}\right) = 19$ years.

17. Requried average $= \frac{(38.9\times10)-(42\times6)}{4} = \frac{137}{4} = 34.25$

18. Let the highest score be x. Then, lowest score $= (x-172)$.

Then, $(50\times40)-[x+(x-172)] = 38\times48$

$\Leftrightarrow 2x = 2000+172-1824 \Leftrightarrow 2x = 348 \Leftrightarrow x = 174$

19. Average after 11 innings $= 36$

$\therefore$ Requried number of runs $= (36\times11)-(32\times10) = 396-320 = 76$

20. Average of 10 numbers $= 7$.

Sum of these 10 numbers $= (10\times7) = 70$

$\therefore\ x_1+x_2+.....+x_{10} = 70$.

$\Rightarrow 12x_1+12x_2+....+12x_{10} = 840$

$\Rightarrow \frac{12x_1+12x_2+.....+12x_{10}}{10} = 84$

$\Rightarrow$ Average of new numbers is 84.

21. Let P, Q and R represents their respective monthly incomes. Then, we have

$P+Q = (5050\times2) = 10100$ ....(i)

$Q+R = (6250\times2) = 12500$ .....(ii)

$P+R = (5200\times2) = 10400$ ....(iii)

Adding (i), (ii) and (iii) we get: 2 (P + Q + R) = 330000 or P + Q + R = 16500 ....(iv)
Substracting (ii) from (iv), we get P = 4000.
$\therefore$ P's monthly income = Rs. 4000.

GEOMETRY

SYNOPSIS - 1

BASIC GEOMETRICAL IDEAS:

Explanation of a point, line segment, ray, line, plane and space.

Point: A fine dot marked with a sharp edged pencil represents a point. It has no length, breadth and thickness. Points are denoted by capital letters like A,B,C, etc.,

Point has no dimensions: Point has no thickness or size, generally we should keep a dot as thin as possible to represent a point.

Line Segment: The shortest path connecting two points is called a segment. Let 'A' and 'B' be two points in a plane. Then, the shortest path from A to B is called the line segment AB. Line segment AB is same as line segment BA. It is denoted by $\overline{AB}$ or $\overline{BA}$

$\overline{AB}$ is same as $\overline{BA}$.

Note: A line segment contains infinite number of points

Ray: A line segment extended endlessly in one direction is called a ray.

Note:

1. The ray AB has one end point, namely A, called its initial point.
2. Clearly, a ray has no definite length
3. Usually $\overrightarrow{AB}$ is not same as $\overrightarrow{BA}$.
4. $\overrightarrow{BA}$ is a ray with initial point 'B' and extends endlessly in the direction from 'B' to 'A'

So $\overrightarrow{AB}$ and $\overrightarrow{BA}$ are two different rays.

Can ray has more than one name?

Observe ray AB, its initial points is 'A' and its direction is from 'A' to 'B'. It can aslo be named as ray AD, ray AC but not as ray DC.

Note: A ray contains infinite number of points.

Line: A line segment extended endlessly on both sides is called a line. Thus a line segment $\overline{AB}$ extended on both sides and marked by arrows at two ends represents a line, denoted by $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$ and called as line AB or line BA.

Some times we represent the line by small letters l, m, n etc.

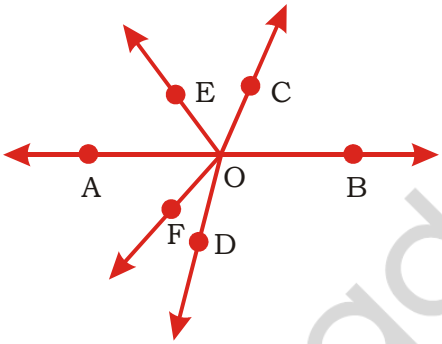
Note: 1. A line has no end points. It contains infinite number of points.
2. It has length but no thickness.
3. The line segment is a part of the line.

Naming a line:

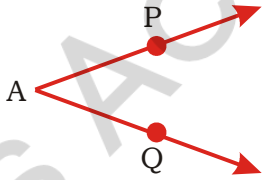
First line can be called as $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$.

Second line can be called as $\overleftrightarrow{AB}, \overleftrightarrow{AC}, \overleftrightarrow{AD}, \overleftrightarrow{BC}, \overleftrightarrow{BD}, \overleftrightarrow{CD}, \overleftrightarrow{BA}, \overleftrightarrow{CA}, \overleftrightarrow{DA}, \overleftrightarrow{CB}, \overleftrightarrow{DB}, \overleftrightarrow{DC}$.

Coinitial rays: Unlimited number of rays can be drawn in different directions with a given point say 'O' as the initial point.



$\overrightarrow{OA}, \overrightarrow{OB}, \overrightarrow{OC}, \overrightarrow{OD}, \overrightarrow{OE}, \overrightarrow{OF}$ are called co initial rays



Here, $\overrightarrow{AP}$ and $\overrightarrow{AQ}$ are co - initial rays.

Note: We cannot draw the complete picture of a ray on the paper.

Introduction to Plane: A solid has a surface which may be flat or curved. The surface of a wall is flat and the surface of a ball is curve. Flat surfaces are known as plane surfaces.

Definition: A smooth flat surface which extends endlessly in all directions is called a plane. A plane has infinite length and breadth but has no thickness.

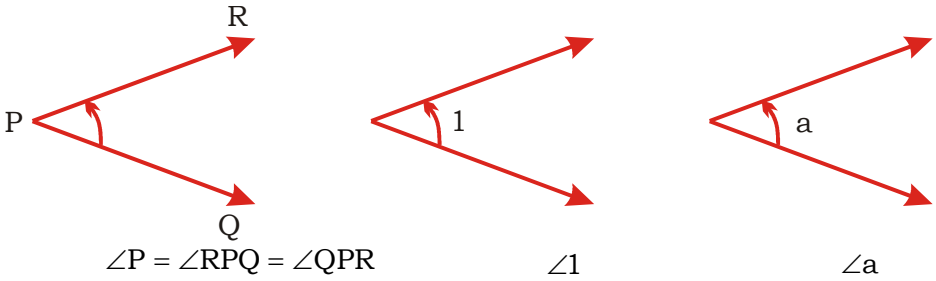
Part of a plane: The surface of the top of a table is a part of a plane, which has a boundary.

Plane figures: Triangle, Rectangle, Circle etc,. are plane figures. We draw them in a plane and call them as plane figures. Cube is not a plane figure.

Angle: An angle is the union of two different rays having the same initial point. (or) Amount of rotation

Representing an angle: Generally we use three capital letters to represent an angle. The above angle is represented by $\angle AOB$ (or) $\angle BOA$ and is read as 'angle AOB' or 'angle BOA'. Note that the middle letter denotes the vertex of the angle. The symbol $\angle$ stands for angle. It can also be represented by $\angle O$. Some times we use numbers or lower case letter to denote angles.

Consider the following angles:

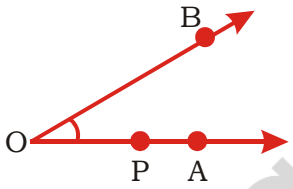


$\angle P = \angle RPQ = \angle QPR$ $\angle 1$ $\angle a$

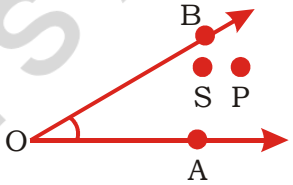
INTERIOR AND EXTERIOR OF AN ANGLE:

An angle divides the plane into three regions.

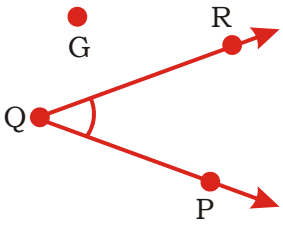
i) Point belongs to the angle: If any point (like P) lying on one of its arms, then that 'P' belongs to the angle.



ii) Interior of an angle: In the following figure, 'S' does not belong to the angle. Note that the points 'S' and 'P' are on the same side of the $\overrightarrow{OB}$ and the points 'S' and 'P' are also on the same side of the $\overrightarrow{OA}$. Such a point is said to be in the interior of the angle.



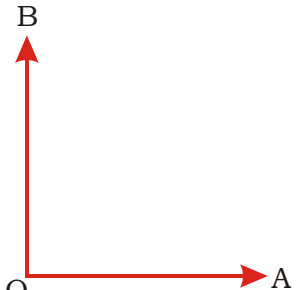
iii) Exterior of an angle: In the following figure, 'G' does not belong to the angle. It is not in the interior of the angle. We say that it is in the exterior of the angle.



Magnitude of an angle: The magnitude of an angle is the amount of rotation through which one of the arms must be rotated about the vertex to bring it to the position of the other.

Measure of an angle: To find out the magnitude to a given angle, we need a standard unit angle. Then we can compare the given angle with the unit angle and say its measure.

i) A quarter turn of a ray $\overrightarrow{OA}$ about O describes an angle which is called a right angle.



A right angle

ii) Units for measuring angle: A right angle is divided into 90 equal parts and each part is called a degree. Degree is the unit for measuring an angle. One degree is written as 1°. One degree is divided into 60 equal parts and each part is called a minute. One minute is divided into 60 equal parts and each part is called a second. 1 minute is denoted by 1^{1}. 1 second is denoted by 1^{11}.

$1^{0} = 60^{1}$ (read as 60 minutes)

$1^{1} = 60^{11}$ (read as 60 seconds).

TYPES OF ANGLES:

Acute angles: An angle whose measure is less than 90° and greater than O° is called an acute angle i.e., If θ is an acute angle, then $0^{o} < \theta < 90^{o}$

Right angle: An angle whose measure is 90° is called a right angle.

TYPE OF ANGELS:

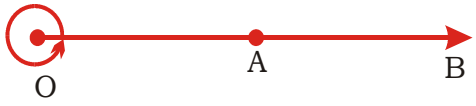
i) Obtuse angle: An angle whose measure is greater than 90° and less than 180° is called obtuse angle.

ii) Straight angle: An angle whose measure is 180° is called a straight angle.

Note: A straight angle = Two right angles.

iii) Reflex angle: An angle whose measure is greater than 180° and less than 360° is called a reflex angle.

iv) Complete angle: An angle whose measure is 360° is called a complete angle

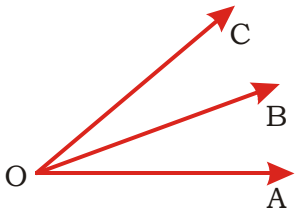


Here $\angle AOB$ is 360°.

Note: A complete angle = Four right angles.

v) Zero angle: If the measure of the angle is zero, it is called a zero angle.

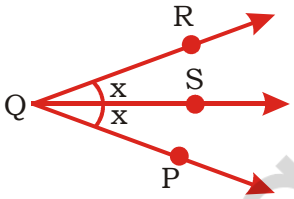
OPERATIONS WITH ANGLES:



Consider $\angle AOB$ and $\angle BOC$ in the above figure. Both $\angle AOB$ and $\angle BOC$ have a common arm $\overrightarrow{OB}$ and a common vertex 'O'. $\therefore \angle AOC = \angle AOB + \angle BOC$.

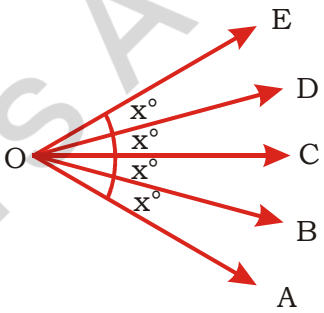
Bisector of the angle:

i)



$\angle PQS$ and $\angle SQR$ have the same measure and congruent. So $\overrightarrow{QS}$ is called the bisector of $\angle PQR$. A ray which divides an angle into two congruent angles is called the bisector of the angle.

ii)



In the above figure, $\angle AOE$ is divided into four congruent angles.

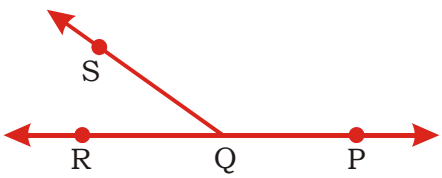
$\angle AOB = \angle BOC = \angle COD = \angle DOE = x^\circ, \angle AOE = 4x^\circ$

$\angle AOB = \frac{\angle AOE}{4}, \angle AOC = \frac{\angle AOE}{2}, \angle AOD = \frac{3\angle AOE}{4}$

PAIRS OF ANGLES:

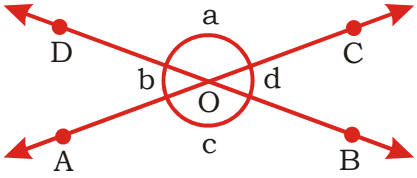
i) Adjacent angles: Two angles in a plane are called adjacent angles, if they have a common vertex, a common side and their interiors do not have a common point.

ii) Linear pair:



In the above figure ∠PQS and ∠RQS are adjacent angles, $\overrightarrow{QP}$ and $\overrightarrow{QR}$ are opposite rays.
Such a pair of adjacent angles is called a 'linear pair' (or) the pair of adjacent angles whose non common arms are opposite rays is called a 'linear pair'. Linear pair forms 180°.

iii) Vertically opposite angles: Consider two lines $\overleftrightarrow{AC}$ and $\overleftrightarrow{BD}$ intersecting at 'O'.



Consider the angle ∠a and ∠c. They have a common vertex "O' but do not have common arm. Such angles are called vertically opposite angles. ∠b and ∠d are also vertical opposite angles, which are equal.

iv) Supplementary angles: Two angles are said to be supplementary if the sum of their measure is 180°.

Ans: The measure of the supplementary angle of 20° is 180° – 20° = 160°

Complementary angles: If the sum of the measures of two angles is equal to 90°, then they are called complementary angles.

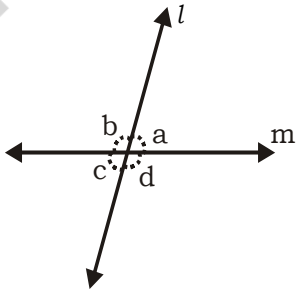
Ans: The measure of the complementary angle of 60° is 90° – 60° = 30°

WORK SHEET - 1

SINGLE ANSWER TYPE

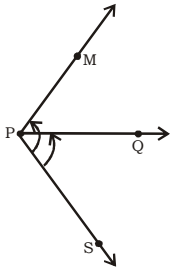
1. Points that don't lie on the same line are called _____
   1) Collinear points 2) Non-Collinear points
   3) Coplaner points 4) Non-Coplanar points
2. If two different lines in a plane have a point in common, then the lines are called
   1) Concurrent lines 2) Intersecting lines
   3) Coplanar lines 4) both (2) & (3)
3. Which of the following statement is true?
   1) A line segment is a set of points
   2) A line segment is always a part of a line
   3) A line segment has two end points
   4) All of the above
4. Of three collinear points A,B, and C), if AB + BC = AC, then we say that
   1) A is between B and C 2) B is between A and C
   3) C is between A and B 4) none of these
5. If A, B and C are three collinear points then which of the following
   1) AB + BC + AC 2) AC – BC = AB
   3) AC – AB = BC 4) All of the above

6. Which of the following statement is false _____
   1) A ray is a part of a line 2) A ray has two end points
   3) A ray is a set of points 4) None of these
7. During the rotation, at one stage two rays becomes opposite rays. Then the angle so formed is called
   1) Zero angle 2) Straight angle 3) Reflex angle 4) No angle can form
8. If the terminal ray coincide with the initial ray without any rotation then the angle formed is
   1) zero angle 2) straight angle 3) complete angle 4) reflex angle
9. An angle whose measure is 90^0 is called
   1) An acute angle 2) Obtuse angle
   3)) Right angle 4) Reflex angle
10. An angle whose measure is 180^0 is called
    1) Right angle 2) Reflex angle 3) Straight angle 4) Obtuse angle
11. Two angles in a plane have the common vertex, a common side and their interiors do not have a common point. Such angles are called
    1) Congruent angles 2) Adjacent angles
    3) Linear angles 4) Supplementary angles
12. If the sum of the measure of two angles is equal to 90^0 they are called
    1) Adjacent angles 2) Complementary angles
    3) Supplementary angles 4) vertically opposite angles
13. If two complementary angles have equal measures, the measure of each angle is
    1) 90^0 2) 45^0 3) 60^0 4) 0^0
14. The measure of an angle is 20^0 more than the measure of its supplement s
    1) 80^0 2) 100^0 3) 70^0 4) 110^0
15. In the given figure, lines 1 and m intersect at a point. If $\angle a = 50^0$, then the measure of $\angle c$ is



1) 50^0 2) 30^0 3) 60^0 4) 140^0

16. In the adjacent figure, $\angle SPM = 110^0$ & $\angle SPQ = 55^0$ the measure of $\angle MPQ$ is

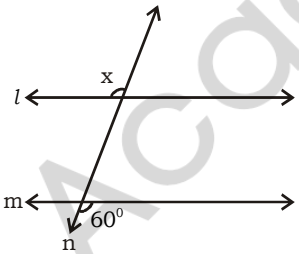


1) 45^0 2) 110^0 3) 55^0 4) 65^0

17. In the given figure, $\angle 1 = 70^0$. If $\overline{AB} \,||\, \overline{CD}$ then $\angle 2 =$

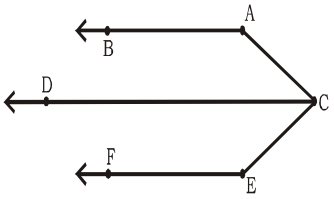
1) 70^0 2) 20^0 3) 110^0 4) 90^0

18. If $l \,||\, m$ and n is the transversal then the value of x is



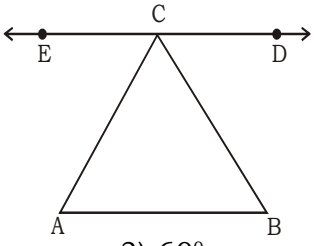
1) 60^0 2) 120^0 3) 70^0 4) 130^0

19. In the adjacent figure, $\overline{AB} \,||\, \overline{CD}$ and $\overline{CD} \,||\, \overline{EF}$. $\overline{CD}$ is the bisector of $\angle ACE$. If $\angle ACE = 80^0$ then the value of $\angle BAC + \angle ACE + \angle CEF$ is



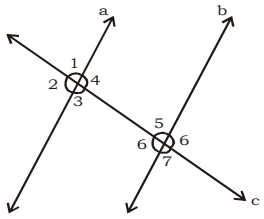
1) 160^0 2) 240^0 3) 180^0 4) 360^0

20. In the following figure, $\overline{DE} \,||\, \overline{AB}$. If $\angle A = 60^0$ & $\angle B = 80^0$, then $\angle ACE + \angle ACB + \angle BCD$ is



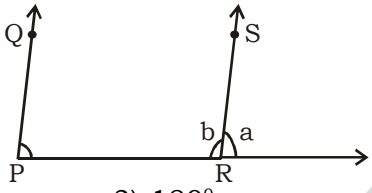
1) 40^0 2) 180^0 3) 60^0 4) 80^0

21. In the adjacent figure a b and c is their transversal. If $\angle I = 45^0$ then $\angle 8$ =



1) 35^0 2) 45^0 3) 145^0 4) 135^0

22. In the adjacent figure $\overline{PQ} \,||\, \overline{RS}$. If $\angle QPR = 60^0$, then $\angle b - \angle a$ =



1) 60^0 2) 120^0 3) 180^0 4) 30^0

MULTI ANSWER TYPE

23. A ray contains
1) One end point 2) No definite length
3) Contains infinite number of points 4) Contains finite number of points

24. Which of the following is/are plane figure(s)
1) Triangle 2) Cube 3) Rectangle 4) Circle

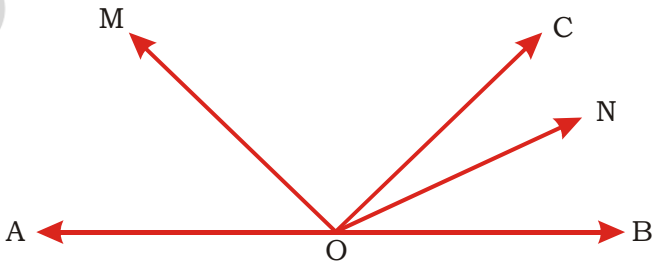
REASONING ANSWER TYPE

25. *Statement-I*: An angle divides the plane into two regions.

Statement-II: A point in the interior of the angle does not belong to the angle.

1) Both Statements are true, Statement II is the correct explanation of Statement I.
2) Both Statements are true, Statement II is not correct explanation of Statement I.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

26.



Statement-I: From the diagram $\angle AOC = 100^0$ and OM and ON are bisectors of $\angle AOC$, and $\angle BOC$ respectively, then $OM \perp ON$.

Statement-II: The bisectors of linear pair forms right angle.

1) Both Statements are true, Statement II is the correct explanation of Statement I.
2) Both Statements are true, Statement II is not correct explanation of Statement I.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

COMPREHENSION TYPE

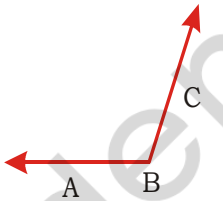
Writeup:1

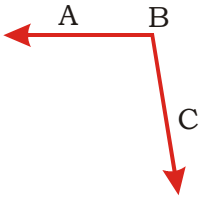
The straight line is generally called as line.Only one straight line is possible through two points on a plane.But we can draw infinite curved line through two points in a plane.

27. Which of the following figure is a straight line?

1) 

2) 

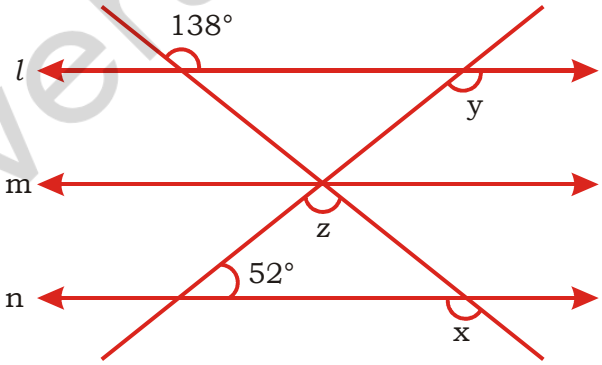
3) 

4) 

28. Two straight lines can't encloses
1) Plane 2) Point 3) Curve 4) Line

29. Number of curves that can be drawn through two points are
1) One 2) Two 3) Infinite 4) Four

Writeup:2



Answer the following from the above diagram

30. The value of X is
1) 52° 2) 138° 3) 90° 4) 69°

31. Valu of Z in degrees is
1) 60° 2) 138° 3) 52° 4) 76°

32. Relation between x and y is
1) Congruent 2) Complementary 3) Supplementary 4) x<y

MATRIX MATCHING TYPE

33.

Column - I	**Column - II**
a) $90° - x°$	1) Complete angle
b) $180°$	2) Suplement of x
c) $360°$	3) Complement of x
d) $180° - x°$	4) Straight angle
	5) Reflex angle

34.

Column - I	**Column - II**
a) Vertex of the angle $\angle DEF$ is	1) $\overrightarrow{QP}, \overrightarrow{QR}$
b) In an angle $\angle PQR$ two initial rays are	2) $\overrightarrow{PQ}, \overrightarrow{PR}$
c) In $\angle AEB$ is also represented by angle	3) 2
d) The minimum number of arms required to form an angle is	4) E
	5) 3

INTEGER ANSWER TYPE

35. The angle formed by hands of a clock when the time is 9:00am _____.

SYNOPSIS - 2

LINE SEGMENT: A part of a line with two end points is called a line segment. A line segment whose end points are A and B is denoted by $\overline{AB}$ or $\overline{BA}$.

i. e it has only length but no direction.
A line segment is also a set of infinite points and all the points are in between the end points of the line .

Number of line Segments: If A, B, C, D, E ... are on a line segment $\overline{PQ}$, then the number of line segments determained by the 'n' points lying on $\overline{PQ}$ is $\frac{n(n-1)}{2}$.

Length of a line Segment: The length or measure of a line segment AB is denoted by $\overline{AB}$ and it is a positive number showing the distance between A and B.

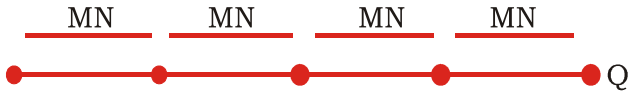
Comparison of line Segments: Two or more line segments can be compared by the virtue of their length. The instruments like ruler, divider, compasscan be used to compare, the line segments.

Congruent line Segments: If the lengths of two line segments is same, then they are called as 'congruent segments'.

i.e. if length of $\overline{AB}$ = length of $\overline{CD}$, then it is denoted by $\overline{AB} \cong \overline{CD}$ where "$\cong$" is the symbol of congruency and read as $\overline{AB}$ is congruent to $\overline{CD}$

Measurement of a line Segment : A line segment can be measured by comparing it with a standard segment called a unit segment. The number of times a unit segment is contained in a given segment is called its measure or length.

Example: A line segment $\overline{PQ}$ is measured by another line segment $\overline{MN}$ of unit measured

i.e 

$\Rightarrow \overline{PQ} = 4\,\overline{MN} = 4$ units.

The basic unit of length in the international system of units (SI) is meter. The other units of length are derived from it as the following :

Unit	Symbol	Relation with meter
Millimeter	mm	1 mm = $\frac{1}{1000}$ mts
Centimeter	cm	1 cm = $\frac{1}{100}$ mts
Decimeter	dm	1 dm = $\frac{1}{10}$ mts
Decameter	dem	1 dem = 10mts
Hectameter	hm	1 hm = 100mts
Kilometer	km	1 km = 1000mts

From the above relation it is noted that
1 cm = 10 mm
1 dm = 10 cm
1 m = 100 cm = 1000 mm
The instruments like ruler, divider, etc can be used to determine the length of line segments.
The greater lengths like length of claas room, badminton court... etc can be measured by a tape

Betweenness: If A, B and C are any three collinear points and if AB + BC = AC, then we say that B is between A and C. Also if $\overline{AB} = \overline{BC}$ then B is called mid point of $\overline{AC}$. Here B is said to be bisector of $\overline{AC}$

Addition and subtraction of lengths of line segments:
Two line segments of different lengths can be added or subtracted using their measurements.

Example: If AB = 6cm and CD = 4.5 cm then
AB + CD = 6 + 4.5 = 10.5 cm
AB – CD = 6 – 4.5 = 1.5 cm
4 CD – 2 AB = 4 (4.5) – 2 (6)
= 18 – 12 = 6 cm

WORK SHEET - 2

SINGLE ANSWER TYPE

1. A line has _____ end points
   1) One 2) Two 3) No 4) None of these
2. A line extends definitely in _____ directions.
   1) Both 2) Only one direction
   3) Right 4) Left
3. Name the given line :

   1) $\overline{AB}$ 2) $\overline{BC}$ 3) $\overline{BC}$ 4) All of the above
4. Points lying on the same line are called _____
   1) Collinear points 2) Similar points
   3) Coplanar points 4) All
5. No. Of lines can be drawn passing through two different points in a plane is
   1) One 2) Two 3) Infinite 4) No line
6. No. Of curves that can be drawn passing through two points in a plane
   1) One 2) Two 3) Infinite 4) Finite
7. No. Of lines that can be drawn passing through three non collinear points taking two at a time
   1) One 2) Two 3) Three 4) Six
8. No. Of lines that can be drawn passing through three non collinear points taking two at a time
   1) One 2) Two 3) Three 4) Six
9. No. Of lines can we draw passing through three collinear points
   1) One 2) Two 3) Three 4) Infinite
10. The formula for the number of lines joining two points at a time is
    1) $\frac{n(n+1)}{2}$ 2) $\frac{n(n-1)}{2}$ 3) $\frac{n(n-3)}{2}$ 4) $\frac{n(n+3)}{2}$
11. A flat surface extending indefinitely in all directions is called
    1) Plane 2) Line 3) Parallelogram 4) Triangle
12. A plane is a flat surface extending indefinitely in directions
    1) One 2) Two 3) All 4) None
13. No. Of lines can be drawn passing through a given point in a plane.
    1) An Unlimited 2) Only one
    3) Finite 4) None of these
14. Two lines are in the same plane and they are not intersecting. Such lines are called)
    1) Intersecting lines 2) Parallel lines
    3) Non- parallel lines 4) None of these
15. Points belonging to the same plane are called
    1) Collinear points 2) Co-planar points
    3) Non collinear points 4) Intersecting points

16. Lines belonging to the same plane are called
    1) Parallel lines 2) Non - intersecting lines
    3) Intersecting lines 4) Co-planar lines
17. The point through which the concurrent lines pass is called the
    1) Intersecting point 2) Point of concurrence
    3) Collinear point 4) All of the above
18. The set of all points is called _____
    1) Plane 2) Space 3) Surface 4) All
19. Space is set of points.
    1) Finite 2) An Infinite
    3) Collection of 4) None of the above
20. Lines and planes are subsets of
    1) Plane 2) Space 3) Surface Area 4) All
21. Two segments having the same length are called
    1) Equal segments 2) Similar Segments
    3) Congruent segments 4) All of the above
22. If AB = 4.5cm and CD = 2.5cm then the value of 2AB – 3CD is
    1) 2.5cm 2) 2cm 3) 1cm 4) 1.5cm
23. If AB = 8cm and CD = 4.2cm then the value of 4AB + CD/3 is
    1) 3,4cm 2) 16.2cm 3) 18.2cm 4) 33.4cm
24. The line divided into two parts called
    1) Line 2) Line segment 3) Rays 4) All
25. A ray has _____ end point(s)
    1) One 2) Two 3) No end points 4) Infinite
26. Two rays are extending indefinitely in the opposite directions of the same line. Such rays are called
    1) Intersecting rays 2) Opposite rays
    3) Such type of rays does not exist 4) None of these
27. An angle whose measure is greater than 90^0 and less than 180^0 is called
    1) An acute angle 2) An Obtuse angle
    3) Right angle 4) Reflex angle
28. One complete angle = ——— Right angles
    1) 2 2) 4 3) 3 4) 5
29. The magnitude of the angle between the hands of a clock when the time is 3'0 clock
    1) 120^0 2) 150^0 3) 180^0 4) 90^0
30. A ray which divides an angle into two congruent angles is called of the angle
    1) Bisector 2) Congruent 3) Measure 4) None

31. The pair of adjacent angles, whose non common arms are opposite rays is called
    1) A linear pair 2) Adjacent angles
    3) Complementary angles 4) Supplementary angles

32. If two lines intersect, then the angles formed having no common side are called angles
1) Adjacent angles 2) Complementary angles
3) Vertically opposite 4) Supplementary

33. The supplementary angle of 31° is
1) 59^0 2) 139^0 3) 149^0 4) 69^0

34. The complementary angle of 30° is
1) 60^0 2) 150^0 3) 140^0 4) 50^0

35. Angle between two parallel lines is
1)0^0 2)90^0 3) 180^0 4)360^0

36. Angle between two perpendicular lines is
1) 0^0 2) 90^0 3) 270^0 4) 180^0

37. The coplanar lines which do not intersect are called
1) Parallel lines 2) Perpendicular lines
3) Non Intersecting lines 4) none

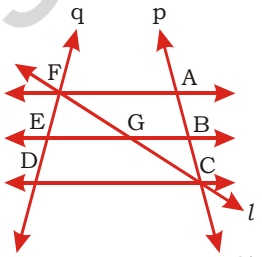
38. A line which intersects two or more given lines at different points is called to the given lines.
1) Parallel 2) Perpendicular 3) Transversal 4) Equal

39. 1, m and n are lines n a plane if $l||m$ and $m||n$ then
1) $l||n$ 2) $n||l$ 3) $l||n||m$ 4) All

40. If $l \perp n$ and $m \perp n$ then
1) $l \perp n$ 2) $l \perp m$ 3) Both 1 & 2 4) None

MULTI ANSWER TYPE

41. A, B, C are collinear if and only if
1) AB + BC = AC 2) BC = AB + AC 3) AB = BC + AC 4) 42. In the given figure, collinear points are _____



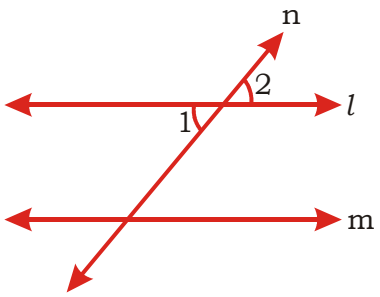
1) A, B, C 2) D, E, F 3) F, G, C 4) D, G, B

REASONING ANSWER TYPE

43. *Statement-I*: If AX = 0.3 cm, XB = 4cm, AB = 3.7 cm then A, B, X are called collinear.
Statement-II: The lines which belong to the same plane are called non - coplanar lines.
1) Both Statements are true, Statement II is the correct explanation of Statement I.
2) Both Statements are true, Statement II is not correct explanation of Statement I.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

44. *Statement-I*: In the given figure l, m are parallel lines and n is a transversal, then $\angle 1 = \angle 2$.

Statement-II: In the given figure l is parallel to m and vertically opposite angles are equal.

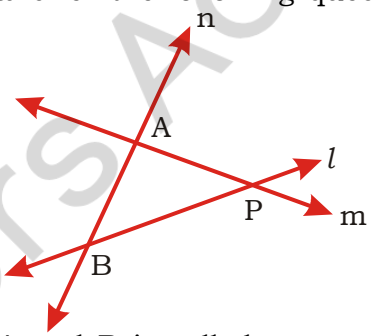


1) Both Statements are true, Statement II is the correct explanation of Statement I.
2) Both Statements are true, Statement II is not correct explanation of Statement I.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup:1

By using given figure answer the following questions

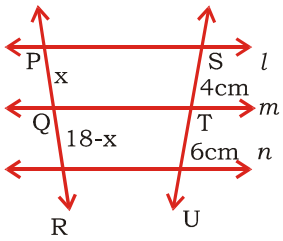


45. The distance between A and B is called
1) $\overline{AB}$
2) Intercept
3) Length of the line AB
4) None

46. The line 'n' is called
1) Transversal
2) Intersecting lines
3) Parallel line
4) Perpendicular line

47. The lines l and m intersecting at
1) A
2) B
3) P
4) Q

Writeup:2



In the given figure $l||m||n$ and PR, SU are transvesals

PR = 18 cm, UT = 6 cm, TS = 4 cm

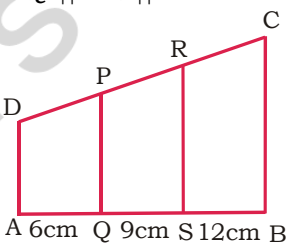
48. The length of QR is
    1) 10.8 cm 2) 5.8 cm 3) 5 cm 4) 4.2 cm
49. The length of PQ
    1) 28.8 cm 2) 7.2 cm 3) 11 cm 4) 132 cm
50. The value of PR + UT is
    1) 20 cm 2) 22.8 cm 3) 24 cm 4) 22 cm

MATRIX MATCHING TYPE

51.

Column - I	**Column - II**
a) Maximum number of points of intersection at three different lines is	1) Infinite
b) Three points P, Q and R are collinear, if PR + RQ = PQ the point lies between P and Q	2) 3
c) If l ||n and m||n then	3) R
d) Coincident lines have common points	4) l||m

52. In the given figure, AD || PQ || RS || BC. If CD = 30 cm.



Column - I	**Column - II**
a) the length of DP is	1) $6\frac{2}{3}$cm.
b) the length of PR is	2) $13\frac{1}{3}$cm.
c) the length of RC is	3) 10 cm.
d) CR – DP =	4) 8 cm.
	5) 9 cm.

INTEGER ANSWER TYPE

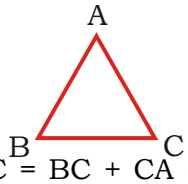
53. The sum of adjacent angles in a linear pair is _____.

SYNOPSIS - 3

Introduction: A simple closed figure bounded by line segments is called a Polygon.

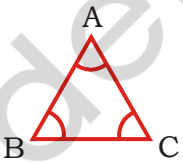
Triangle: A polygon with three sides is called a triangle. The symbol for triangle is 'Δ'

Perimeter of the traiangle: The sides are $\overline{AB}, \overline{BC}, \overline{CA}$. The sum of the measures of $\overline{AB}, \overline{BC}$ and $\overline{CA}$ is called the perimeter of the triangle.



Perimeter of the triangle ABC = BC + CA + AB.

Angles of the triangle: Observe the figure $\overline{BA}$ and $\overline{BC}$ are two line segment having the same end point B, which forms an angle. This angle is '$\angle B$'.



Similarly $\angle C$ and $\angle A$ are the other two angles.

$\therefore$ A triangle has three sides and three angles.

Totally these six are called six components (or) six parts of a triangle.

Note: The sum of the measures of the angles of a triangle is 180°.

INTERIOR AND EXTERIOR OF A TRIANGLE

a) Interior of a triangle: A point is said to be interior of a triangle, if it lies inside the triangle.

b) Lies on a triangle: A point lies on a triangle, if it lies on any one of its sides.

c) Exterior of a triangle: A point lies in the outside of a traingle, if it lies in the plane of the triangle, but neither on the triangle nor in the interior.

Note: A triangle divides a plane in which it lies into three parts.

CLASSIFICATION OF TRIANGLES

a) Classification of triangles according to the sides:

1) Equilateral triangle: A triangle whose sides are equal in length is called an 'equilateral triangle'. All the angles in the equilateral triangle are equal.

2) Isosceles triangle: A triangle in which two sides are equal in length is called 'Isosceles triangle'. In an isosceles triangle the unequal side is called the base of the triangle. The base angles of an isosceles triangle are congruent.

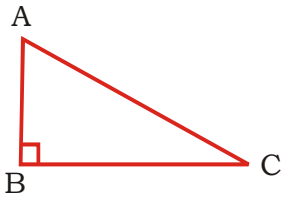
Note: Every equilateral triangle is isoceles.

3) Scalene triangle: If no two sides of a triangle are equal in length, it is called a Scalene triangle.

b) Classification of triangles according to the angles:

1) Acute angled triangle: If each angle of a triangle is an acute angle, then it is called an 'Acute angled triangle'. Measure all angles and observe all are less than 90°.

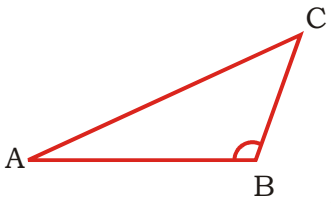
2) Right angled triangle: A triangle in which one of its angles is a right angle is called 'Right angled triangle'



In this triangle $\angle B = 90°$, therefore it is a right angled triangle.

In a right angled triangle, the opposite side of the right angle is called 'Hypotenuse'.

3) Obtuse angled triangle: A triangle containing an obtuse angle is called obtuse angled triangle.



In the figure $\angle B > 90°$, so it is an obtuse angled triangle.

CONCURRENT LINES IN A TRIANGLE:

Median: A line segment which joins a vertex of a triangle to the mid point of the opposite side is called median. The number of such line segments that can be drawn in the triangle are three. The median which joins the vertex A of a triangle to the mid point of side a is denoted by M_a it is given, in terms of the sides of a triangle, the formula $M_a = \frac{1}{2}\sqrt{2b^2 + 2c^2 - a^2}$

Altitude: The perpendicular drawn from any vertex of the triangle to the opposite side or its extension is called altitude. The number of such line segments that can be drawn in the triangle are 3.

Note: In an obtuse angled triangle, two altitudes fall on the extensions of the sides outside the triangle, and the third altitude falls inside the triangle. In an acute angled triangle all three altitudes lie within the triangle. In a right angled triangle the legs serve as altitudes.

Perpendicular bisector: The line passing through the mid point of the side and perpendicular to the same side is called perpendicular bisector. The number of such lines that can be drawn in the triangle are 3.

Angular bisector: An angular bisector of triangle is the line segment which divides any angle into two equal halves.

Concurrent lines: Three or more lines passing through the same point are called concurrent lines. That common point is called point of concurrence.

1. Centroid: The point of concurrence of the medians of a triangle is called centroid. It is denoted by 'G'

Note: 'G' divides AD in the ratio 2:1.

2. Orthocentre: The point of concurrence of the altitude of a triangle is called orthocentre. It is denoted by 'O' (or) 'H'

3. Circumcentre: The point of concurrence of perpendicular of the sides of a triangle is called circumcentre. It is denoted by 'S'.

Note: Circumcentre is equidistance to its vertices.

In a right angle triangle 's' is the mid point of the hypotenuse.

S.No.	Type of Triangle	Position of circum centre
1.	Acute	Interior of the triangle
2.	Obtuse	Exterior of the triangle
3.	Right	Mid point of hypotenuse

4. Incentre: The point of concurrent of internal angular bisectors of a triangle is called incentre. It is denoted by 'I'.

Note: Incentre is equi distance to its sides.

5. Excentre: The point of concurrence of internal bisector of one angle and the external bisectors of other two angles is called excentre.

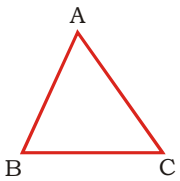
Note: A triangle has three ex-centres.

Properties of triangles:

I. Inequalities of a triangle:

1. The sum of the lengths of any two sides of a triangle is greater than the length of the third side.
2. The difference of the lengths of any two sides of a triangle is smaller than the length of the third side.

In the adjacent triangle ABC



3) In the adjacent triangle ABC,

(i) $AB + AC > BC$, $AC + BC > AB$, $BC + AB > AC$ (OR)
$c + b > a$, $b + a > c$, $a + c > b$

(ii) $AB - AC < BC$, $AC - BC < AB$, $BC - AB < AC$ (OR)
$c - b < a$, $b - a < c$, $a - c < b$

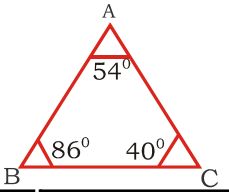
Example:- Can the following be the measures of the sides of triangle ?
7 cm,12 cm,13 cm

Sol:- Here, $7 + 12 = 19 > 13$; $12 + 13 = 25 > 7$; $7 + 13 = 20 > 12$.
Also, $12 - 7 = 5 < 13$; $13 - 12 = 1 < 7$; $13 - 7 = 6 < 12$.
So, 7 cm,12 cm,13 cm are the sides of a triangle.

II. Relation between sides and angles of a triangle:

1. In a triangle, the angle opposite to longer side is the greatest angle.
2. In a triangle, the angle opposite to shorter side is the smallest angle.
3. Example:- Consider the triangle ABC, clearly $\angle C < \angle A < \angle B$, then

AC is the longest side and AB is smallest side.



Note:

1) No two angles of a scalene triangle are congruent.

2) In a right angle triangle hypotenuse is the longest side and it is opposite to right angle.

3) In a right angle triangle, angles other than right angle are smaller than 90°.

4) Exterior angle of a triangle is equal to sum of its interior opposite angles greater than each of its interior opposite angles.

5) In an equilateral triangle , all the three angles are congruent and each angle is 60^o

6) In an isosceles triangle , two of the angles are congruent and the sides opposite to congruent angles are congruent.

WORK SHEET - 3

SINGLE ANSWER TYPE

1. In a triangle ABC, $\angle A = 60$ and AB = AC then the triangle ABC is _____
   1) Equilateral 2) Isosceles 3) Both a & b 4) None
2. A simple closed figure bounded by line segment is called a
   1) Segment 2) polygon 3) line 4) ray
3. A polygon with three sides is called
   1) Parallelogram 2) pentagon
   3) decagon 4) triangle
4. A point lies on a triangle if it lies on any one of its
   a) Sides b) angles c) both (1) and (2) d) neither (a) or (b)
5. A triangle divides a plane in sets of points
   a) Two b) three c) four d) one
6. A triangle has six components namely
   a) 4 sides, 4 angles b) 2 sides, 2 angles
   c) 5 sides, 5 angles d) 3 sides, 3 angles
7. Sum of the angles of a triangle.
   a) 360^0 b) 180^0 c) 540^0 d) 1080^0
8. A triangle in which all sides are equal
   a) E equilateral b) Isosceles
   c) scalene d) none of these
9. A Triangle in which two sides are equal is called an
   a) Equilateral b) Isosceles c) scalene d) none of these
10. In isosceles triangle the unequal side is called _____ of triangle
    a) Base b) angle c) both (a) and (b) d) height
11. The base angles of a Isosceles triangle are
    a) congruent b) not congruent c) both (a) & (b) d) unequal
12. If each angle of a triangle is less than 90° it is called angled triangle
    a) Acute b) obtuse c) right d) none
13. In a triangle if one of the angles is 90° it is called angled triangle
    a) acute b) Right c) obtuse d) none

14. In triangle ABC $\angle A = 80^0$, $\angle B = 70^0$, $\angle C$ = ?
    a) 30^0 b) 40^0 c) 20^0 d) 50^0
15. No. of obtuse angles can triangle have
    a) one b) two c) Three d) Four
16. Can a triangle have two right angles?
    a) No b) Yes c) both d) None
17. A triangle having 90^0, 45^0 angles, then the triangle is
    a) Right angled isosceles triangle b) acute angled
    c) obtuse angled d) None
18. A triangle having $100^0.60^0.20^0$ angles then the triangle is
    a) obtuse angled b) Right angled
    c) acute angled d) None
19. A Triangle having $45^0,55^0,80^0$ angles is called
    a) Acute angled b) obtuse angled
    c) Right angled d) None
20. The sides are 15cm, 8crn, 4cm. can you form a triangle?
    a) No b) Yes c) both d) None
21. Sum of any two sides in a triangle is _____ than third side
    a) greater b) less c) equal d) both (a)&(b)
22. If two sides of a triangle are unequal the measure of the angle opposite to the longer side is then the measure of an angle opposite to the shorter side
    a) greater b) bigger c) both (a) and (b) d) smaller
23. If two angle of a triangle are unequal, then the side opposite to the greater angle is then the side opposite to smaller angle.
    a) longer b) shorter c) smaller d) both (b) & (c)
24. Each angle of an equilateral triangle is _____
    a) Congruent b) equal c) unequal d) both (a) & (B)
25. The side opposite to right angle is called _____
    a) hypotenuse b) adjacent side c) opposite side d) small side
26. In the triangle PQR $\angle P = \angle Q, \angle R = 60^0$ then the triangle PQR is
    a) scalene b) isosceles c) acute angled d) equilateral
27. The sum of lengths of sides is called its
    a) perimeter b) volume c) area d) both a & b
28. Perimeter of a triangle ABC is
    a) BC+CD+AB b) a+b+c c) both a & b d) a b c
29. If measure of three angles of a triangle are X – 2, X + 6, x + 8 then the angles are
    a) 54^0, 62^0, 64^0 b) 53^0, 63^0, 66^0
    c) 53^0, 36^0, 64^0 d) 57^0, 63^0, 60^0
30. Which of the following are false?
    I) Every equilateral triangle is an Isosceles Triangle
    II) A triangle can have two obtuse angles
    III) A triangle must have three acute angles

a) I & II b) II & III c) III & I d) I, II, III

31. If 2x, x 3x are angles of a triangle, then the angles are
a) 60^0, 30^0, 80^0 b) 60^0, 30^0, 90^0
c) 50^0, 40^0, 90 d) 60^0,60^0,60^0

32. If 3x – 5, x + 10 4x + 5 are angles, find the angles ?
a) $58\frac{3^0}{4},31\frac{1^0}{4},90^0$ b) $58^0,32^0,90^0$
c) $90^0,1^0,90^0$ d) $49^0,71^0,60^0$

WORK SHEET – 1 (KEY)				
1) 2	**2)** 4	**3)** 4	**4)** 2	**5)** 4
6) 2	**7)** 2	**8)** 1	**9)** 3	**10)** 3
11) 2	**12)** 2	**13)** 2	**14)** 2	**15)** 1
16) 3	**17)** 3	**18)** 1	**19)** 4	**20)** 2
21) 4	**22)** 1	**23)** 1,2,3	**24)** 1,3,4	**25)** 4
26) 1	**27)** 1	**28)** 1	**29)** 3	**30)** 2
31) 4	**32)** 1	**33)** (2,3)(3,5) (1,2), (2)	**34)** 4,1,4,3	**35)** 90

WORK SHEET – 2 (KEY)				
1) 3	**2)** 1	**3)** 4	**4)** 1	**5)** 1
6) 3	**7)** 3	**8)** 1	**9)** 2	**10)** 1
11) 3	**12)** 1	**13)** 2	**14)** 2	**15)** 4
16) 2	**17)** 2	**18)** 2	**19)** 2	**20)** 4
21) 4	**22)** 3	**23)** 3	**24)** 1	**25)** 2
26) 3	**27)** 2	**28)** 2	**29)** 4	**30)** 1
31) 1	**32)** 3	**33)** 3	**34)** 1	**35)** 1
36) 2	**37)** 1	**38)** 3	**39)** 4	**40)** 2
41) 1,2,3	**42)** 1,2,3	**43)** 3	**44)** 1	**45)** 2
46) 1	**47)** 3	**48)** 1	**49)** 2	**50)** 3
51) 1,3,4,1	**52)** 1,3,2,1	**53)** 180		

WORK SHEET – 3 (KEY)				
1) 1	**2)** 2	**3)** 4	**4)** 1	**5)** 2
6) 4	**7)** 2	**8)** 1	**9)** 2	**10)** 1
11) 1	**12)** 1	**13)** 2	**14)** 1	**15)** 1
16) 1	**17)** 1	**18)** 1	**19)** 1	**20)** 1
21) 1	**22)** 3	**23)** 1	**24)** 2	**25)** 1
26) 4	**27)** 1	**28)** 4	**29)** 1	**30)** 2
31) 2	**32)** 1			

MENSURATION

SYNOPSIS

AREA:

1. The area of a simple closed figure is the measure of the region enclosed by the boundary of the figure.
2. The area is measured in square units. A square meter is the area of a square whose side is one meter. A square centimeter is the area of a square whose side is one centimeter

Definition: A closed plane figure bounded by three line segments is called triangle.

a. Area of triangle of base 'b' units and height 'h' units is

$$A = \frac{1}{2} \times \text{base} \times \text{height sq.units}$$

b. Area of a triangle whose sides are 'a' units, ' b' units and 'c' units as per Heron's formula.

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

Where $s = \frac{\text{semi perimeter}}{2} = \frac{a+b+c}{2}$

c. **Area of right angled triangle:** In a right angled triangle, the sides making right angle are 'a' and ' b' units, then the

Area $= \frac{1}{2} \times a \times b = \frac{1}{2} ab$ sq.units $= \frac{1}{2}$ product of the sides

$$\text{Area of Isosceles right angled triangle} = \frac{1}{2}a^2 \text{ sq.units}$$

Area of isosceles right angled triangle in terms of hypotenuse is

$A = \frac{h^2}{4}$ sq.units

$$\text{Area of an equilateral triangle} = \frac{\sqrt{3}}{4}a^2 \text{ sq.units}$$

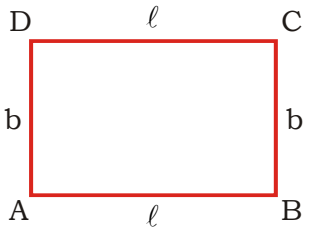
Area of an equilateral triangle with height 'h' units is given as

$$A = \frac{h^2}{\sqrt{3}} \text{ sq.units}$$

Height of an equilateral triangle is $h = \frac{\sqrt{3}}{2}a$ units .

Perimeter of an equilateral triangle is P = 3 × side units.

Perimeter and area of a rectangle:



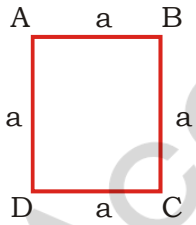
Perimeter= AB + BC + CD + DA

$= \ell + b + \ell + b = 2(\ell + b)$ units.

$$P = 2(\ell + b)$$

Area = $\ell \times$ b sq.units $\quad \ell = \frac{\text{Area}}{\text{Breadth}}$, $\quad b = \frac{\text{Area}}{\text{length}}$

Perimeter and area of a square:



A square whose each side is equal to 'a' units, then

$Perimeter = 4 \times a$ units

Area = side $\times$ side = a^2 sq.units

Side of a square = $\sqrt{\text{Area}}$ units

Relation between various units of area:

Length Units	Area Units
1cm = 10mm	$1cm^2 = (10 \times 10)mm^2 = 100mm^2$
1m = 100cm	$1m^2 = (100 \times 100)cm^2 = 10000cm^2$
1dam = 10m	$1dam^2 = (10 \times 10)m^2 = 100m^2 = 1\ Are$
1hm = 100m	$1hm^2 = (100 \times 100)m^2 = 10000m^2 = 1 hectare$

Area of four walls of a room:

1. Area of four walls of a room when the floor is in the shape of a rectangle.

a) If *l*, b and h are the length, breadth and height of a room and A be the total area of the four walls then

$$A = 2h(\ell + b)\ sq.units$$

b) If the perimeter of a floor is 'p', its height is 'h' and the total area is 'A', then

$$A = ph\ \ sq.units$$

2. Area of four walls of a room when the floor is in the shape of a square if 'ℓ' and 'h' are the length and height of a room and 'A' is the total area of four walls then

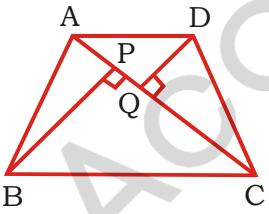
$$A = 4\ell h\ \ sq.units \quad \text{or} \quad A = ph\ \ sq.units$$

When 'p' is the perimeter of the room.

Quadrilaterals: A simple closed figure bounded by four line segments is called a quadrilateral.

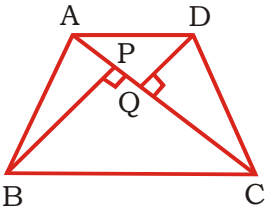
$$\text{Area of quadrilateral} = \frac{1}{2}d(h_1 + h_2)\text{sq.units}$$

Where AC = d, BP = h_1, DQ = h_2



$$\text{Area of quadrilateral ABCD} = (\text{Area of triangle ABC}) + (\text{Area of triangle ADC})$$

Parallelogram: A quadrilateral in which both pairs of opposite sides are parallel is called a "parallelogram".

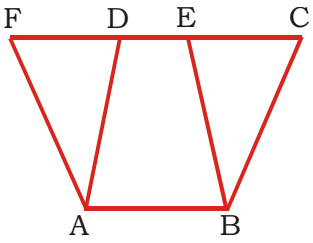


i. The opposite sides are equal
ii. The opposite angles are equal
iii. Diagonals bisects each other
iv. Diagonals are not equal

$$\text{Area of Parallelogram} = \text{base} \times \text{height}$$

Results on areas: Parallelograms on the same base and between the same parallel line are equal in area.

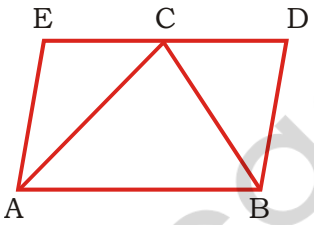
i.



$\therefore$ Area of Parallelogram ABCD = Area of Parallelogram ABEF

Perimeter of a Parallelogram ABCD = AB + BC + CD + DA

ii.



If a triangle and a parallelogram are on the same base and between the same parallel lines then

$$\text{Area of triangle} = \frac{1}{2}(\text{Area of parallelogram})$$

$$\therefore \text{Area of } \Delta ABC = \frac{1}{2}(\text{Area of Parallelogram ABDE})$$

Area of a rectangle = length $\times$ breadth sq.units

Perimeter of a rectangle = $2(l + b)$ units

Diagonal of a rectangle $= \sqrt{l^2 + b^2}$.

Area of a square = Side $\times$ Side = S^2 sq.units.

Perimeter of a square = 4 $\times$ side units

$$\text{Area of a square} = \frac{(\text{diagonal})^2}{2}.$$

WORK SHEET

SINGLE ANSWER TYPE

1. If the side of a sqaure s 'x' then ts area is
   1) x 2) x^2 3) 4x 4) 2x
2. If the side of a square is 'x' then its perimeter is
   1) x 2) x^2 3) 4x 4) 2x
3. Perimeter of rectangle whose length 'l' s and breadth is 'b' is
   1) lb 2) 2(l + b) 3) 2l 4) 2
4. Area of rectangle whose length 'x' is and breadth s 'y'
   1) xy 2)x + y 3) x – y 4) 2(x + y)
5. Area of triangle with base 'b' and height 'h' is
   1) $\frac{1}{2}$bh 2) bh 3) (b + h) 4) All
6. 50^0, 80^0 are two angles of triangle, then triangle is
   1) equilateral 2) isosceles 3) scalene 4) can't say
7. 45^0, 90^0 are two angles of a triangle, then triangle is
   1) acute triangle 2) obtuse triangle
   3) isosceles 4) scalene
8. 3cm, 4cm, 5cm are the side of _____ triangle
   1) equilateral 2) acute 3) obtuse 4) right
9. Each angle in a square is
   1) 30^0 2) 60^0 3) 90^0 4) 120^0
10. Sum of any two sides of a triangles _____ the third side.
    1) equal to 2) less than 3) greater than 4) all
11. The diagonals of a square divide the square into 4 _____ triangles
    1) right angled 2) isosceles 3) right isosceles 4) all
12. If the side of a square is 60cm then its perimeter is _____
    1) 240cm 2) $240cm^2$ 3) 150cm 4) 3600cm
13. In a triangle angles ratio is 1 : 1 : 1 then sides ratio is
    1) $1 : 1 : \sqrt{2}$ 2) $1 : \sqrt{2} : 1$ 3) $\sqrt{2} : 1 : 1$ 4) None
14. Height of an angles ratio is 1 : 1 : 1 then sides ratio is
    1) $\sqrt{3}a$ 2) $\sqrt{3}a/4$ 3) $\frac{\sqrt{3}a}{2}$ 4) $\frac{\sqrt{3}a^2}{4}$
15. In a triangle angles are in the ratio 1 : 1 : 2 then corresponding sides ratio is
    1) $1 : 1 : \sqrt{2}$ 2) $1 : \sqrt{2} : 1$ 3) 1 : 1 : 1 4) $1 : \sqrt{3} : 2$
16. In a triangle angles are in the ratio 1 : 2 : 3 then sides ratio is
    1) $1 : \sqrt{3} : 2$ 2) $1 : 3 : \sqrt{2}$ 3) $1 : \sqrt{3} : \sqrt{2}$ 4) $1 : \sqrt{3} : \sqrt{2}$
17. Area of isosceles right angle triangle is $32cm^2$ then length of its hypotenuse
    1) 8 2) $8\sqrt{2}$ 3) 4 4) $2\sqrt{8}$
18. Area of an equilateral triangle is $64\sqrt{3}$ then its perimeter is
    1) 4 2) 8 3) 48 4) 84

19. d_1, d_2 are length of diagonals of rhombus then its area is

1) d_1d_2 2) $d_1\left(\frac{d_2}{4}\right)$ 3) $\left(\frac{d_1}{2}\right)d_2$ 4) $\frac{1}{2}d_1(h_1+h_2)$

20. a, b are lengths of parallel sides and 'h' is the distance between parallel sides of a trapezium then its area is

1) $\frac{1}{2}ah$ 2) $a\frac{h}{2}+\frac{1}{2}bh$ 3) h(a + b) 4) abh

21. The diagonal of a quadrilateral is 'd' heights of the vertices opposite to the diagonal are h_1 and h_2 then its area is

1) dh_1h_2 2) $\frac{1}{2}dh_1h_2$ 3) $\frac{1}{2}dh_1+h_2$ 4) $d\left(\frac{h_1}{2}+\frac{h_2}{2}\right)$

22. In which of the following diagonals need not to bisect each other
1) Rhombus 2) square 3) parallelogram 4) trapezium

23. The ratio of angles in a quadrilateral is 1 : 2 : 3 : 4 the its smallest angle is
1) 36^0 2) 63^0 3) 72^0 4) 144^0

24. The angle in a quadrilateral are x, x+ 10, x + 20, 2x – 30 then ts greatest angle is
1) 141^0 2) 114^0 3) 72^0 4) 92^0

25. Area of trapezium is $\frac{1}{2}(a^2-b^2)cm^2$ where a,b are parallel sides in it, then distance between a & b is _____
1) a + b 2) b + a 3) b – a 4) a – b

26. Base and height of a parallelogram are 12cm, and 7cm then its area is
1) $84cm^2$ 2) 84cm 3) $96cm^2$ 4)$42cm^2$

27. In a ΔABC, BC = 8cm, altitude from A to BC is 6cm then its area is
1) $48cm^2$ 2) $24cm^2$ 3) $42cm^2$ 4) None

28. In a quadrilateral ABCD, AC = 10cm, lengths of perpendiculars from B to D to AC are 5cm, 7cm, respectively then its area is
1) $60cm^2$ 2) $50cm^2$ 3) $100cm^2$ 4) $120cm^2$

29. In a quadrilateral, diagonals intersect at right angle and have length equal to 6cm and 7cm then its area is

1) $\frac{21}{2}cm^2$ 2) $21cm^2$ 3) $\frac{42}{2}cm^2$ 4) both 2 & 3

30. The area of parallelogram ABCD is $102cm^2$, distance between AB and CD is 8.5cm then length of AB is
1) 10cm 2) 11cm 3) 6cm 4) 12cm

31. If d is the length of the diagonal of square then ts area is

1) d^2 2) $\frac{d}{2}$ 3) $\frac{1}{2}d.d$ 4) $\sqrt{d}$

32. In a parallelogram ABCD, DP $\perp$ AC and AC = 10cm, DP = 4cm, AB = 8cm then distance between AB and CD is
1) 10cm 2) 8cm 3) 6cm 4) None

33. ABCD is a parallelogram whose area is $60cm^2$ and $DP \perp AC$, AC = 12cm then the length of DP = _____
1) 10cm 2) 6cm 3) 5cm 4) 9cm

34. The parallel sides of a trapezium are $6\frac{1}{2}cm$ and $5\frac{1}{2}cm$ and distance between them is $2\frac{2}{3}cm$, then side of a square which has the same area as trapezium
1) 16cm 2) 4cm 3) 8cm 4) 2cm

35. The area of rhombus is $25cm^2$ one of the diagonal is 10cm long then the length f other diagonal is
1) 20cm 2) 15cm 3) 10cm 4) 5cm

36. The diagonal of a square is 18cm, and then side of the square is
1) 9cm 2) $2\sqrt{9}\,cm$ 3) $9\sqrt{2}\,cm$ 4) $\sqrt{2}\,cm$

MULTI ANSWER TYPE

37. If one of whose diagonals of a parallelogram is 88cm and offset of one of the vertices to this diagonal is 40cm, then its area is
1) 3520 cm^2 2) 0.352 m^2 3) $35.20\times10^2\,cm^2$ 4) $3.520\times10^3\,cm^2$

38. The base of a triangular field is three times its height. If the cost of cultivating the field is Rs. 36.72 per hectare is Rs. 495.72. Then
1) the base of the triangular field is 900m
2) the base of the triangular field is 1200m
3) the height of the triangular field is 300m
4) the height of the triangular field is 400m

39. If the altitude of an equilateral triangle is $2\sqrt{3}$, then its
1) area is $4\sqrt{3}\,cm^2$ 2) side is 4cm 3) area is $\frac{8}{\sqrt{3}}cm^2$ 4) side is 6cm

REASONING ANSWER TYPE

40. *Statement-I*: Sides of a right angled triangle are 9cm, 12cm, 15cm, then its area is 108 sq.cm.
Statement-II: Area of a right triangle is $\frac{1}{2}\times b\times h$.
1) Both Statements are true, Statement II is the correct explanation of Statement I.
2) Both Statements are true, Statement II is not correct explanation of Statement I.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

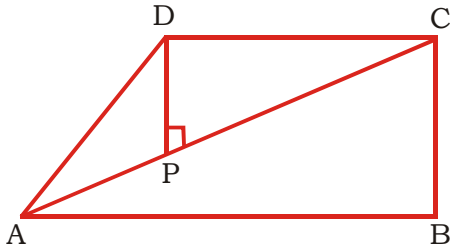
41. *Statement-I*: Area of rhombus is $480cm^2$.
Statement-II: If the diagonals of a rhombus are 48 cm and 20 cm are stated in statement 1.
1) Both Statements are true, Statement II is the correct explanation of Statement I.

2) Both Statements are true, Statement II is not correct explanation of Statement I.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

COMPREHENSION TYPE

Writeup:1

In the figure ABCD is a parallelogram and DP is perpendicular to AC



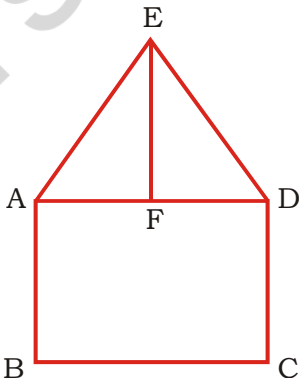
42. If the area of a parallelogram is 70sq.cm and AC = 14cm, then the length of DP is
1) 5 cm 2) 840 cm 3) 980 cm 4) 3 cm

43. If AC = 16cm, DP = 5 cm, AB = 10cm, then the distance between AB and CD is
1) 80 cm^2 2) 50 cm^2 3) 8 cm 4) 16 cm

44. If AD = 6cm, AC = 9cm, DP = 4cm, then the distance between AD and BC is
1) 6 cm 2) 54 cm 3) 24 cm 4) 3 cm

Writeup:2

In the given figure ABCD is a square, AC = BD = $4\sqrt{2}$cm, AE = DE = 2.5 cm.



Read the above passage and answers the questions below.

45. EF =
1) 1.5 cm 2) 2.5 cm 3) 3 cm 4) 4cm

46. Area of ABCD =
1) 16cm^2 2) 14cm^2 3) 17cm^2 4) 12cm^2

47. Area of ABCDE =
1) 22cm^2 2) 19cm^2 3) 17cm^2 4) 20 cm^2

MATRIX MATCHING TYPE

48.

Column - I	Column - II
a) In an equilateral triangle angles are in the ratio 1 : 1 : 1, then side are in the ratio	1) $1:1:\sqrt{2}$
b) The area of isosceles right triangle of side 'a' units	2) $\frac{1}{2}a^2$ sq.units
c) Area of an equilateral triangle whose height is 'h' units	3) $1:\sqrt{3}:2$
d) If the angles in a triangle are in the ratio 1 : 1 : 2,	4) $\frac{h^2}{\sqrt{3}}$ sq.units
	5) 1 : 1 : 1

INTEGER ANSWER TYPE

49. If the base of an isosceles triangle is 8cm and each of its equal sides is 5cm, then its area is_____sq.cm.

KEY & HINTS

WORK SHEET (KEY)				
1) 2	**2)** 3	**3)** 2	**4)** 1	**5)** 1
6) 2	**7)** 3	**8)** 4	**9)** 3	**10)** 3
11) 4	**12)** 1	**13)** 4	**14)** 3	**15)** 1
16) 1	**17)** 2	**18)** 3	**19)** 3	**20)** 2
21) 4	**22)** 4	**23)** 1	**24)** 2	**25)** 4
26) 1	**27)** 2	**28)** 1	**29)** 4	**30)** 4
31) 3	**32)** 4	**33)** 3	**34)** 1	**35)** 4
36) 3	**37)** 1,2,3,4	**38)** 1,3	**39)** 1,2	**40)** 4
41) 1	**42)** 1	**43)** 3	**44)** 1	**45)** 1
46) 1	**47)** 2	**48)** 5,2,4,1	**49)** 12	

37. bh = 88 × 40 = 3520 sq.cm

38. Area of field = $\frac{495.72}{36.72}$ = 13.5 hectare = 135000 m^2

Now, if h = x, b = 3x

$\therefore \frac{1}{2} \times b \times h = 135000$

39. Height of an equilateral triangle = $\frac{\sqrt{3}}{2} \times$ side

$\therefore \quad 2\sqrt{3} = \frac{\sqrt{3}}{2} \times \text{side} \quad \Rightarrow \text{side} = 4\text{cm}$

$\therefore$ Area of an equilateral triangle = $\frac{\sqrt{3}}{4} \times (\text{side})^2 \quad = \frac{\sqrt{3}}{4} \times 4 \times 4 = 4\sqrt{3}\ \text{cm}^2$

40. Conceptual

41. bh = 70; Area of triangle $= \frac{1}{2} \times AC \times DP = \frac{1}{2} \times 14 \times DP = 35 \Rightarrow DP = 5\text{cm}$

42. Area of parallelogram = $2\left(\frac{1}{2} \times 16 \times 5\right) = 2(8 \times 5)$

A = 2 × 40 = 80cm^2

The distance between AB and CD is h

AB × distance between AB and CD = 80cm^2

$10 \times h = 80 \Rightarrow h = 8$ cm

43. $9 \times 4 = 6 \times x$; x = 6cm

44. Conceptual

45 – 47 Paragraph

AB = BC = CD = AD = 4 cm $\left(\because \text{Side} = \frac{\text{Digonal}}{\sqrt{2}}\right)$

and EF = 1.5 cm (By Pythagorus theorem)

$\therefore$ Area of ABCDE = Area of ABCD + Area of AED $= (4)^2 + \frac{1}{2} \times 4 \times 1.5 = 19\text{cm}^2$

48. Conceptual

49. $s = \frac{a+b+c}{2} = \frac{8+5+5}{2} = \frac{18}{2} = 9$

$A = \sqrt{9(9-8)(9-5)(9-5)} \quad = \sqrt{9 \times 4 \times 4} = 3 \times 4 = 12\ \text{cm}^2$

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