PREFACE

Education is a process of human enlightenment and Empowerment. Recognizing the enormous potential of education, all progressive societies have committed themselves to the universalization of elementary education with a strong determination to provide quality education to all.

We are confident that the children in our school will enjoy mathematics, make mathematics a part of their life experience, pose and solve meaningful problems, understand the basic structure of mathematics with the help of this book.

The real essence of Mathematics lies in conquering the basics. With a motive of strengthening the basics in the budding minds, Varsity Education Management Pvt. Ltd. has brought out 'Techno for beginners - A bridge course in Mathematics'.

Varsity Education Management Pvt. Ltd. is the source of your success skills. The philosophy of this book is to integrate the study of life with innovative technology and co-relate it with student's self experiences from their day to day life.

The salient features of this book are -

- Concepts are explained in a simple way with appropriate illustrations.
- Systematic approach in developing the concepts.
- Simple and lucid language to enhance the reading skills.
- "Aims" to give conceptual clarity.
- "Work sheets" are provided to challenge the students.

You are your competitor. So, Dream, Achieve and Enjoy your success.

Constructive suggestions from teachers are welcome to make this book more student friendly.

With regards
Department of Mathematics

MATHEMATICS

INDEX

I. PRIMARY NUMBER SYSTEM

NATURAL NUMBERS & WHOLE NUMBERS

AIM - 1

SYNOPSIS

NATURAL NUMBERS

- Counting numbers 1, 2, 3, 4,..... are called natural numbers, denoted by **N**, **i.e. N** = {1, 2, 3, 4,......}.
- The smallest number in natural numbers is 1 and the greatest number can't be determined.
- The difference between any two consecutive natural numbers is 1.
- Given any natural number, we can add 1 to that number to get its successor .
  Example : The successor of 7 is 7 + 1 = 8.
- Given any natural number, we can subtract 1 from that number to get its predecessor.
  Example : The predecessor of 9 is 9 – 1 = 8.
- The number of natural numbers between 'a'and 'b', where a < b is **b – a – 1.**
- The number of natural numbers from 'a' to 'b', where a < b is **b – a + 1.**

WHOLE NUMBERS

- The natural numbers along with zero are called whole numbers, denoted by **W**,
  i.e.W = {0, 1, 2, 3, ...}
- The smallest whole number is '0' and the greatest number can not be determined.
- All natural numbers are whole numbers.
- The difference between any two consecutive whole numbers is '1'.

EVEN NUMBERS

- The natural numbers which are exactly divisible by '2' are known as even numbers denoted by 'E' i.e.,
  E = {2, 4, 6 ....}
- The difference between any two consecutive even numbers is '2'. **Example :** 8 – 6 = 2,
- The sum of any two even numbers is even. **Example :** 2 + 4 = 6 is even.
- The product of any two even numbers is even. **Example :** 4 × 6 = 24 is even.

ODD NUMBERS

- The natural numbers which when divided by 2, leaves the remainder 1 are known as odd numbers, denoted by 'O'. i.e., O = {1,3,5.......}
- The difference between any two consecutive odd numbers is '2'. **Example :** 7 – 5 = 2.
- The sum of two odd numbers is even. **Example :** 3 + 5 = 8 is even
- The product of two odd numbers is odd. **Example :** 5 × 7 = 35 is odd.
- The sum of an even and an odd numbers is odd. **Example :** 4 + 5 = 9 is odd.
- The product of an even and an odd numbers is even. **Example :** 4 × 5 = 20 is even.

WORK SHEET - 1

Straight Objective type questions

1. The set of natural numbers is denoted by [ ]
a) W b) N c) Q d) R

2. The successor of greatest 3 digited number is [ ]
a) 999 b) 1999 c) 1000 d) 998

3. The predecessor of 555 is [ ]
a) 556 b) 554 c) 553 d) 560

4. The set of whole numbers is represented by [ ]
a) N b) Z c) W d) Q

5. The greatest whole number in the set of whole numbers is [ ]
a) 100000 b) 999999 c) 0 d) can't be determined

6. The difference between any two consecutive whole numbers is [ ]
a) 0 b) 1 c) –1 d) 2

7. The natural numbers along with zero are called [ ]
a) whole numbes b) even numbers c) odd numbers d) integers

8. The natural numbers which are exactly divisible by 2 are called [ ]
a) an odd numbers b) an even numbers c) prime numbers d) whole numbers

9. From the table a set of odd numbers is [ ]
a) {1, 2, 3, 5}
b) {1, 3, 5, 9, 17}
c) {2, 4, 8, 2}
d) {8,9,12,17}

1	8	12
5	2	4
9	17	3

10. The sum of first five whole numbers is [ ]
a) 15 b) 14 c) 12 d) 10

One or more than one correct answer type Questions

11. Among the following an even number is [ ]
a) 4 b) 18 c) 21 d) 39

12. The number of odd natural numbers from 1 to 50 is [ ]
a) 50 b) 25 c) 24 d) the predecessor of 26

13. **Statement (A) :** The greatest natural number can't be determined. [ ]
Statement (B) : All natural numbers are whole numbers.
a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

14. **Statement (A) :** The sum of any two even numbers is odd.
Statement (B) : The sum of an even number and an odd number is odd. [ ]
a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

15. **Assertion (A) :** The number of natural numbers between 9 to 99 is 89. [ ]
Reason (R) : The number of natural numbers between 'a' and 'b', where a < b is b – a – 1.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct.

16. **Assertion (A) :** The number of whole numbers from 0 to 59 is 60. [ ]
Reason (R) : The number of whole numbers from 'a' to 'b', where a < b is b – a + 1 .
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct.

Matrix matching type questions

	Column - I	Column - II
17.	The least natural number is	a) 2
18.	The difference between any two consecutive odd natural numbers is	b) 1
19.	The least even number is	c) 3
20.	The product of first two odd numbers is	d) the successor of 1

17	a	b	c	d
18	a	b	c	d
19	a	b	c	d
20	a	b	c	d

Do you know ?

$1729 = 10^3 + 9^3 = 1^3 + 12^3$

The number 1729 is called "Ramanujan Number".

Do you know ?

$6 = 2^1(2^2 - 1) = 1 + 2 + 3$

$28 = 2^2(2^3 - 1) = 1 + 2 + 3 + 4 + 5 + 6 + 7 = 1^3 + 3^3$

$496 = 2^4\ (2^5 - 1) = 1 + 2 + 3 + ... + 29 + 30 + 31 = 1^3 + 3^3 + 5^3 + 7^3$

$8128 = 2^6\ (2^7 - 1) = 1 + 2 + 3 + ... + 125 + 126 + 127 = 1^3 + 3^3 + 5^3 + 7^3 + 9^3 + 11^3 + 13^3 + 15^3$

INTEGERS

AIM - 2

SYNOPSIS

INTEGERS

- "The set containing the positive numbers 1, 2, 3, 4, ... and the negative numbers –1, –2, –3, ... together with zero is called the set of integers", denoted by Z, i.e. Z = {.....–3, –2, –1, 0, 1, 2, 3....}.
- The set of negative numbers along with the set of whole numbers is known as integers.
- There are infinite positive numbers to the right of zero and infinite negative numbers to the left of zero.
- The whole number '0' is neither a positive integer nor a negative integer.
- {1, 2, 3, 4,...} is called the set of positive integers, denoted by Z^+ or N.
- {..., – 4, – 3, – 2, – 1} is called the set of negative integers, denoted by Z^-.
- {0, 1, 2, 3, 4,...} is called the set of non-negative integers, denoted by W.
- {..., – 3, – 2, – 1, 0} is called the set of non positive integers.
- The numbers – 1, – 2, – 3, ... are called additive inverses of 1, 2, 3 ..... .

ADDITION OF TWO INTEGERS

- The sum of two positive integers is always a positive integer, obtained by taking the sum of the numerical values of the addends.

  Example : (+ 2) + (+ 3) = + 5.
- The sum of two negative integers is always a negative integer, obtained by taking the sum of the numerical values of the addends.

  Example : (– 2) + (– 3) = – 5
- For adding a positive and a negative integer, we first find the difference between their numerical values and assign the sign of the integer having greater magnitude.

  Example : (+ 4) + (– 3) = (+ 1) + (+ 3) + (– 3) = + 1

SUBTRACTION OF TWO INTEGERS

- If 'a' and 'b' are two integers, then a - b is equal to a + (– b).
- If we subtract a number from another number, then we add the additive inverse of second number to the first number.

  Example : (+ 5) – (+ 7) = 5 + (–7) = –2;

  9 – (– 5) = 9 + (+ 5) = 14

MULTIPLICATION OF INTEGERS

- The repeated addition is called multiplication.

  Example : i) 2 × 3 = 2 + 2 + 2 = 6 i.e., 2 is added 3 times.

  ii) (– 2) × 3 = (– 2) + (– 2) + (– 2) = – 6 i.e., (– 2) is added 3 times.

- The product of two positive integers is a positive integer.
  Example : $(+6) \times (+7) = +42$
- The product of a negative and a positive integer is a negative integer.
  Example : $(-3) \times (+4) = -12$
- The product of two negative integers is a positive integer.
  Example : i) $(-3) \times (-6) = +18$, ii) $(-17) \times (-4) = +68$

DIVISION OF INTEGERS

- The repeated subtraction is called division
  Example : $12 \div 4$
  $12 - 4 = 8$
  $8 - 4 = 4$
  $4 - 4 = 0$
  4 is subtracted 3 times from 12
  $\therefore 12 \div 4 = 3$.
- Division of an integer by zero is not defined i.e., $\frac{x}{0}$ is not defined, where $x \in Z$.

WORK SHEET - 2

Straight objective type Questions

1. The set of integers is denoted by [ ]
   a) N b) W c) Z d) Q
2. The sum of any two positive integers is [ ]
   a) positive b) negative c) zero d) 1
3. The integer which is greater than any negative integer is [ ]
   a) – 9 b) – 1 c) 0 d) can't say
4. The repeated addition with the same number is called [ ]
   a) division b) subtraction c) difference d) multiplication
5. $21 + 3 + (-9) - 6 =$ [ ]
   a) 39 b) 27 c) 9 d) – 18
6. $-5 - (-17) + (11) + 15 =$ [ ]
   a) 4 b) 38 c) 47 d) 16
7. The additive inverse of 2015 is [ ]
   a) 2014 b) 2016 c) $\frac{1}{2015}$ d) – 2015
8. $(-9) \times 5 \times 6 =$ [ ]
   a) 270 b) – 270 c) – 99 d) 2

9. The repeated subtraction with the same number is called [ ]
a) multiplication b) product c) division d) addition

10. $119 \div 17 =$ [ ]
a) 102 b) 136 c) 7 d) 9

One or more than one correct answer type Questions :

11. The set {0,1,2,3,4 ......} is called the set of [ ]
a) positive integers b) non - negative integers
c) whole numbers d) non - positive integers

12. If 'a' and 'b' are two integers, then $a - b =$ [ ]
a) $a + (-b)$ b) $b - a$ c) $a - (+b)$ d) $a - (-b)$

13. **Statement(A) :** The smallest integer in the set of integers is zero. [ ]
Statement(B) : {----- , – 4, – 3, – 2, – 1,0} is called the set of non positive integers.
a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

14. **Statement (A) :** The number of positive integers is infinite. [ ]
Statement (B) : The set containing negative numbers along with whole numbers is called Integers.
a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

15. **Assertion(A) :** $(-18) \times (-9) = 162$. [ ]
Reason(R) : The product of any two negative integers is positive.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

16. **Assertion(A) :** $\frac{0}{9999} = 0$. [ ]
Reason(R) : The division of '0' by any integer except '0' is 0.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

Matrix Matching type Questions :

	Column - I	**Column - II**
17.	Neither positive nor negative integer is	a) not defined
18.	The least positive integer is	b) – 1
19.	The division of an integer by zero is	c) 1
20.	2015 + (– 2016) =	d) 0

17	a	b	c	d
18	a	b	c	d
19	a	b	c	d
20	a	b	c	d

Try This

Is it possible to find the sum of greatest positive integer and least negative integer ? Why ?

MULTIPLES AND FACTORS

AIM - 3

SYNOPSIS

MULTIPLE

- The product of a number and counting numbers are known as the multiples of that number. Multiples of a given number are all those numbers which are exactly divisible by the given number.
  Example : Multiples of 3 are 3, 6, 9, ... and each of these numbers is exactly divisible by 3.
- Every multiple of a number is greater than or equal to that number.
- The number of multiples of a given number is infinite.
- Every number is a multiple of itself and it is the least multiple of that number.

FACTOR

- If a number 'x' divides another number 'y' exactly, then we say that 'x' is a factor of 'y'.
  Example : 6 divides 18 exactly 6 is a factor of 18.
- The numbers that are multiplied to get the product are called the factors of the product.
- The number of factors of a given number is finite.
- When two or more numbers are multiplied, then each number is a factor of that product.
- Every factor of a number is an exact divisor of that number.
- Every factor of a number is less than or equal to that number.
- The number of factors of a given number is finite.
- The gretest factor of a given number is the number itself.

PERFECT NUMBER

- A number in which sum of all its factors is equal to twice the number is called a perfect number.
  Example 1 : The sum of the factors of 6 = 1 + 2 + 3 + 6 = 12 = 2 × 6.
  The sum the of factors of 6 is twice the number, so 6 is a perfect number.
  Example 2 : The sum of the factors of 28 = 1 + 2+ 4 + 7 + 14 + 28 = 56 = 2 × 28.
  The sum of the factors of 28 is equal to twice the given number, so 28 is a perfect number.

PRIME NUMBER

- The natural number greater than 1 is said to be a prime number, if it has only two factors 1 and itself.
  Example : 2, 3, 5, 7, 11, ...
- The set of prime numbers is a subset of set of natural numbers.
- If $2^K - 1$ is a prime number then $2^{k-1}(2^k - 1)$ is a perfect number.

CO- PRIMES

- The two positive integers are said to be co-primes or relatively primes, if they do not have any common factor other than 1.
  Example : (5, 9), (25,18), (6,23), ... are pairs of co- primes.

PRIME FACTOR

- If a factor of a given number is prime, then the factor is called a prime factor.

  Example : The factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30. The prime factors are 2, 3 and 5.

TWIN PRIMES

- A pair of prime numbers that differs by 2 are called twin primes.

  Example : The prime numbers 3 and 5 differ by 2, so(3, 5) is a pair of twin primes.

COMPOSITE NUMBER

- A natural number which is neither 1 nor a prime is called a composite number (or) a natural number having atleast three factors is called a composite number.

  Example : 4 is a composite number. ($\because$ 1, 2, 4 are factors of 4).
- The first natural number 1,being divisible by only one factor (by itself) is neither a prime number nor a composite number.

SQUARE OF A NUMBER

- The square of a number is the product of a number by itself.

  For a given number 'a' , the square of 'a' is a × a , denoted by a^2.

  Example : square of 9 = 9 × 9 = 81.

PERFECT SQUARE OR SQUARE NUMBER :

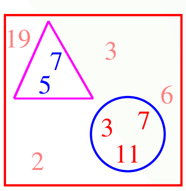
- A natural number is called a perfect square or a square number, if it is the square of any natural number.

  Example : 1, 4, 9, 25, 36, ... are perfect squares.

WORK SHEET - 3

Straight objective type Questions :

1. The multiplication of a given number with natural numbers is called its [ ]
   a) factor b) multiple c) root d) square
2. The first four multiples of 6 are [ ]
   a) 12, 18, 24, 30 b) 6, 12, 24, 36 c) 6, 12, 18, 24 d) 1, 2, 3, 6
3. The factor of every number is [ ]
   a) 0 b) 1 c) 2 d) 3
4. From the table not a prime number is [ ]
   a) 2
   b) 3
   c) 6
   d) 11



5. Among the following a composite number is [ ]
   a) 8 b) 9 c) 17 d) both a, b

One or more than one correct ansswer type Questions :

6. Among the following a pair of co - primes is [ ]
a) (3,14) b) (5,22) c) (3,12) d) (4,32)

7. Among the following a pair of twin primes is [ ]
a) (2,3) b) (3,5) c) (17,19) d) (41,43)

8. **Statement(A) :** Every multiple of a number is greater than or equal to the number. [ ]
Statement(B) : The greatest factor of a given number is the number itself.
a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

9. **Statement (A) :** A number which has '1' and itself as its only factors is called a prime number.
Statement (B) : The smallest multiple of a given number is the number itself. [ ]
a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :** The numbers 6, 28 and 496 are called perfect numbers. [ ]
Reason(R) : If the sum of all the factors of a given number except that number is equal to the twice of the number, then the number is called a perfect number.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

11. **Assertion(A) :** $(-11) \times (-11) = (-11)^2 = 121$ and $16 \times 16 = (16)^2 = 256$. [ ]
Reason(R) : The square of a number is the product of a number by itself.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

Matrix Matching type Questions :

	Column - I	Column - II
12.	The least prime number is	a) 1
13.	The least composite number is	b) 2
14.	The least perfect number is	c) 4
15.	The least perfect square number is	d) 6

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

Do You Know ?

The pairs of twin primes between 1 to 100

(3,5) ; (5,7) ; (11,13) ;(17,19) ; (29, 31) ; (41,43) ; (59,61); (71,73).

4. DIVISIBILITY RULES

AIM - 4

SYNOPSIS

DIVISIBILITY BY '2'

- A natural number is divisible by '2', if and only if the digit in its unit's place is either 2 or 4 or 6 or 8 or 0.

Example : 1) 59628 is divisble by 2. ($\because$ the unit's digit is 8).
2) 789403 is not divisible by 2. ($\because$ the unit's digit is 3).

DIVISIBILITY BY '3'

- A natural number is divisible by '3', if and only if the sum of its digits is divisible by 3.

Example : 1) 524781 is divisble by 3. ($\because$ the sum of digits = 5 + 2 + 4 + 7 + 8 + 1 = 27).
2) 79124 is not divisible by 3. ($\because$ the sum of digits = 7 + 9 + 1 + 2 + 4 = 23).

DIVISIBILITY BY '4'

- A natural number is divisible by '4' ,if and only if the number formed by the last two digits is divisible by 4 or last two digits in the given number are zeroes.

Example : 1) 35056 is divisble by 4. ($\because$ 56 is divisible by 4).
2) 946126 is not divisible by 4. ($\because$ 26 is not divisible by 4).
3) 1200 is divisible by 4. ($\because$ the last two digits of the number are zeroes).

DIVISIBILITY BY '5'

- A natural number is divisible by '5' ,if and only if the last digit is either 0 or 5.

Example : 1) 6430 is divisible by 5. ($\because$ the unit's digit is 0) .
2) 2347 is not divisible by 5. ($\because$ the unit's digit is neither 0 nor 5).

DIVISIBILITY BY '6'

- A natural number is divisible by '6', if and only if it is divisible by both 2 and 3.

Example : 1) 2070 is divisible by 6. ($\because$ the number is divisible by both 2 and 3).
2) 136976 is not divisible by 6. ($\because$ the number is not divisible by 3).

DIVISIBILITY BY '8'

- A natural number is divisible by '8', if and only if the last three digits of the given number is divisible by 8.

Example : 1) 36792 is divisible by 8. ($\because$ 792 is divisible by 8).
2) 901674 is not divisible by 8. ($\because$ 674 is not divisible by 8) .

DIVISIBILITY BY '9'

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

Example : 1) 20691 is divisible by 9. ($\because$ the sum of digits = 2 + 0 + 6 + 9 + 1 = 18).
2) 872645 is not divisible by 9. ($\because$ the sum of digits = 8 + 7 + 2 + 6 + 4 + 5 = 32)

DIVISIBILITY BY '10'

- A natural number is divisible by '10', if and only if the last digit is 0.

Example : 1) 2560 is divisible by 10. ($\because$ the unit's digit is 0).
2) 3765 is not divisible by 10. ($\because$ the unit's digit is not 0).

DIVISIBILITY BY '11'

- A natural number is divisible by '11', if and only if the difference of the sum of the numbers obtained on adding the alternating digits of the number separately is divisible by 11.

Example : 1) 137269 is divisible by 11. ($\because$ sum of the digits in odd places = 1 + 7 + 6 = 14.
sum of the digits in even places = 3 + 2 + 9 = 14.
difference = 14 14 = 0 is divisible by 11)

WORK SHEET - 4

Straight objective type Questions :

1. Among the following a number divisible by 3 is [ ]
a) 123 b) 1234 c) 2345 d) 4567

2. Among the following a number divisible by 4 is [ ]
a) 546 b) 566 c) 576 d) 586

3. A number divisible by 9is [ ]
a) 2352 b) 6750 c) 6668 d) 8985

4. A number not divisible by 10 is [ ]
a) 40 b) 100 c) 9990 d) 999

5. A number divisible by 5 is [ ]
a) 555 b) 1000 c) 1506 d) both a,b

One or more than one correct answer type Questions :

6. Among the following a number dvisible by 2 is [ ]
a) 6 b) 20 c) 88 d) 65

7. Among the following a number divisible by 12 is [ ]
a) 728 b) 684 c) 912 d) 1602

8. **Statement(A) :** A number is divisible by 3, if the sum of its digits is divisible by 3 . [ ]
Statement(B) : A number is divisible by 4, if the number formed by the tens and units digits is divisible by 4 (or) its tens and units digits are both zeroes.
a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

9. **Statement (A) :** The numbers 9232 and 18000 are not divisible by 8. [ ]
Statement (B) : If a number is divisible by 3 and 5, then it is divisible by 15.
a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :** The number 578412 is divisible by 6 **.** [ ]

Reason(R) : If a number is divisible by 2 and 3, then it is divisible by 6 .

a) Both A and R are correct, and R is the correct explanation of A

b) Both A and R are correct, but R is not the correct explanation of A

c) A is correct and R is incorrect d) A is incorrect and R is correct.

11. **Assertion(A) :** The number 37345 is not divisible by 11 **.** [ ]

Reason(R): If the sum of the alternate digits of a number from right to left is equal to sum of the remaining digits (or) their difference is a multiple of 11, then that number is divisible by 11

a) Both A and R are correct, and R is the correct explanation of A

b) Both A and R are correct, but R is not the correct explanation of A

c) A is correct and R is incorrect d) A is incorrect and R is correct.

Matrix Matching type Questions :

	Column - I	Column - II
12.	769812 is divisible by	a) 2
13.	444444 is divisible by	b) 3
14.	333333 is divisible by	c) 4
15.	37806 is divisible by	d) 6

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

Try This

Is 27720 is divisible by first eleven natural numbers (or) not ? Why ?

Do you Know

Divisibility by '7'

A number of the form $a_k a_{k-1} a_{k-2}$ ....$a_5 a_4 a_3 a_2 a_1 a_0$ is divisible by '7' if and only if, $a_2 a_1 a_0 - a_5 a_4 a_3 + a_8 a_7 a_6 -$ .... $a_k a_{k-1} a_{k-2}$ is divisible by 7

(OR)

To check whether a number is divisible by 7, subtract twice of the units digit from the remaining and check whether it is divisible by 7 or not. Continue the above process till you get a simple number.

Example : 1) 342384 is divisible by 7.

Since 384 – 342 = 42 is divisible by 7.

2) 343 is divisible by 7.

Since 34 – (2 × 3) = 28 is divisible by 7.

H.C.F AND L.C.M

AIM - 5

HIGHEST COMMON FACTOR(H.C.F)

- The greatest number, which is the common factor of two or more given numbers is called the Highest Common Factor (H.C.F.) or the Greatest Common Divisor (G.C.D.).

- **H.C.F. by using factors**

Example : Find H.C.F. of 8, 12.

Solution: Factors of 8 are 1, 2, 4, 8.
Factors of 12 are 1, 2, 3, 4, 6, 12.
Common factors of 8,12 are 1, 2, 4.
$\therefore$ H.C.F. of 8 and 12 is 4.

- **H.C. F of numbers using prime factorization**

Example : Find G.C.D. of 24, 36 and 84

Solution : $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3^1$
$36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$
$84 = 2 \times 2 \times 3 \times 7 = 2^2 \times 3 \times 7$
$\therefore$ H.C.F. of 24, 36, 84 is $2 \times 2 \times 3 = 12$.

- Two positive integers 'a' and 'b' are said to be relatively prime or **co-primes,** if the G. C. D. of 'a' and 'b' is 1. i.e., (a, b) = 1.

LEAST COMMON MULTIPLE (L.C.M)

- The least common multiple of two or more natural numbers is the least natural number that is a multiple of the given numbers.

- L.C.M. by writing multiples of given numbers :

Example : Find the L.C.M. of 2 and 3.

Solution : Multiples of 2 are 2, 4, 6, 8, 10,12, 14, 16, 18, ...
Multiples of 3 are 3, 6, 9, 12, 15,18, ...
Common multiples of 2 and 3 are 6, 12, 18, ...
$\therefore$ The least common multiple of 2 and 3 is 6.

- **L.C.M. by prime factorization method :**

Example : Find L.C.M. of 15, 24.

Solution : $15 = 3 \times 5$
$24 = 2 \times 2 \times 2 \times 3$
L.C.M. $= 3 \times 5 \times 2 \times 2 \times 2 = 120$

- **L.C.M. by synthetic division method :**

Example : Find L.C.M. of 30, 60, 90.

$$\begin{array}{r|l} 3 & 30, 60, 90 \\ \hline 2 & 10, 20, 30 \\ \hline 5 & 5, 10, 15 \\ \hline 2 & 1, 2, 3 \\ \hline 3 & 1, 1, 3 \\ \hline & 1, 1, 1 \end{array}$$

$\therefore$ The L.C.M. of 30, 60, 90 is $3 \times 2 \times 5 \times 2 \times 3 = 180$.

➤ RELATION BETWEEN H.C.F. AND L.C.M. OF TWO NUMBERS

Example: H.C.F. of 12 and 15 is 3
L.C.M. of 12 and 15 is 60
Product of H.C.F. and L.C.M. = $3 \times 60 = 180$,
Product of two numbers = $12 \times 15 = 180$

$\boxed{\text{Product of two numbers = product of their H.C.F and L.C.M}}$

WORK SHEET - 5

Straight objective type Questions

1. The H.C.F of 13,26 is [ ]
   a) 1 b) 13 c) 26 d) 52
2. The H.C.F of 24, 72, 96 is [ ]
   a) 4 b) 6 c) 12 d) 24
3. The L.C.M of 3,5 is [ ]
   a) 1 b) 3 c) 5 d) 15
4. The L.C.M of 25,40,60 is [ ]
   a) 300 b) 400 c) 600 d) 800
5. If the L.C.M of two numbers is 144 and their H.C.F. is 24 such that one of the numbers is 48, then the other number is [ ]
   a) 72 b) 96 c) 108 d) 132

One or more than one correct answer type Questions :

6. The L.C.M of 12,15 and 60 is [ ]
   a) 30 b) 60 c) 120 d) $2^2 \times 15$
7. The H.C.F of 13, 72 is [ ]
   a) 1 b) 12 c) least natural number d) 13
8. **Statement(A) :** The H.C.F of 1 and any natural number is 1. [ ]
   Statement(B) : The L.C.M of 1 and any natural number is their sum.
   a) Both A and B are true b) Both A and B are false
   c) A is true, B is false d) A is false, B is true
9. **Statement (A) :** The H.C.F of 150, 180 and 200 is 10. [ ]
   Statement (B) : The L.C.M of 1,2,3 is 6.
   a) Both A and B are true b) Both A and B are false
   c) A is true and B is false d) A is false and B is true
10. **Assertion(A) :** If the L.C.M of 336 and 560 is 1680, then their G.C.D is 112. [ ]
    Reason(R) : The product of two numbers is equal to product of their H.C.F and L.C.M.
    a) Both A and R are correct, and R is the correct explanation of A
    b) Both A and R are correct, but R is not the correct explanation of A
    c) A is correct and R is incorrect d) A is incorrect and R is correct.

11. **Assertion(A) :** The H.C.F of 25, 125, 625 is 625. [ ]

Reason(R) : The greatest number which is the common factor of two (or) more given numbers is called their H.C.F.

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct.

Matrix Matching type Questions :

	Column - I	**Column - II**
12.	The H.C.F of 2,18 is	a) 1
13.	The L.C.M.of 1, 3 is	b) 2
14.	The L.C.M.of 2, 4 is	c) 3
15.	The H.C.F of 17,19 is	d) 4

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

Do You Know ?

1. The L.C.M. of $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$ is 6

$$\left[\text{The L.C. M of fractions} = \frac{\text{L.C.M of numerators}}{\text{H.C.F of denominators}}\right]$$

2. The H.C.F. of $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$ is $\frac{1}{12}$

$$\left[\text{The H.C.F of fractions} = \frac{\text{H.C.F of numerators}}{\text{L.C.M of denominators}}\right]$$

Know this

Pythagorean Triplet

Three natural numbers m,n and p are said to form a Pythagorean triplet (m, n, p), if $m^2 + n^2 = p^2$.

For every natural number m > 2, we have (2m, m^2-1, m^2+1) is a Pythagorean triplet.

Example : The Pythagorean triplet whose smallest number 12 is (12, 35, 37).

6. FRACTIONS

AIM - 6

SYNOPSIS

FRACTION

- The numbers of the form $\frac{p}{q}$, where $q \neq 0$ and p,q are non negative integers and (p,q) =1 is called a fraction.

Example : $\frac{2}{3}, \frac{3}{5}, \frac{5}{7}$ .....

PROPER FRACTION

- A fraction whose denominator is greater than the numerator is called a proper fraction.

Example : $\frac{1}{2}, \frac{1}{3}, \frac{2}{5}, \frac{3}{4}, 0$ .....

IMPROPER FRACTION

- A fraction whose numerator is greater than its denominator is called an improper fraction.

Example : $\frac{3}{2}, \frac{5}{2}, \frac{7}{5}, \frac{8}{3}, \frac{2}{2}, 1,$ .....

MIXED FRACTION

- A fraction which contains integral part and a fractional part (fractional part should be a proper fraction) is called a mixed fraction.

Example : $1\frac{1}{2}, 2\frac{3}{4}, 4\frac{5}{6}, 6\frac{7}{8},$ .....

EQUIVALENT FRACTIONS

- The fractions obtained by multiplying or dividing the numerator and denominator of a given fraction with same number are called equivalent fractions.

Example : The equivalent fractions of $\frac{3}{5}$ are $\frac{6}{10}, \frac{9}{15}, \frac{12}{20}, \frac{15}{25}, \frac{18}{30},$ ..... etc.

LIKE FRACTIONS

- Fractions having same denominator are called like fractions

Example : $\frac{1}{3}, \frac{2}{3}, \frac{4}{3}, \frac{5}{3}, \frac{7}{3}, \frac{8}{3},$ .....

UNLIKE FRACTIONS

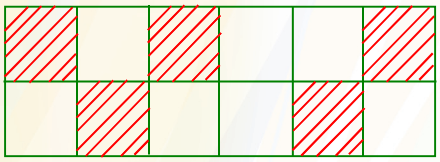
➢ The fractions having different denominators are called unlike fractions

Example : $\frac{1}{2}, \frac{2}{3}, \frac{5}{7}, \frac{8}{9}, ...$

WORK SHEET - 6

Straight objective type Questions

1. The fraction represented by the shaded region in the figure is [ ]



a) $\frac{7}{12}$ b) $\frac{1}{12}$

c) $\frac{11}{12}$ d) $\frac{5}{12}$

2. Among the following an improper fraction is [ ]

a) $\frac{2}{3}$ b) $\frac{3}{11}$ c) $\frac{17}{6}$ d) $\frac{1}{9}$

3. The equivalent fraction of unshaded region in the figure is [ ]

a) $\frac{15}{16}$ b) $\frac{20}{32}$

c) $\frac{10}{8}$ d) $\frac{9}{24}$

4. $3\frac{5}{11} =$ [ ]

a) $\frac{35}{11}$ b) $\frac{36}{11}$ c) $\frac{33}{11}$ d) $\frac{38}{11}$

5. $\frac{59}{6} =$ [ ]

a) $9\frac{5}{6}$ b) $5\frac{9}{6}$ c) $8\frac{11}{6}$ d) $11\frac{4}{5}$

One or more than one correct answer type Questions

6. The possible value of an improper fraction is [ ]

a) < 1 b) 1 c) 0 d) > 1

7. Among the following not a unit fraction is [ ]

a) $\frac{9}{8}$ b) $\frac{1}{18}$ c) $\frac{2}{3}$ d) $\frac{1}{32}$

8. **Statement (A) :** The value of a proper fraction is always less than 1. [ ]
Statement (B) : A fraction consists of a whole number and a proper fraction is called a mixed fraction
a) Both A and B are true
b) Both A and B are false
c) A is true, B is false
d) A is false, B is true

9. **Statement (A) :** If the numerator of a fraction is less than the denominator, then the fraction is said to be a proper fraction.
Statement (B) : The value of a mixed fraction is always greater than 1. [ ]
a) Both A and B are true
b) Both A and B are false
c) A is true, B is false
d) A is false, B is true

10. **Assertion (A) :** The fractions $\frac{1}{13}, \frac{5}{13}$, and $\frac{9}{13}$ are like fractions. [ ]
Reason (R) : The fractions having same denominator are called like fractions
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct

11. **Assertion (A) :** The fractions $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$ are called unlike fractions. [ ]
Reason (R) : The fractions having 1,2,3,......... as their numerators are called unlike fractions.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct

Matrix matching type Questions :

Column - I	Column - II
12. $\frac{2}{7}, \frac{1}{5}, \frac{3}{11}$ *are*	a) Equivalent fractions
13. $\frac{8}{5}, \frac{7}{4}, \frac{6}{3}$ *are*	b) Like fractions
14. $\frac{2}{15}, \frac{1}{15}, \frac{7}{15}$ *are*	c) Unlike frctions
15. $\frac{3}{4}, \frac{12}{16}, \frac{15}{20}, \frac{18}{24}$ *are*	d) Improper fractions

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

7. DECIMAL FRACTIONS

AIM - 7

SYNOPSIS

DECIMAL FRACTIONS

- The fractions having 10, 100, 1000 , ... in the denominator are called decimal fractions.

Example : $\frac{1}{10}, \frac{7}{100}, \frac{23}{1000}, ...$

- Decimals are used in many ways in our lives as, in representing units of money, length and weight.
- Decimal numbers having two parts, the left side part of the decimal point is whole number part and the right side part of the decimal point is decimal part.
  Example : In 12.576, the whole number part is 12 and the decimal part is 576.
- The value of the decimal part of a number is always less than 1.

LIKE DECIMALS

- If any two decimals having the same number of decimal places, then they are called like decimals.
  Example : 5.76, 9.52 are like decimal

UNLIKE DECIMALS

- If any two decimals having different number of decimal places then they are called unlike decimals.
  Example : 11.65, 13.459 are unlike decimals.

ADDITION OF DECIMAL FRACTIONS

- The sum of two decimals should be find by change them in the form of fractions.

Example : $2.5 + 3.4 = \frac{25}{10} + \frac{34}{10} = \frac{59}{10} = 5.9$

SUBTRACTION OF DECIMAL FRACTIONS

- The difference of two decimals should be find by change them in the form of fractions.

Example : $5.72 - 3.26 = \frac{572}{100} - \frac{326}{100} = \frac{246}{100} = 2.46$

MULTIPLICATION

- To multiply a decimal number by 10,100,1000 ..... we move the decimal point in the number to the right by as many places as there are zeroes in the numbers 10,100, 1000, ...
  Example : $2.527 \times 10 = 25.27$

DIVISION

- To divide a decimal number by 100,1000 ...... we move the decimal point in the number to the left by as many places as there are zeroes in 10,100, 1000, ...
  Example : $3.567 \div 10 = 0.3567$

ADDITION OF TWO DECIMAL NUMBERS :

➤ We can add two decimal numbers in such a way that the tenth part of first number will add to tenth part of second number, similarly the hundredth parts should be added together.

Example :

$$\begin{array}{r} 0.63 \\ +0.53 \\ \hline 1.17 \end{array}$$

WORK SHEET - 7

Straight objective type Questions :

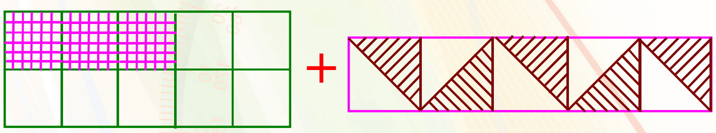
1. The fractions having 10, 100, 1000 , ... in the denominator are called [ ]
   a) proper fractions b) decimal fractions c) percentages d) mixed fractions

2. $\frac{625}{100} =$ [ ]
   a) 62.5 b) 0.625 c) 6.25 d) 0.0625

3. $\frac{1234}{1000} =$ [ ]
   a) 1. 234 b) 12.34 c) 0.1234 d) 123.4

4. 7.8 = [ ]
   a) $\frac{7}{8}$ b) $\frac{78}{100}$ c) $\frac{78}{10}$ d) $\frac{780}{10}$

5. The sum of the fractions represented by shaded regions from the figures is [ ]
   a) $\frac{12}{10}$ b) $\frac{8}{10}$
   c) $\frac{8}{20}$ d) $\frac{6}{10}$



One or more than one correct answer type Questions :

6. $\frac{11}{100} - \frac{2}{100} =$ [ ]
   a) $\frac{9}{100}$ b) $\frac{11}{100}$ c) $\frac{9}{10}$ d) 0.09

7. 6.35 + 9.32 = [ ]
   a) 16.97 b) 15.67 c) $\frac{156.7}{10}$ d) 1.567

8. **Statement(A) :** $\frac{1}{10}+\frac{2}{100}=\frac{12}{100}$. [ ]

Statement(B) : The value of the decimal part of a number is always less than 1.

a) Both A and B are true   b) Both A and B are false
c) A is true, B is false   d) A is false, B is true

9. **Statement (A) :** $1 + 2.7 = \frac{37}{10}$. [ ]

Statement (B) : The whole number part in 102. 69 is 12.

a) Both A and B are true   b) Both A and B are false
c) A is true and B is false   d) A is false and B is true

10. **Assertion(A) :** 1.25, 2.73 and 5.23 are called like decimals. [ ]

Reason(R) : If any two decimals having the same number of decimal places, then they are called like decimals.

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect   d) A is incorrect and R is correct

11. **Assertion(A) :** 5.23, 7.523, 11.2723 are unlike decimals . [ ]

Reason(R) : If any two decimals having different number of decimal places, then they are called unlike decimals.

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect   d) A is incorrect and R is correct

Matrix matching type Questions :

Column - I	Column - II
12. $\frac{7}{10}+\frac{3}{100}=$	a) $\frac{43}{100}$
13. $\frac{11}{100}+\frac{32}{100}=$	b) $\frac{123}{100}$
14. $\frac{29}{100}-\frac{12}{100}=$	c) $\frac{73}{100}$
15. $1.2 + 0.03 =$	d) $\frac{17}{100}$

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

Try This

Verify : $1+\frac{1}{10}+\frac{1}{100}+\frac{1}{1000}+\frac{1}{10000}+\frac{1}{100000}=\frac{111111}{100000}$.

II. EXPONENTS AND POWERS

INTRODUCTION TO ALGEBRA

AIM - 8

SYNOPSIS

VARIABLE

➢ A symbol which can take various numerical values is called a variable or literal.
Examples : x, y, z, a, b, c etc

CONSTANT

➢ A symbol which has fixed value is called a constant.
Example : i) In 5x, 5 is a constant and 'x' is a variable.
ii) If we say 'a' is a constant in ax, then 'a' takes a fixed value.

TERM

➢ Constants alone or variables alone or their combinations by operation of multiplication or division are called terms.

Examples : 6, x, 4x, $7x^2 yz$, $\frac{x}{y}$, $\frac{2}{y}$ etc.

CONSTANT TERM

➢ A term of an expression having no literal is called a constant term.

Examples : 2, $\frac{4}{3}$, $\frac{7}{9}$, $\sqrt{5}$ etc.

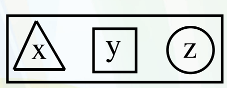
WORK SHEET - 8

Straight objective type Questions

1. Among the following not a variable is [ ]
a) a b) 2 c) – x d) s

2. In (2015 x), constant is [ ]
a) 2015 b) x c) – 1 d) – x

3. Among the following a term is [ ]
a) 6 b) 9x c) $\frac{3}{x}$ d) all

4. The sum of the variables from the adjacent figures is 

[ ]
a) $\frac{x+y}{2}$ b) x+ y+ z c) xyz d) $\frac{1}{x+y+z}$

5. The product of l,b,h is [ ]

a) $\frac{lb}{h}$ b) l + b+ h c) $l$bh d) $\frac{l+b}{h}$

One or more than one correct answer type Questions :

6. Among the following a constant term is [ ]

a) $\frac{5a}{b}$ b) 6abc c) 9 d) $\sqrt{5}$

7. The difference of p and q is [ ]

a) p + q b) p –q c) p + (– q) d) p – (– q)

8. **Statement(A) :** A symbol which can take various numerical values is called a variable. [ ]

Statement(B) : 'x' divided by '9' can be written as $\frac{9}{x}$.

a) Both A and B are true b) Both A and B are false

c) A is true, B is false d) A is false, B is true

9. **Statement (A) :** A term containing only numbers is called a constant term. [ ]

Statement (B) : The variable in – 999 x is – 9x.

a) Both A and B are true b) Both A and B are false

c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :** p,q,r,s, ... are called constants . [ ]

Reason(R) : A symbol which has a fixed value is called a constant .

a) Both A and R are correct, and R is the correct explanation of A

b) Both A and R are correct, but R is not the correct explanation of A

c) A is correct and R is incorrect d) A is incorrect and R is correct

11. **Assertion(A) :** 2x, 5y , 2 ,9x , xyz , $\frac{x}{y}$ .... are called terms. [ ]

Reason(R) : Constants alone or variables alone or their combinations by operation of multiplication or division are called terms.

a) Both A and R are correct, and R is the correct explanation of A

b) Both A and R are correct, but R is not the correct explanation of A

c) A is correct and R is incorrect d) A is incorrect and R is correct

Matrix Matching type Questions :

	Column - I	Column - II
12.	2014 is	a) a term
13.	29 sr is	b) an expression
14.	a + 25 is	c) a variable
15.	In 9k, k is	d) a constant

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

EXPONENTS AND LAWS OF EXPONENTS

AIM - 9

SYNOPSIS

EXPONENTIAL FORM

- The product of a number x with itself, 'n' times (n is a natural number) is given by $x \times x \times x \times \ldots \times x$ (n factors) and is written as x^n which is called the exponential form.
  Here x is called the base, n is called the exponent (or) index of x. x^n can be read as n^{th} power of x (or) x raised to the power n.

  Example : $5 \times 5 \times 5 \times 5 = 5^4$ where base is 5 and index is 4.
- The first power of a number is the number itself. i.e., $x^1 = x$
- The second power is called 'square' and the third power is called 'cube' (of a number) .
  Example : Square of 3 is 3^2 and Cube of 5 is 5^3.
- '1' raised to any integral power gives 1.
  Example : $1^{8383} = 1$
- When '-1' is raised to an odd positive integral power, it gives '-1'
  Example : $(-1)^{243} = -1$
- When '-1' is raised to an even positive integral power, it gives '1'
  Example : $(-1)^{624} = 1$

LAWS OF EXPONENTS

- In the product of exponential forms, if the bases are same, then the powers should be added.
  i.e., $a^m \cdot a^n = a^{m+n}$, where $a \neq 0$.
  Example : $2^2 \times 2^5 = 2^{2+5} = 2^7$
- The power of a product of two or more factors is equal to the product of the same powers of each of the separate factors. i.e., $(abc\ldots)^n = a^n b^n\ldots$
  Example : $(7.2.10)^2 = 7^2.2^2.10^2$
- $(-a)^n = (-1)^n a^n = \begin{cases} a^n, & \text{if } n \text{ is even} \\ -a^n, & \text{if } n \text{ is odd} \end{cases}$
- The power of a power of the base is a power of the same base with the index is equal to the product of powers. i.e., $\left(a^m\right)^n = a^{mn}$.
- $\left(a^m\right)^n$ is different from a^{m^n}

- $\left(a^m\right)^n$ means a^m raised to the power n and a^{m^n} means a raised to the power m^n.

Example : $(2^3)^2 = 2^6$, $2^{3^2} = 2^9$, i.e., $\left(2^3\right)^2 \neq 2^{3^2}$.

- A positive integral power of a number expressed as a fraction is equal to the power of the numerator divided by the power of the denominator.

i.e. $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$, where b $\neq$ 0

Example : $\left(\frac{2}{3}\right)^4 = \frac{2^4}{3^4}$.

- The quotient (fraction) of powers of the same base is the power of the same base with index is equal to the difference of the indices.

$$\frac{a^m}{a^n} = \begin{cases} a^{m-n} & if \;\; m > n \\ \frac{1}{a^{n-m}} & if \;\; m < n, \;\; where \;\; a \neq 0 \\ 1 & if \;\; m = n \end{cases}$$

Example : i) $\frac{12^5}{12^3} = 12^{5-3} = 12^2$ ii) $\frac{5^3}{5^7} = \frac{1}{5^{7-3}} = \frac{1}{5^4}$

- Any non zero base with an index of zero is equal to 1, i.e., $a^0 = 1$, where $a \neq 0$.

Example : i) $(1000)^0 = 1$ ii) $(a.b.c....z)^0 = 1$

- $a^{-n} = \frac{1}{a^n}$ $(a \neq 0)$ and $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$, here $a, b \neq 0$

- $a^m = a^n \Leftrightarrow m = n$ $(a \neq 0, 1)$

WORK SHEET - 9

Straight objective type Questions :

1. The exponential form of a × a × a × a × a is [ ]

a) 5a b) a + 5 c) a^5 d) $\frac{5}{a}$

2. $(2015)^1$= [ ]

a) 0 b) 1 c) 2016 d) 2015

3. $(-1)^{2014}$ = [ ]

a) – 1 b) – 2014 c) 1 d) 2014

4. $(-1)^{999} =$ [ ]
a) 1999 b) – 1 c) – 999 d) 1000

5. The index of $(-1)^{2008}$ is [ ]
a) 1 b) – 2008 c) 2008 d) 2009

One or more than one correct answer type Questions :

6. $(9)^{15} =$ [ ]
a) $\left(9^5\right)^3$ b) $\left(9^{10}\right)^5$ c) $\left(9^3\right)^5$ d) $\left(9^{10}\right)+\left(9\right)^5$

7. $(-99999)^0 =$ [ ]
a) 0 b) 1 c) $(99)^0$ d) $(100000)^0$

8. **Statement(A) :** $a^m \times a^n = a^{m+n}$,(where $a \neq 0$ and $m,n \in Q$). [ ]

Statement(B) : $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$,(where $b \neq 0$).

a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

9. **Statement (A) :** $9^2 \times 29^2 \times 31^2 = (9 \times 29 \times 31)^6$. [ ]
Statement (B) : The value of 1 raised to any integral power is 1.
a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :** $\frac{9^8}{9^3} = 9^{8-3}$ (or) 9^5. [ ]

Reason(R) : If $m > n$ and $a \neq 0$,then $\frac{a^m}{a^n} = a^{m-n}$.

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct

11. **Assertion(A) :** $\frac{(25)^2}{(25)^8} = \frac{1}{(25)^6}$. [ ]

Reason(R) : If $m < n$ and $a \neq 0$, then $\frac{a^m}{a^n} = \frac{1}{a^{n-m}}$.

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct

Matrix Matching type Questions :

Column - I	Column - II
12. $(5)^{-2} =$	a) 5^5
13. $\frac{5^4}{5^2} =$	b) $\frac{1}{5^2}$
14. $5^2 \times 5^3 =$	c) 5^{25}
15. $5^{5^2} =$	d) 5^2

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

Do you know ?

Is $4^{3^6} = 4^{18}$ (or) not ? Why ?

Do you know

Rational Numbers

A number should be written in the form of $\frac{p}{q}$, where 'p' and 'q' are integers and $q \neq 0$ is called a rational number, the set of rational numbers is denoted by "Q". A rational number may be positive, zero or negative.

Example : $\frac{1}{2}, \frac{2}{2}, \frac{-2}{3}, \frac{0}{1}, \frac{-5}{11}, ...$

III. ALGEBRAIC EXPRESSIONS

TYPES OF ALGEBRAIC EXPRESSIONS

AIM - 10

SYNOPSIS

ALGEBRAIC EXPRESSION

- The combination of terms obtained by the fundamental operations +, –, $\times$, $\div$ is called an algebraic expression.

  Examples : 2x + 3, 5 - 2y, 6a, 7 $\div$ b.

TYPES OF ALGEBRAIC EXPRESSIONS

- An expression containing only one term in which powers of variables are non-negative integers is called a **monomial**.

  Examples : 4xyz, $2l^2m^2$, 8pq etc.
- Every monomial is a term but every term need not be a monomial .

  Examples :2x is a monomial and also a term
- $\frac{2}{x}$ is only a term, not a monomial, because $\frac{2}{x} = 2x^{-1}$, where power of 'x' is a negative integer.
- An expression containing two monomials is called a **binomial.**

  Examples : 2 + x, 3y + 4z etc.
- An expression containing three monomials is called a **trinomial.**

  Examples : x + y - z, 3xz - 4xy + 2zy etc.
- An expression containing one or more monomials is called a **polynomial.**

  Examples : 2a - 4b, 5x + y + z etc.
- An expression containing one or more terms is called a **multinomial.**

  Examples : $2 + \frac{4}{x}$, 3x + y - z etc.
- All polynomials are multinomials but every multinomial need not be a polynomial.

WORK SHEET - 10

Straight objective type Questions

1. Among the following a polynomial is [ ]

   a) 5x + 2y + 3z b) $6x + \frac{2}{y} + z$ c) $x + \sqrt{y} + z$ d) $x^2 + y^{-1} + z$

2. The combination of terms obtained by the fundamental operations +, –, $\times$, $\div$ is called [ ]

   a) an equation b) an algebraic expression
   c) an identity d) a polynomial

3. Among the following not a monomial is [ ]

   a) xy b) 2015 c) $\frac{a}{2016}$ d) $\frac{2015}{x}$

4. Among the following a trinomial is [ ]

a) abc b) $\frac{a+b}{c}$ c) a + b + c d) a + bc

5. $\frac{x+y}{2}$ is [ ]

a) a monomial b) a binomial c) a trinomial d) not a polynomial

One or more than one correct answer type Questions :

6. Among the following a polynomial is [ ]

a) 11x b) x + y + 6 c) x + y d) abcd

7. Among the following a multinomial is [ ]

a) xyz b) x + y + z c) $\frac{xy}{z}$ d) x + yz

8. **Statement(A) :** Every monomial is a term but every term need not be a monomial. [ ]
Statement(B) : xyz is a trinomial.
a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

9. **Statement (A) :** All polynomials are multinomials. [ ]
Statement (B) : All multinomials are polynomials.
a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :** 3a + 2b + c is a trinomial. [ ]
Reason (R) : An algebraic expression containing three monomials is called a trinomial.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

11. **Assertion(A) :** abc, $a^2b^2c^2$, 9pqr, x^2y,.... are monomials. [ ]
Reason(R) : An expression containing only one term in which the powers of variables are non - negative integers is called a monomial.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

Matrix Matching type Questions :

Column - I	Column - II
12. 4xyz is	a) a multinomial
13. $\frac{1}{x}+2$ is	b) a binomial
14. a + b + c + d is	c) a polynomial
15. x + 999 is	d) a monomial

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

FACTORS, COEFFICIENTS AND DEGREES OF EXPRESSIONS

AIM - 11

SYNOPSIS

FACTORS

- In a product each of the literal or numerical value is called a factor of the product.

  Example : $6 = 2 \times 3$, where 2, 3 are called factors of 6 , $5xy = 5 \times x \times y$, where 5, x, y are called factors of 5xy.

COEFFICIENT

- In a product containing two or more factors, each factor is called the coefficient of the product of the other factors.

  Example : In 6x, 6 is the numerical coefficient of 'x' and 'x' is the literal coefficient of 6.
- When the numerical coefficient of a term is + 1 or - 1, there is no need to mention 1.

  Example : The coefficient of x^2 in $x^2 + 3x + 5$ is 1, the coefficient of xy in $5x^2 + 7xy + 10y^2$ is 7.
- The degree of zero polynomial is "not defined."

DEGREE OF A MONOMIAL

- The degree of a monomial is the sum of the powers of variables involved in it.

  Example : The degree of $5x^2y$ is '3'.
- Every non-zero number is considered as a monomial with degree zero.

  Example : The degree of '27' is '0'.

DEGREE OF A POLYNOMIAL

- The greatest degree of terms in a polynomial is called the degree of polynomial.

  Example : The degree of $5x^2 + 6x^3 + 7x + 2$ is '3', the degree of $(x^3 + x^4)^2$ is $4 \times 2 = 8$.
- The degree of multinomial is not defined

WORK SHEET - 11

Straight objective type Questions

1. The coefficient of x in $99xy^2z$ is [ ]

   a) 99 b) $99y^2$ c) $99y^2z$ d) 1
2. The degree of 2016 is [ ]

   a) 1 b) 2016 c) 2015 d) 0
3. The degree of $10x^8 + 5x^6 + 6x^3 + 2x + 9$ is [ ]

   a) 7 b) 8 c) 9 d) 10
4. The coefficient of x in $-101x$ is [ ]

   a) 101 b) 1 c) -101 d) 0

5. The degree of $5x^2$ y is [ ]
a) 3 b) 2 c) 1 d) 0

One or more than one correct answer type Questions

6. One of the factors of 36 xy is [ ]
a) 36 x b) xy c) 9x d) y

7. The degree of $5x^3 + 7x^2 + 6x + 2$ is [ ]
a) 1 b) 3 c) $\frac{3^1}{1^3}$ d) 0

8. **Statement (A) :** The degree of 27 is 1. [ ]
Statement (B) : The degree of multinomial is not defined.
a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

9. **Statement (A) :** $2x^2 + 4x + 5$ is a trinomial with degree 2. [ ]
Statement (B) : A constant is a polynomial with degree 0.
a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

10. **Assertion (A) :** $6x^5 + 5x^4 + 3x^2 + \frac{4}{x} + 5$ is not a polynomial of degree 5. [ ]
Reason(R) : The exponent of 'x' is a negative integer, it is a multinomial.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct.

11. **Assertion(A) :** The degree of 0 is 0. [ ]
Reason(R) : The degree of zero polynomial is not defined.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct.

Matrix Matching type Questions :

	Polynomial	Degree
12.	x^4	a) 1
13.	x^3	b) 2
14.	x^2	c) 3
15.	x	d) 4

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

LIKE TERMS ,UNLIKE TERMS AND SUBSTITUTION

AIM - 12

SYNOPSIS

LIKE TERMS

- The terms which contain the same literal factors are called like terms or similar terms.
- In like terms the numerical co-efficient may be different.

Examples : x, 7x, 9x ; $3x^2yz$, $-7x^2yz$, $\frac{2}{3}x^2yz$

UNLIKE TERMS

- The terms which do not have the same literal factors are called unlike terms.

Examples : 5x, 5y; $6x^2$, 7xy

SUBSTITUTION

- The method of replacing numerical values in the place of literal numbers is called substitution.

Example : Find the value of 6y at y = 3

Solution : $6y = 6 \times y = 6 \times 3 = 18$.

WORK SHEET - 12

Straight objective type Questions

1. Among the following a pair of like terms is [ ]

a) $2x^2$, 2x b) 8ab, – 6 ab c) x y, $\frac{x}{y}$ d) $\sqrt{x}, x^2$

2. Among the following a pair of unlike terms is [ ]

a) 5xy, $\frac{xy}{9}$ b) 9 ab, 3ab c) xyz, $\frac{1}{xyz}$ d) a^2 , $\frac{a^2}{9}$

3. If x = 9, then 3x = [ ]

a) 6 b) 12 c) 27 d)3

4. If a = 5, b = 11and c = 8, then a + b + c = [ ]

a) 14 b) 24 c) 35 d) 47

5. If x = – 1 , then $x^2 + x - 1$ = [ ]

a) 0 b) 1 c) – 1 d) 3

One or more than one correct answer type Questions

6. Among the following have same literal factors are [ ]

a) $3x^2$ b) 9x c) $-\frac{2}{3}x^2$ d) $\frac{3}{x^2}$

7. If $x = -13$, then $2x =$ [ ]

a) -15 b) -26 c) $13 \times (-2)$ d) 26

8. **Statement(A) :** If $a = 3$, then $2a + 5 = 11$. [ ]
Statement(B) : The method of replacing numerical values in the place of literal numbers is called substitution.

a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

9. **Statement (A) :** If $a = 8$, $b = -5$ and $c = 3$, then $a + b + c = 0$. [ ]
Statement (B) : If $x = -2$, then $3x^2 - 2 = -14$.

a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :** The terms 5 abc , $\frac{abc}{5}$ and 55 abc are called like terms. [ ]
Reason(R) : The terms which contain the same literal factors are called like terms.

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

11. **Assertion(A) :** The terms $6a^2bc$, $6ab^2c$, $6abc^2$ are called unlike terms. [ ]
Reason(R) : The terms which do not have the same literal factors are called unlike terms.

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

Matrix Matching type Questions :

If $x = 3$, $y = 2$ and $z = 5$, then

	Column - I	Column - II
12.	$x^y + y^x =$	a) 38
13.	$x^2 + y^2 + z^2 =$	b) 34
14.	$x + y + z =$	c) 17
15.	$x^y + z^y =$	d) 10

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

Do You Know ?

1) $(a + b)^2 = a^2 + 2ab + b^2$
2) $(a - b)^2 = a^2 - 2ab + b^2$
3) $a^2 - b^2 = (a + b)(a - b)$.
4) $(a + b)^2 = (a - b)^2 + 4ab$
5) $(a - b)^2 = (a + b)^2 - 4ab$
6) $a^2 + b^2 = (a + b)^2 - 2ab$
7) $a^2 + b^2 = (a - b)^2 + 2ab$
8) $(a^2 + b)^2 + (a - b)^2 = 2a^2 + 2b^2 = 2(a^2 + b^2)$
9) $(a + b)^2 - (a - b)^2 = 4ab$
10) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
11) $(a - b - c)^2 = a^2 + b^2 + c^2 - 2ab + 2bc - 2ca$
12) $(-a - b - c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

IV. GEOMETRY

BASIC GEOMETRICAL CONCEPTS

AIM - 13

SYNOPSIS

POINT

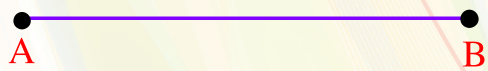
- A Point is a mark of position. It has no length , breadth and thickness.

  Example : We represent our state with a dot in India map. Here dot represents the position of the state and is called a point .
- Point has no thickness or size, generally we should keep a dot as thin as possible to represent a point.

LINE SEGMENT

- Fold a piece of paper and unfold it, you see a fold. This gives an idea about the line segment. It has two end points 'A' and 'B'.
- 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 $\overline{BA}$.



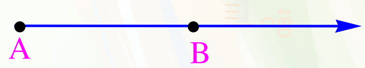
- A line segment contains infinite number of points.

  Example : Edge of a box, edge of a post card.
- A line segment has a definite length, which can be measured.
- The measure of each line segment is a unique number called its length.

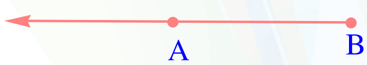
RAY

- A line segment extended endlessly in one direction is called a ray.

  Example : The line segment AB, extended endlessly in the direction from A to B is a ray, denoted by $\overrightarrow{AB}$ called a ray AB.



- The ray AB has one end point, namely A, called its initial point.
- Clearly, a ray has no definite length .
- Usually $\overrightarrow{AB}$ is not same as $\overrightarrow{BA}$
- $\overrightarrow{BA}$ is a ray with initial point 'B' and extends endlessly in the direction from 'B' to 'A'.



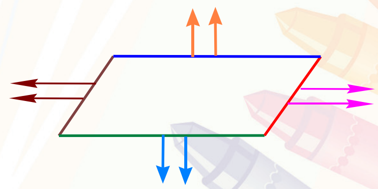
- A ray contains infinite number of points.

LINE

- A line segment extended endlessly in both sides is called a line.
- A line is denoted by $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$ and called as line AB or line BA.

- A line has no end points, it contains infinite number of points.
- It has infinite length but no thickness.
- The line segment is a part of the line.
- The number of line segments possible from 'n' given points such that no three points are collinear is $\frac{n(n-1)}{2}$.
- A line and a line segment contains infinite points.

PLANE



- A 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

- A part of a plane has a boundary.

  Example : The surface of the top of a table is a part of a plane, which has a boundary.
- Triangle, Rectangle, Circle etc. are plane figures. We draw them in a plane and call as plane figures.
- A plane has infinite length and breadth but no thickness.
- Through a single point on a plane, we can draw infinite number of lines.
- A plane contains infinite lines.

SPACE

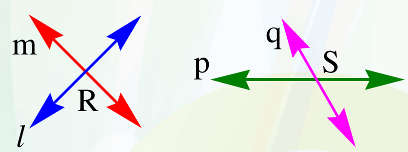
- A ball that encloses a volumetric portion is called a part of a space.
- The portion enclosed by an infinitely large ball is called space.

  Example : Cube, Cuboid, Sphere, Prism are Space figures.
- Two straight lines cannot enclose a space.
- A space contains infinite number of planes.
- A space has infinite length, breadth and also thickness.

INTERSECTING LINES

- If two lines are having a common point, then they are said to be intersecting lines.

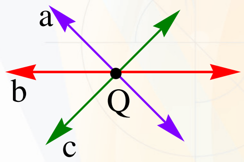
Example :



CONCURRENT LINES

➢ If three or more lines are having the same common point, then those lines are called concurrent lines.

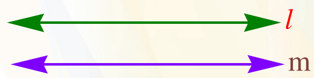
Example :



PARALLEL LINES:

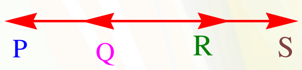
➢ Two lines ‘*l*’ and ‘m’ are said to be parallel, if they lie in the same plane and do not have a common point. If ‘*l*’ and ‘m’ are parallel, then we can represent them as $l \parallel m$.

Example :



COINCIDENT LINES

➢ Two lines having infinite common points are called coincident lines.

Example : 

, here $\overleftrightarrow{PR}$, $\overleftrightarrow{QS}$ are called coincident lines.

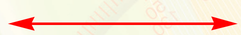
WORK SHEET - 13

Straight objective type Questions

1. Among the following has a definite length is [ ]

   a) a point b) a line c) a line segment d) a ray

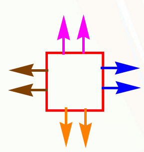
2. The number of end points of the adjacent figure is [ ]

   a) 0 b) 1

   c) 2 d) infinite

3. A flat surface extended endlessly in all directions is [ ]

   a)  b)  c)  d) 

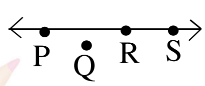
4. The number of lines should be drawn through a given point is [ ]

   a) 1 b) 2 c) 3 d) infinite

5. The portion exclosed by an infinitely large ball is called [ ]

   a) a plane b) a space c) a polygon d) a surface

One or more than one correct ansswer type Questions

6. In the figure , 

   the correct statement is [ ]

   a) P,R are collinear b) P,Q,R are collinear c) Q,R are non collinear d) P,R,S are non collinear

7. Among the following a space figure is [ ]

   a) a triangle b) a cube c) a sphere d) a cuboid

8. **Statement(A) :** The line segment PQ is denoted by $\overline{PQ}$. [ ]
Statement(B) : A space cantains infinite planes.
a) Both A and B are true
b) Both A and B are false
c) A is true, B is false
d) A is false, B is true

9. **Statement (A) :** The distance between two parallel lines is the same at every where. [ ]
Statement (B) : The figures having the same beginning and end points are called closed figures.
a) Both A and B are true
b) Both A and B are false
c) A is true and B is false
d) A is false and B is true

10. **Assertion(A) :** The two lines having no common points are called parallel lines. [ ]
Reason(R) : The two lines having an infinite common points are called coincident lines.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct.

11. **Assertion(A) :** A plane has infinite length and breadth . [ ]
Reason(R) : The representation of a plane on a paper is not possible.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect
d) A is incorrect and R is correct.

Matrix Matching type Questions

	Column - I	Column - II
12.	The number of common points of concurrent lines is	a) 0
13.	The number of end points of line segment is	b) 1
14.	The number of measurements of a point is	c) 2
15.	The number of measurements of a space is	d) 3

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

Do you know

Unit	Symbol	Relation with metre
Millimetre	mm	$1mm \ \frac{1}{1000}m$
Centimetre	cm	$1cm \ \frac{1}{100}m$
Decimetre	dm	$1dm \ \frac{1}{10}m$
Decametre	dem	1 dem = 10m
Hectametre	hm	1 hm = 100m
Kilometre	km	1 km = 1000m

1 cm = 10 mm; 1dm = 10 cm; 1m = 100cm = 1000mm.

ANGLES

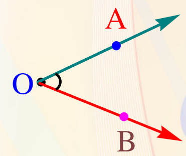
AIM - 14

SYNOPSIS:

ANGLE

- An angle is the union of two different rays having the same initial point.

Example :



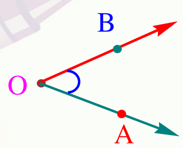
- In the figure, $\overrightarrow{OA}$ and $\overrightarrow{OB}$ are different rays having a common initial point 'O'. $\overrightarrow{OA}$ and $\overrightarrow{OB}$ are called arms (or) sides of the angle and the common initial point 'O' is called as the vertex of the angle.

TYPES OF ANGLES

ACUTE ANGLE

- An angle whose measure is less than 90° and greater than zero degrees, is called an acute angle i.e. If θ is an acute angle, then $0° < \theta < 90°$.

Example :

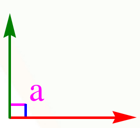


Here $\lfloor\underline{AOB}$ is less than 90° and greater than zero degrees, so it is an acute angle.

RIGHT ANGLE

- An angle whose measure is 90°, is called a right angle.

Example :

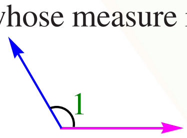


Here $\lfloor\underline{a}$ is 90°, so it is a right angle.

OBTUSE ANGLE

- An angle whose measure is greater than 90° and less than 180° is called an obtuse angle.

Example :

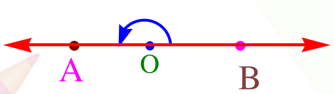


Here $\lfloor\underline{1}$ is more than 90° and less than 180°, so it is an obtuse angle.

STRAIGHT ANGLE

- An angle whose measure is 180° is called a straight angle.

Example :

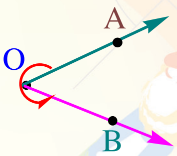


Here $\overrightarrow{OA}$, $\overrightarrow{OB}$ are two opposite rays, AOB is a straight line and $\lfloor\underline{AOB}$ is a straight angle.

- A straight angle = Two right angles.

REFLEX ANGLE

- An angle whose measure is greater than 180° and less than 360° is called a reflex angle.

Example : 

Here $\angle AOB$ is more than 180° and less than 360°, so it is a reflex angle.

COMPLETE ANGLE

- An angle whose measure is 360° is called a complete angle.

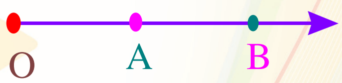
Example : 

Here $\angle AOB$ is 360°.

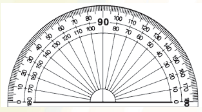
- A complete angle = Two straight angles = Four right angles.

ZERO ANGLE

- An angle whose measure is 0° is called a zero angle.

Example : 

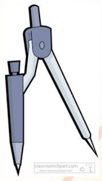
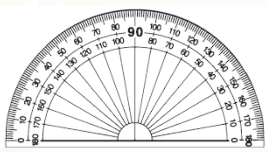
Here $\angle AOB = 0°$.

- The instrument used to measure the angles is Protractor. 

WORK SHEET - 14

Straight objective type Questions :

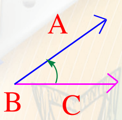
1. The instrument used to measure the angles is [ ]

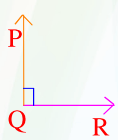
a)  b)  c)  d) 

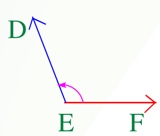
2. An angle whose measure is 180° is called [ ]

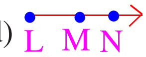
a) obstuse angle b) reflex angle c) right angle d) straight angle

3. Among the following the symbol represents a right angle is [ ]

a) 

b) 

c) 

d) 

4. The measure of the angle between the hands of a clock at 5 O' clock is [ ]

a) 150° b) 180° c) 200° d) 250°

5. The two rays forming an angle are called [ ]
a) the sides b) the vertices c) the arms d) both a,c

One or more than one correct answer type Questions

6. Among the following an obtuse angle is [ ]
a) 89° b) 91° c) 181° d) 179°

7. The measure of a complete angle is [ ]
a) 360° b) four right angles c) two obtuse angles d) two straight angles

8. **Statement(A) :** The union of two different rays having the same initial point is called an angle.
Statement(B) : The symbolic representation of an angle is $\angle$. [ ]
a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

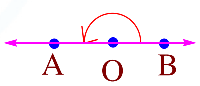
9. **Statement (A) :** The common end point of an angle is called a vertex. [ ]
Statement (B) : The measure of an angle betwen the hands of a clock at 8 O'clock is 200°.
a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :** If $\angle A = 225°$, then it is called a reflex angle. [ ]
Reason(R) : If the measure of an angle is lies between 180° and 360°, then it is called a reflex angle.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

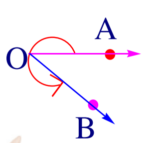
11. **Assertion(A) :** If $\angle S = 89°$, then it is called an acute angle. [ ]
Reason(R) : The measure of an angle is greater than 0° is called an acute angle.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

Matrix Matching type Questions

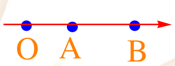
Geometrical figures **Name of the angles**

12. 

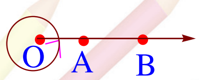
a) a complete angle

13. 

b) a straight angle

14. 

c) a reflex angle

15. 

d) a zero angle

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

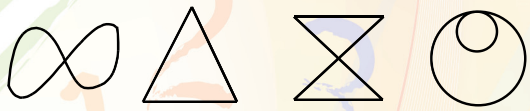
TRIANGLES

AIM - 15

SYNOPSIS

CLOSED FIGURE

- If the start and end points of a figure are same, then it is called a closed figure.

Example : 

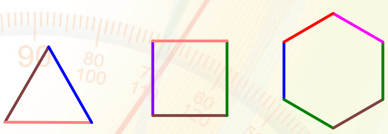
- **SIMPLE CLOSED FIGURE**

  A closed figure which does not cross it self is called a simple closed figure.

Example : 

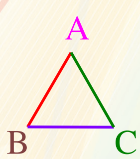
POLYGON

- A simple closed figure bounded by line segments is called a Polygon.

Examples : 

TRIANGLE

- A polygon with three sides is called a triangle.The symbol for triangle is ‘ Δ ’ .

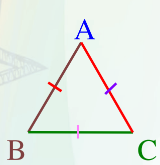
Example : 

We read as ‘triangle ABC’ and it is denoted by Δ ABC .

CLASSIFICATION OF TRIANGLES ACCORDING TO THE SIDES

EQUILATERAL TRIANGLE

- A triangle whose three sides are equal in length is called an ‘Equilateral triangle’. All the angles in the equilateral triangle are equal.

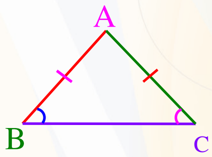
Example : 

$\overline{AB} = \overline{BC} = \overline{CA}$ and $\angle A = \angle B = \angle C = 60^\circ$

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.

Example :

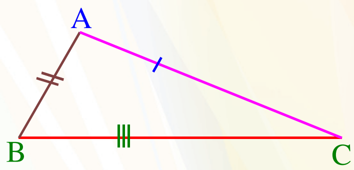


Here $\overline{AB} = \overline{AC}$, $\angle B = \angle C$, Base = $\overline{BC}$

SCALENE TRIANGLE

➤ If no two sides of the triangle are equal in length, then it is called a Scalene triangle.

Example :



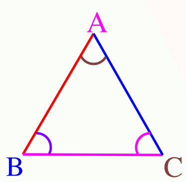
where AB $\neq$ BC $\neq$ CA, $\angle A \neq \angle B \neq \angle C$

CLASSIFICATION OF TRIANGLES ACCORDING TO THE ANGLES

ACUTE ANGLED TRIANGLE

➤ If each angle of a triangle is an acute angle, then it is called an 'Acute angled triangle'.

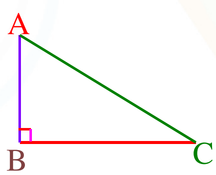
Example :



Measure all angles and observe each angle is less than 90°.

RIGHT ANGLED TRIANGLE

➤ A triangle in which one of its angles is a right angle is called 'Right angled triangle'.

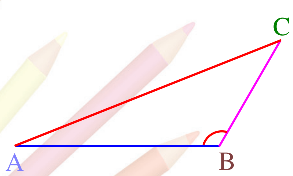


In this triangle $\angle B = 90°$, therefore it is a right angled triangle.

In a right angled triangle, the opposite side of the right angle is called 'Hypotenuse'.

OBTUSE ANGLED TRIANGLE

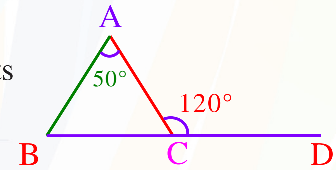
➤ A triangle in which one of its angles is an obtuse angle is called 'Obtuse angled triangle'.



In the figure $\angle B > 90°$, so it is an obtuse angled triangle.

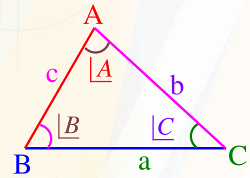
EXTERIOR ANGLE OF A TRIANGLE

An exterior angle is formed by one side of a triangle and the extension of its adjacent side of the triangle. In the figure $\angle ACD$ is the exterior angle.



INEQUALITIES OF A TRIANGLE

- The sum of the lengths of any two sides of a triangle is greater than the length of the third side.
  i.e., $a + b > c$, $b + c > a$, $c + a > b$
- The difference of the lengths of any two sides of a triangle is smaller than the length of the third side. i.e., $|a-b| < c$, $|b-c| < a$, $|c-a| < b$



WORK SHEET - 15

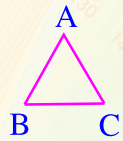
Straight objective type Questions

1. A simple closed figure formed by three line segments is called [ ]
   a) a triangle b) a circle c) a quadrilateral d) a sphere

2. The symbolic representation of a triangle is [ ]
   a) $\angle$ b) △ c) □ d) ○

3. If the lengths of all sides of a triangle are different , then it is called [ ]
   a) an isosceles triangle b) a scalene triangle
   c) an equilateral triangle d) can't say

4. The number of angles exists in the figure is [ ]
   a) 1
   b) 2
   c) 3
   d) 4



5. If $\angle A + \angle C = 120°$, $\angle B + \angle C = 140°$ and $\angle A + \angle B = 100°$, then $\angle A, \angle B$ *and* $\angle C$ respectively are [ ]
   a) 60°,40°,80° b) 40°,60°,80° c) 80°,40°,60° d) 60°,80°,40°

One or more than one correct answer type Questions

6. The sum of the measures of three angles in a triangle is [ ]
   a) 180° b) two acute angles c) two right angles d) a straight angle

7. A triangle should have [ ]
   a) three sides b) three vertices
   c) at least two acute angles d) two right angles

8. **Statement(A) :** If one of the measure of an angle in a triangle is 91°, then it is an obtuse angled triangle.
   Statement(B) : In ΔABC, if $\angle A = 30°$ and $\angle B = 50°$, then $\angle C = 120°$. [ ]
   a) Both A and B are true b) Both A and B are false
   c) A is true, B is false d) A is false, B is true

9. **Statement (A) :** The sum of the lengths of any two sides of a triangle is greater than the length of the third side. [ ]

Statement (B) : In ΔABC, $\overline{AB} - \overline{BC} > \overline{AC}$.

a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :** If $\angle A = 60°$, $\angle B = 50°$ and $\angle C = 70°$, then ΔABC is an acute angled triangle. [ ]

Reason(R) : In an acute angled triangle the measure of each angle lies between 0° and 90°.

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

11. **Assertion(A) :** In ΔPQR, if $\angle P = 45°$, $\angle Q = 55°$ and $\angle R = 80°$, then the measure of exterior angle when $\overline{PQ}$ produced is 100°. [ ]

Reason(R) : In a triangle, the measure of an exterior angle is equal to sum of its opposite interior angles.

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

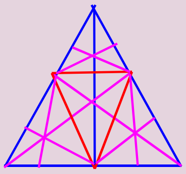
Matrix Matching type Questions

	The measure of angles / sides	**Name of the triangle**
12.	90°, 45°, 45°	a) acute angled triangle
13.	9 cm, 9 cm, 9 cm	b) right angled triangle
14.	100°, 35°, 45°	c) scalene triangle
15.	3 cm, 4 cm, 5 cm	d) equilateral triangle

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

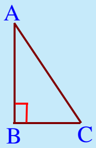
Try This

How many number of triangles are there in the adjacent figure . ?



Do You Know?

In the figure, $\angle B = 90°$ and $\overline{AC}$ is the hypotenuse, then according to Pythagoras theorem $AC^2 = AB^2 + BC^2$.



QUADRILATERALS

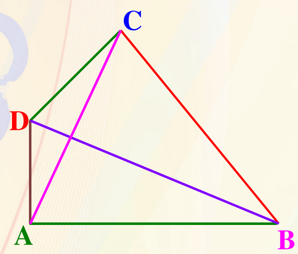
AIM - 16

SYNOPSIS

QUADRILATERAL

- A quadrilateral is a closed figure formed by four line segments such that no two line segments cross each other except at their end points.

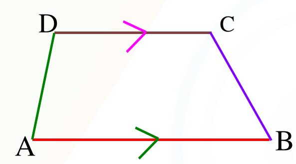
IN A QUADRILATERAL ABCD



- Four sides $\overline{AB}, \overline{BC}, \overline{CD}, \overline{DA}$.
- Four angles $\angle A, \angle B, \angle C, \angle D$.
- Four vertices A,B,C,D.
- Two diagonals $\overline{AC}, \overline{BD}$.
- Adjacent sides : $\overline{AB}$ and $\overline{BC}$; $\overline{BC}$ and $\overline{CD}$; $\overline{CD}$ and $\overline{DA}$; $\overline{DA}$ and $\overline{AB}$.
- Adjacent angles : $\angle A$ *and* $\angle B$; $\angle B$ *and* $\angle C$; $\angle C$ *and* $\angle D$; $\angle D$ *and* $\angle A$.
- Opposite sides : $\overline{AB}$ and $\overline{CD}$; $\overline{AD}$ and $\overline{BC}$.
- Opposite angles : $\angle A$ *and* $\angle C$; $\angle B$ *and* $\angle D$.
- The sum of the interior angles in a quadrilateral is 360°.(i.e. $\angle A + \angle B + \angle C + \angle D = 360°$)
- Each diagonal divides the quadrilateral into two triangles.

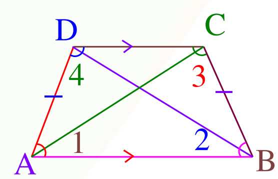
TYPES OF QUADRILATERALS

TRAPEZIUM



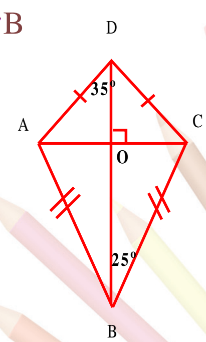
- A trapezium is a quadrilateral in which one pair of opposite sides are parallel.
- In a trapezium ABCD, the parallel sides ($\overline{AB}$, $\overline{CD}$) are called the **bases** of the trapezium and the other two sides are called its non-parallel sides(**legs**), ($\overline{BD}, \overline{AC}$).

ISOSCELES TRAPEZIUM



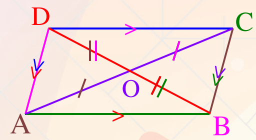
- A trapezium in which the non parallel sides are equal to each other is known as an isosceles trapezium.
- In the isosceles trapezium ABCD , $\overline{AB} \parallel \overline{CD}$, AD =BC
- In an isosceles trapezium diagonals are equal in length.

KITE



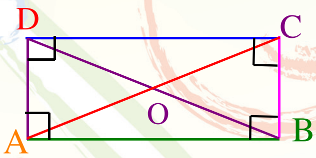
- A quadrilateral having two pairs of equal adjacent sides but unequal opposite sides is called a kite. ABCD is a kite with $\overline{AB} = \overline{BC}$ & $\overline{AD} = \overline{CD}$.
- The diagonals of a kite are perpendicular to each other i.e., $\overline{BD} \perp \overline{AC}$.

PARALLELOGRAM



- A quadrilateral in which both pairs of opposite sides are parallel is called a parallelogram.
- The diagonals of a parallelogram bisect each other (AO = OC, BO = OD).

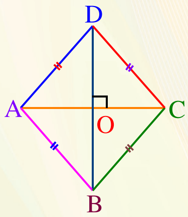
RECTANGLE



- A parallelogram in which one angle is a right angle is called a rectangle.
- In a rectangle all angles are equal and each angle is 90°.
- The lengths of the diagonals of a rectangle are equal and bisect each other.
- Opposite sides are equal.
- Opposite angles are equal.

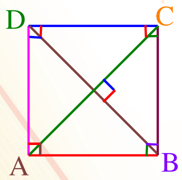
RHOMBUS

- A parallelogram in which two adjacent sides are equal is called a rhombus.



- Each diagonal of a rhombus divides it into two congruent isosceles triangles.
- In a rhombus lengths of all sides are equal

SQUARE



- A rectangle in which adjacent sides are equal is called a square.

(OR)

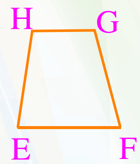
A Rhombus in which one of its angles is a right angle is called a square.

- In a square all sides are equal.
- Each angle is equal to 90°

WORK SHEET - 16

Straight objective type Questions

1. The name of the figure is [ ]



a) a triangle b) a circle
c) a quadrilateral d) an hexagon

2. A quadrilateral whose two pairs of opposite sides are not parallel is [ ]
a) a square b) a trapezium c) a parallelogram d) a rectangle

3. A quadrilateral whose two pairs of adjacent sides are equal but opposite sides are unequal is
a) a rhombus b) a square c) a rectangle d) a kite [ ]

4. If one angle of a parallelogram is 90°, then it is [ ]
a) a trapezium b) a kite c) a rectangle d) a rhombus

5. The lengths of all sides are equal in [ ]
a) a trapezium b) a rhombus c) a rectangle d) a kite

One or more than one correct answer type Questions

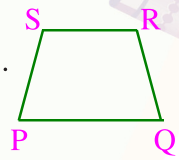
6. The lengths of two pairs of opposite sides are equal in [ ]
a) a square b) a parallelogram c) a rectangle d) a rhombus

7. The measure of each angle is a right angle in [ ]
a) a kite b) a square c) a rhombus d) a rectangle

8. **Statement(A) :** In a trapezium, if the lengths of non parallel sides are equal, then it is called an isosceles trapezium. [ ]
Statement(B) : In any quadrilateral, each diagonal divides it into two triangles.
a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

9. **Statement (A) :** In a trapezium, the lengths of all sides are different. [ ]
Statement (B) : The number of diagonals in a quadrilateral is 4.
a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :**In the figure, if $\angle P + \angle Q + \angle R = 280°$, then $\angle S = 80°$. [ ]



Reason(R) : The sum of the measures of four angles in a quadrilateral is 360°.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

11. **Assertion(A) :** If ABCD is a parallelogram , then $\angle A - \angle C = 0°$. [ ]
Reason(R) : In a parallelogram, the measures of opposite angles are equal.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

Matrix Matching type Questions

12. The lengths of the diagonals are equal in — a) a rhombus
13. The diagonals bisects each other in — b) a rectangle
14. The diagonals bisects each other perpendicularly in — c) a kite
15. The diagonals bisects each other and their lengths are equal in — d) a square

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

CIRCLES

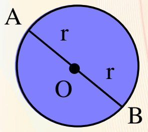
AIM - 17

SYNOPSIS

CIRCLE

- A circle is a set of points in a plane at a given distance to a given point in the same plane.
- Circle is a closed figure.

Example : Bangle, Wheel



RADIUS OF THE CIRCLE

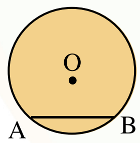
- A line segment joining the centre of a circle to any point on the circle, is called radius of the circle. It is denoted by **'r'.**
- A circle has unlimited number of radii.

CONGRUENT CIRCLES

- Two circles having the same radii are called congruent circles.

CHORD OF THE CIRCLE

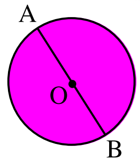
- The line segment joining any two points on the circle is called chord of a circle.



Here $\overline{AB}$ is called chord of the circle.

DIAMETER OF THE CIRCLE

- The chord passing through center of the circle is called diameter of the circle.

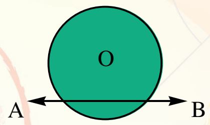


Here $\overline{AB}$ is the diameter of the circle.

- The circle has unlimited number of diameters.
- The diameter is the longest chord in a circle.
- The diameter of a circle is twice its radius.

SECANT OF THE CIRCLE

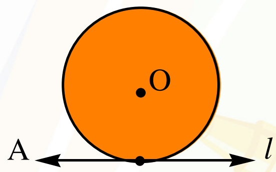
- A line intersecting a circle at two points is called secant of a circle.



Here $\overleftrightarrow{AB}$ is a secant.

TANGENT OF THE CIRCLE

- A line which touches a circle at only one point is called tangent of the circle. Here 'l' is the tangent of the circle.



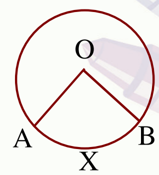
ARC OF A CIRCLE

- A part of a circle is called arc of the circle.
- An arc which is less than half of the circle is called Minor arc.
- An arc which is more than half of the circle is called a Major arc
- An arc is denoted by the symbol $\frown$ and is read as 'arc'. $\overset{\frown}{AB}$ is read as 'Arc AB'.

SEMICIRCLE

- An arc which is exactly half of the circle is called semi circle.
- The angle in a semicircle is 90°.
- The angle in a semicircle at the centre is 180°.

SECTOR OF A CIRCLE



- The sector is a figure formed by all the points on $\overline{OA}$, arc AXB and $\overline{OB}$

It is the union of $\overline{OA}$, arc AXB and $\overline{OB}$

CIRCUMFERENCE OF THE CIRCLE

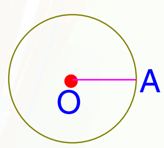
- The length of the circle is called circumference of the circle. It can be denoted by 'C'.
- The circumference of the circle is π times its diameter or 2π times its radius i.e. $C = \pi d$ or $2\pi r$.

WORK SHEET - 17

Straight objective type Questions

1. The length of $\overline{OA}$ in the figure is called [ ]

   a) radius b) diameter
   c) circumference d) area



2. The longest chord of a circle is called [ ]

   a) secant b) diameter c) tangent d) arc

3. The line segment joining the centre to any point on the circumference of a circle is called

   a) radius b) diameter c) perimeter d) area [ ]

4. The fixed point at the midle of the circle is called [ ]

   a) radius b) exterior point c) centre d) end point

5. The region bounded by two radii and an arc is called [ ]

   a) a chord b) a secant c) a tangent d) a sector

One or more than one correct answer type Questions

6. The angle in a semicircle is [ ]
   a) a right angle b) a straight angle
   c) 90° d) one fourth of complete angle

7. A circle should have [ ]
   a) infinite radii b) infinite centres c) infinite chords d) infinite diameters

8. **Statement(A) :** The area enclosed by the circumference is called the interior of the circle. [ ]
   Statement(B) : The circles with same centre and different radii are called concentric circles
   a) Both A and B are true b) Both A and B are false
   c) A is true, B is false d) A is false, B is true

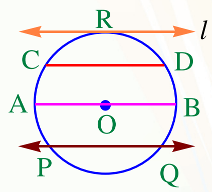
9. **Statement (A) :** The diameter of a circle does not passing through the centre of a circle. [ ]
   Statement (B) : The diameter divides a circle into two equal halves and each half is called a semicircle.
   a) Both A and B are true b) Both A and B are false
   c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :** If the radius of a circle is 9 cm, then its diameter is 18 cm. [ ]
    Reason(R) : The diameter of a circle is twice of its radius.
    a) Both A and R correct and R is the correct explanation of A
    b) Both A and R correct but R is not the correct explanation of A
    c) A is correct , R is incorrect d) A is incorrect, R is correct

11. **Assertion(A) :** The number of chords drawn to a circle are finite. [ ]
    Reason(R) : The number of points lies on a circle is infinite.
    a) Both A and R correct and R is the correct explanation of A
    b) Both A and R correct but R is not the correct explanation of A
    c) A is correct , R is incorrect d) A is incorrect, R is correct

Matrix Matching type Questions

In the figure

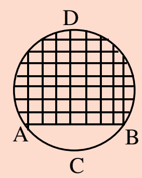


12. $\overline{AB}$ is a) a secant
13. $\overleftrightarrow{PQ}$ is b) a chord
14. $\overline{CD}$ is c) a tangent
15. $\leftrightarrow l$ is d) a diameter

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

Do You Know ?

In the figure the shaded region is called " Major segment"
and the unshaded region is called " Minor segment".



PERIMETER AND AREA

AIM - 18

SYNOPSIS

AREA

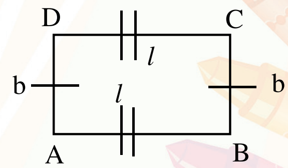
- The area of a simple closed figure is the measure of the region enclosed by the boundary of the figure.
- Area is measured in ‘ square units’.

PERIMETER

- The perimeter of a simple closed figure is the sum of the length of all boundaries
- Perimeter is measured in ‘units’.

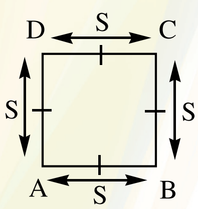
RECTANGLE

- Perimeter of rectangle = 2 (l + b) units, where ‘l’ is length and ‘b’ is breadth
- Area of rectangle $(A) = l \times b$ sq units.



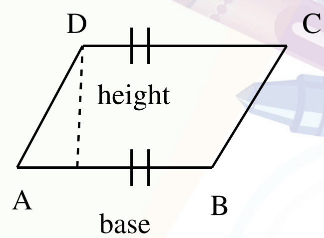
SQUARE

- Perimeter of square = 4 × side = 4S units.
- Area of square (A) = side × side.
  = S × S
  = S^2 sq .units.



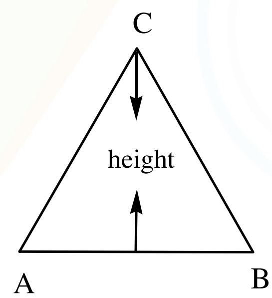
PARALLELOGRAM

- Perimeter of parallelogram is “ sum of all its sides “.
- Area of the parallelogram is equal to the product of its base (b) and corresponding height (h).
  i.e., A= bh sq units.



TRIANGLE

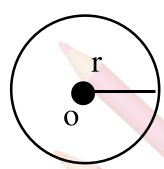
- Perimeter of triangle is, “sum of the lengths of three sides of the triangle”
- Area of triangle = $\frac{1}{2}$ bh sq. units,
  where b is base of triangle and ‘h’ is height of the triangle.



CIRCLE

- Circumference (or) perimeter of the circle $= 2\pi r$ units, where ‘r’ is radius of circle and $\pi = \frac{22}{7}$ (or) 3.14
- Area of circle = $\pi r^2 sq.$ units.
- Area of circle in terms of diameter

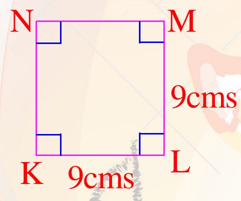
$$(A) = \pi\left(\frac{d}{2}\right)^2 = \pi\frac{d^2}{4} \text{ sq units}$$



WORK SHEET - 18

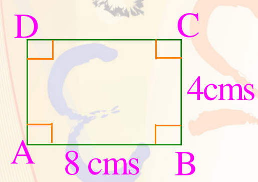
Straight objective type Questions :

1. The area of the figure is [ ]



a) 18 sq cms
b) 81 cms
c) 36 cms
d) 81 sq cms

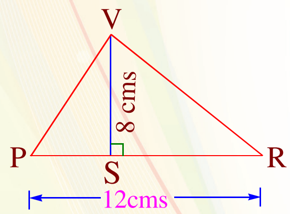
2. The perimeter of the figure is [ ]



a) 32 cms
b) 24 cms
c) 20 cms
d) 32 sq cms

3. The measure of the region enclosed by the boundary of the figure is called its [ ]
a) area b) perimeter c) volume d) length

4. The area of the figure is [ ]



a) 48 sq cms
b) 72 sq cms
c) 96 sq cms
d) 40 sq cms

5. If AB + BC = 18 cms, BC + CA = 16 cms and CA + AB = 12 cms,then the perimeter of ΔABC is
a) 46 cms b) 92 cms c) 72 cms d) 23 cms [ ]

One or more than one correct answer type Questions :

6. If the length of the side of a square is 6 cms, then its perimeter is [ ]
a) 24 cms b) 4×6 cms c) 2×12 cms d) 48 cms

7. If 'r' is the radius and 'd' is the diameter of a circle , then its perimeter is [ ]
a) 2π d b) π d c) π r d) 2π r

8. **Statement(A) :** The sum of the lengths of all sides of a triangle is called its perimeter. [ ]
Statement(B) : $\pi = \frac{22}{7}$ (or) 3.14.(approximately).
a) Both A and B are true b) Both A and B are false
c) A is true, B is false d) A is false, B is true

9. **Statement (A) :** If 'l' is the length and 'b' is the breadth of a rectangle, then its perimeter is (l + b).
Statement (B) : The area of a geometrical figure is measured in square units. [ ]
a) Both A and B are true b) Both A and B are false
c) A is true and B is false d) A is false and B is true

10. **Assertion(A) :** If the radius of a circle is 14 cms, then its perimeter is 88 cms. [ ]
Reason(R) : If 'r' is the radius of a circle , then its perimeter is 4π r.
a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

11. **Assertion(A) :** A circle is a simple closed figure. [ ]

Reason(R) : The circumference of a circle is π times its diameter .

a) Both A and R are correct, and R is the correct explanation of A

b) Both A and R are correct, but R is not the correct explanation of A

c) A is correct and R is incorrect

d) A is incorrect and R is correct.

Matrix Matching type Questions :

12. The area of a circle is

13. The area of a rectangle is

14. The area of a triangle is

15. The area of a square is

a) $\frac{1}{2}bh$

b) πr^2

c) S^2

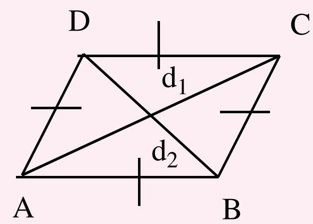
d) l b

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

Do You Know ?

1) **Area of the Rhombus = $d_1\ d_2$ sq. units,**

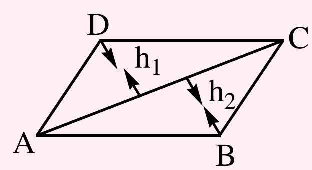
where d_1 and d_2 are lengths of diagonals



2) **Area of the Quadrilateral**

$= d(h_1 + h_2)$ sq. units,

where d is diagonal, h_1 and h_2 are the heights from the opposite vertex to the diagonal

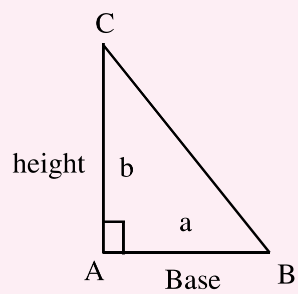


3) **Area of Right angled triangle**

$= \frac{1}{2} \times$ product of $\perp$ r sides

$= \frac{1}{2} \times AB \times AC$

$= \frac{1}{2}$ ab sq uts



PRACTICE OBJECTIVE TEST

TRACK - A (NUMBER SYSTEM , ALGEBRA AND EXPONENTS & POWERS)

Straight Objective type questions :

1. The predecessor of greatest natural number is [ ]
a) 1 b) 1000 c) 999999 d) does not exist

2. The sum of greatest negative integer and least positive integer is [ ]
a) 0 b) 1 c) – 1 d) 2

3. The least two digits perfect number is [ ]
a) 16 b) 28 c) 56 d) 99

4. The variables alone (or) constants alone (or) their combinations by operation of multiplication (or) division are called [ ]
a) constants b) variables c) terms d) exponents

5. $(-1)^{2015}$ = [ ]
a) – 2015 b) 2015 c) 1 d) – 1

6. If $a \neq 0$ and $b \neq 0$, then $\left(\frac{a}{b}\right)^{-n}$ = [ ]
a) $\left(\frac{a}{b}\right)^{n}$ b) $\left(\frac{b}{a}\right)^{n}$ c) $(ab)^{n}$ d) $\left(\frac{b}{a}\right)^{-n}$

7. If x = 10, y = 9 and z = 3, then $x^z + y^z =$ [ ]
a) 1529 b) 1629 c) 1729 d) 1829

One or more than one correct answer type questions :

8. Among the following a pair of twin primes is [ ]
a) (5,7) b) (11,13) c) (71,73) d) (89,91)

9. The number 804264 is divisible by [ ]
a) 2 b) 3 c) 6 d) 8

10. **Statement (A) :** The division of any integer by zero is not defined. [ ]
Statement (B) : The fractions obtained by multiplying both the numerator and denominator of a fraction by the same number are called equivalent fractions of given fraction.
a) Both A and B are true
b) Both A and B are false
c) A is true and B is false
d) A is false and B is true

11. **Assertion (A) :** $\left(\frac{x^a}{x^b}\right)^c \times \left(\frac{x^b}{x^c}\right)^a \times \left(\frac{x^c}{x^a}\right)^b = 1$. [ ]

Reason (R) : $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$, where $a, b \neq 0$.

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

Matrix matching type questions :

	Column - I	**Column - II**
12.	A natural number is	a) 1
13.	A perfect square number is	b) 2
14.	One of the factors of 6 xy is	c) 3
15.	An integer is	d) 4

12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d

TRACK - B (GEOMETRY)

Straight Objective type questions :

16. If three or more lines passing through the same point , then they are called [ ]
a) parallel lines b) coincident lines c) concurrent lines d) non intersecting lines

17. Among the following a reflex angle is [ ]
a) 179° b) 180° c) 181° d) 360°

18. The measure of an angle between two parallel lines is [ ]
a) 90° b) 100° c) 180° d) 0°

19. The sum of the measures of three angles in a triangle is [ ]
a) 100° b) 150° c) 180° d) 200°

20. The quadrilateral whose all sides are equal in length and the measure of each angle 90° is [ ]
a) a rectangle b) a square c) a rhombus d) a kite

21. A line intersecting a circle at two points is called [ ]
a) a sector b) a tangent c) a secant d) an arc

22. If 'd' is the diameter of a circle, then its area is [ ]
a) πd^2 b) $\frac{\pi d^2}{2}$ c) $\frac{\pi d^2}{4}$ d) $\frac{\pi d^2}{8}$

One or more than one correct answer type questions :

23. If $\angle A = 45°$, $\angle B = 90°$ and $\angle C = 45°$, then ΔABC is [ ]
a) a right angled triangle b) an equilateral triangle
c) an isosceles triangle d) an isosceles right angled triangle

24. The lengths of the diagonals are unequal in [ ]
a) a parallelogram b) a square c) a rectangle d) a kite

25. **Statement (A) :** If three (or) more points lying on the same line, then they are called collinear points.
Statement (B) : The measure of a complete angle is two straight angles (or) four right angles.
a) Both A and B are true b) Both A and B are false [ ]
c) A is true and B is false d) A is false and B is true

26. **Assertion (A) :** The perimeter of a semicircle is $(2 + \pi)$r, where 'r' is the radius of the circle.

Reason (R) : The area of the semicircle is $\frac{\pi r^2}{2}$. [ ]

a) Both A and R are correct, and R is the correct explanation of A
b) Both A and R are correct, but R is not the correct explanation of A
c) A is correct and R is incorrect d) A is incorrect and R is correct.

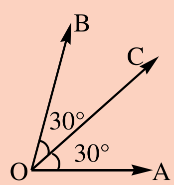
Matrix matching type questions :

	Column - I	Column - II
27.	The length and breadth of a plane is	a) 0
28.	The length of a line segment is	b) 1
29.	The number of possible obtuse angles in a triangle is	c) finite
30.	The number of common points of two parallel lines is	d) infinite

27	a	b	c	d
28	a	b	c	d
29	a	b	c	d
30	a	b	c	d

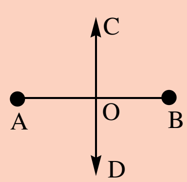
Do You Know ?

1. The ray which divides the given angle into two equal halves, is called angle bisector of that angle.



Example : From the figure $\overrightarrow{OC}$ is the angle bisector of $\angle AOB$

2. The line which divides the given line segment into two equal halves is called the perpendicular bisector of that line segment.



Example : From the figure CD is the perpendicular bisector of AB

PRIMITIVE PYTHAGOREAN TRIPLES

PYTHAGOREAN TRIPLES :

Let x and y denote the lengths of the legs of a right triangle and z the length of its hypotenuse. Then, by the Pythagorean theorem, x, y and z satisfy the diophantine equation.

$$x^2 + y^2 = z^2.$$

The positive integral triplet x – y – z is called a " Pythagorean triple ".

PRIMITIVE PYTHAGOREAN TRIPLES :

A Pythagorean triple x – y – z is primitive if (x, y, z) = 1.

For example, the Pythagorean triples 3 – 4 – 5 and 120 – 119 – 169 are primitive, where as 6 – 8 – 10 and 60 – 45 – 75 are not.

Observe the following primitive Pythagorean triples patterns.

1.

x	y	z
21	220	221
201	20200	20201
2001	2002000	2002001
20001	200020000	200020001
200001	20000200000	20000200001
2000001	2000002000000	2000002000001

2.

$$41^2 + 840^2 = 841^2$$
$$401^2 + 80400^2 = 80401^2$$
$$4001^2 + 8004000^2 = 8004001^2$$
$$40001^2 + 800040000^2 = 800040001^2$$
$$400001^2 + 80000400000^2 = 80000400001^2$$
$$4000001^2 + 8000004000000^2 = 8000004000001^2$$

3.

$$69^2 + 260^2 = 269^2$$
$$609^2 + 20600^2 = 20609^2$$
$$6009^2 + 2006000^2 = 2006009^2$$
$$60009^2 + 200060000^2 = 200060009^2$$
$$600009^2 + 20000600000^2 = 20000600009^2$$
$$6000009^2 + 2000006000000^2 = 2000006000009^2$$

GLOSSARY OF SYMBOLS

Symbol	In Words	Example	Meaning
$\overline{AB}$	Line segment "AB"	$\overline{AB}$	The shortest path between A and B
$\overrightarrow{AB}$	Ray "AB"	$\overrightarrow{AB}$	The line that starts at A which passes through B and continuous.
$\overleftrightarrow{AB}$	Line "AB"	$\overleftrightarrow{AB}$	The line that passes through A and B.
$\angle$	Angle	$\angle ABC$ is 45°	The angle formed by BA and BC is 45 degrees.
∟	Right angle (90°)	∟ is 90°	A right angle is 90 degrees.
0	Degrees	360°	makes a full circle.
$\perp$	Perpendicular	$\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$	The line AB is perpendicular to the line CD.
$\parallel$	Parallel	$\overleftrightarrow{EF} \parallel \overleftrightarrow{GH}$	The line EF is parallel to the line GH
$\triangle$	Triangle	$\triangle$ABC has three sides	Triangle ABC has three sides
$\cong$	Congruent	$\triangle$ ABC $\cong$ $\triangle$ DEF (same shape and size)	Triangle ABC is congruent to triangle DEF
$\sim$	Similar (same shape)	$\triangle$ ABC $\sim$ $\triangle$ MNO	Triangle ABC is similar to triangle MNO.
$\therefore$	Therefore a = b	$\therefore$ b = a	a equals to b, therefore b equals to a

MEMORY MATHEMATICS

Number x	Square x^2	Cube x^3	Factorial $x!$
1	1	1	1
2	4	8	2
3	9	27	6
4	16	64	24
5	25	125	120
6	36	216	720
7	49	343	5040
8	64	512	40320
9	81	729	362880
10	100	1000	3628800
11	121	1331	39916800
12	144	1728	479001600
13	169	2197	6227020800
14	196	2744	87178291200
15	225	3375	1307674368000
16	256	4096	20922789888000
17	289	4913	355687428096000
18	324	832	6402373705728000
19	361	6859	121645100408832000
20	400	8000	2432902008176640000