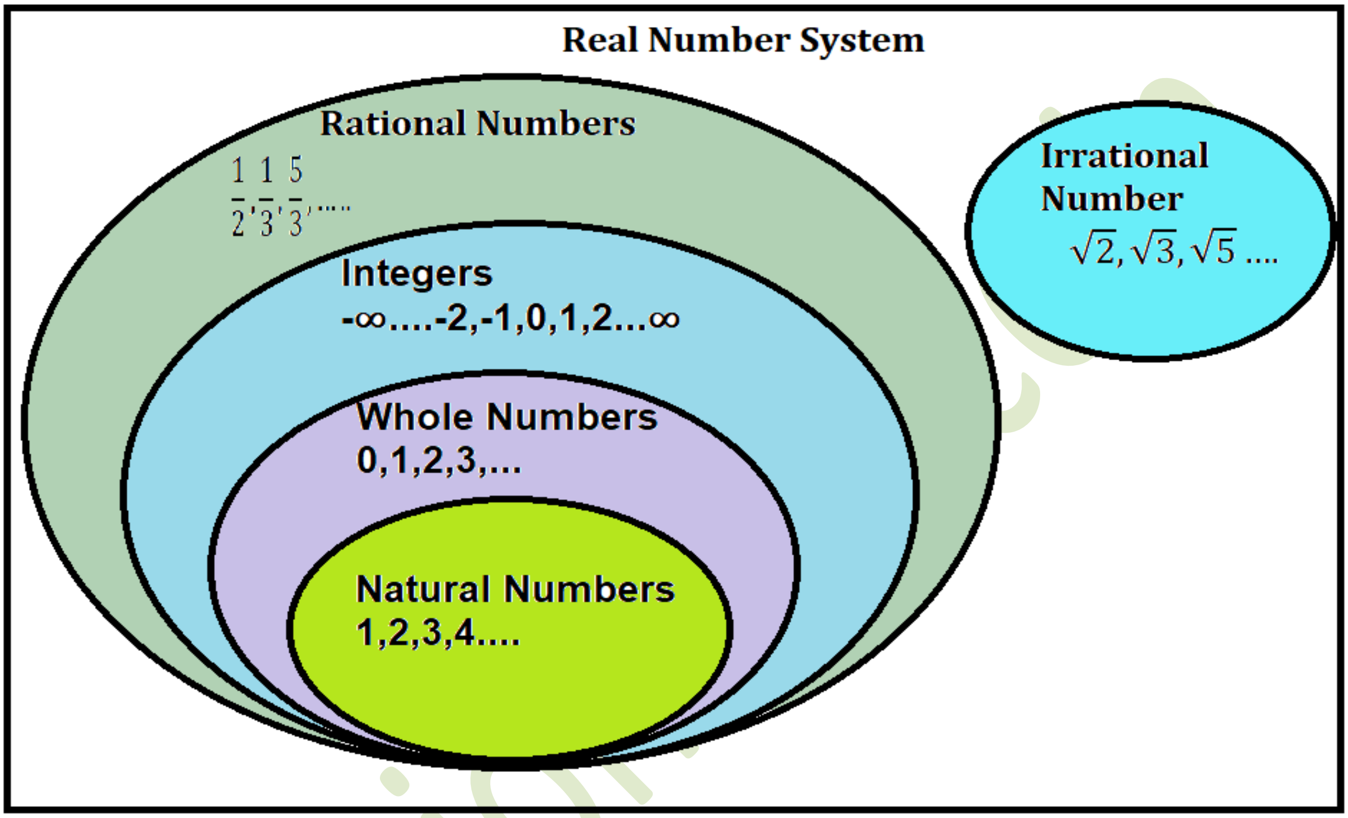


Formulas
Chapter: -1
Real Numbers



(i) **HCF:** Product of the smallest power of each common prime factor in the numbers.

(ii) **LCM:** Product of the greatest power of each prime factor, involved in the numbers.

(iii) **HCF (a, b) × LCM (a, b) = a × b**

Example: 6 = 2 X 3

20 = 2 x 2 x 5 = 2^2 X 5

HCF: 2, **LCM:** 2^2 X 3 X 5

HCF (a, b) × LCM (a, b) = a × b

2 X 2 X 2 X 3 X 5 = 6 X 20

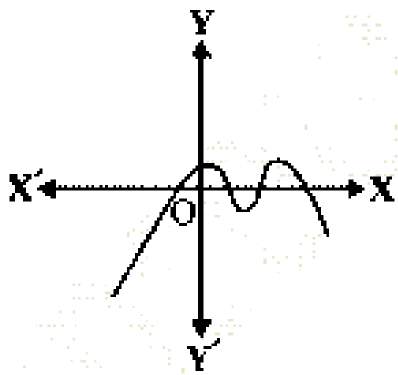
(iv) If a fraction $(x = \frac{p}{q})$ is in the form of $\frac{1}{2^n 5^n}$ is a terminating decimal expansion.

Formulas
Chapter: 2
POLYNOMIALS

1. **Linear polynomial: -** A polynomial of degree 1. **E.g.,** (2x – 3, √3x +5)
2. **Quadratic polynomial: -** A polynomial of degree 2. **E.g.,** ($3x^2 + 2x + 6$)
3. **Cubic polynomial: -** A polynomial of degree 3. **E.g.,** ($4x^3+2x^2-5x+4$)
4. **Number of zeroes: -** Means how many times curve passing though the X-axis.

   Example: -

   Number of Zeros = 4



Quadratic polynomial = ax^2+bx+c

A and β are Zeros (factors), a, b and c are coefficients of x^2, x and constants.

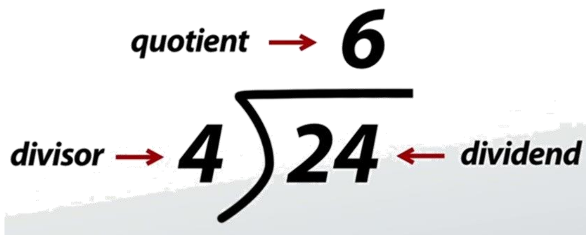
5. Sum of Zeros = $-\frac{(Coefficient\ of\ x)}{Coefficient\ of\ x^2}$

   $\alpha + \beta = -\frac{b}{a}$

6. Product of Zeros = $\frac{constant}{coefficient\ of\ x^2}$

   $\alpha\beta = \frac{c}{a}$

7. Dividend = Divisor × Quotient + Remainder



8. If α, β, γ are the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$, then

(a) $\alpha + \beta + \gamma = -\frac{b}{a}$

(b) $\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a}$

(c) $\alpha\beta\gamma = -\frac{d}{a}$

Formula

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

Chapter: - 3

1) **Linear Equation**: - ax + by +c = 0
2) **Pair of lines: -**

   $ax_1 + by_1 + c_1 = 0, ax_2 + by_2 + c_2 = 0$

Sr. no.	Pair of lines	$\frac{a_1}{a_2}$	$\frac{b_1}{b_2}$	$\frac{c_1}{c_2}$	Compare the ratios	Graphical representation	Algebraic interpretation
(i)	**2x+3y+10=0** **3x-2y+15=0**	$\frac{2}{3}$	$-\frac{3}{2}$	$\frac{10}{15}=\frac{2}{3}$	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	**Intersecting lines**	**Exactly one solution (unique)**
(ii)	**2x+4y+7=0** **4x+8y+14=0**	$\frac{2}{4}=\frac{1}{2}$	$\frac{4}{8}=\frac{1}{2}$	$\frac{7}{14}=\frac{1}{2}$	$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$	**Coincident lines**	**Infinitely many solutions**
(iii)	**3x+2y+5=0** **9x+6y+2=0**	$\frac{3}{9}=\frac{1}{3}$	$\frac{2}{6}=\frac{1}{3}$	$\frac{5}{2}$	$\frac{a_1}{a_2}=\frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	**Parallel lines**	**No solution**

3) If the lines intersect at a point, then that point gives the unique solution of the two equations. In this case, the pair of equations is consistent.

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

4) If the lines coincide, then there are infinitely many solutions — each point on the line being a solution. In this case, the pair of equations is **dependent (consistent).**

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

5) If the lines are parallel, then the pair of equations has no solution. In this case, the pair of equations is inconsistent.

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

Formula
Chapter: - 4
QUADRATIC EQUATIONS

1. **Quadratic polynomial:** - $ax^2 + bx + c, a \neq 0$

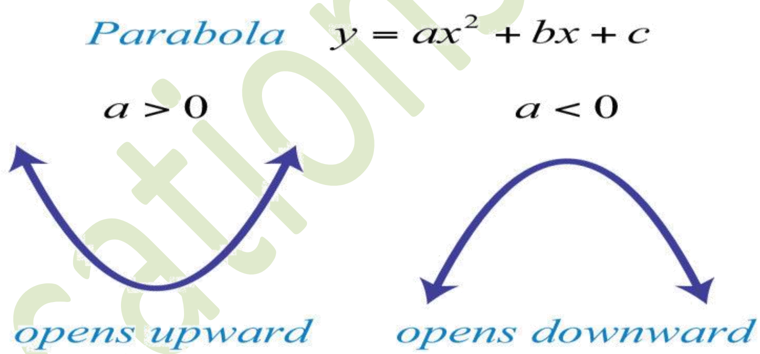
   Three forms of quadratic Equations: -

   a) **Standard:** $y = ax^2 + bx + c$
   b) **Factored:** $y = a(x-m)(x-n)$
   c) **Vertex:** $y = a(x-h)^2 + k$

2. **Quadratic Equations Forms Parabola:**

   General equation of Parabola: - $y = a(x-h)^2 + k$

   a) **Upward If 'a' is positive**
   b) **Downward if 'a' is negative**



3. **Discriminant:** - $b^2 - 4ac$

   $b^2 - 4ac$ determines whether the quadratic equation $ax^2 + bx + c = 0$ has real roots or not.

   (a) **Two distinct real roots, if $b^2 - 4ac > 0$**
   (b) **Two equal real roots, if $b^2 - 4ac = 0$**
   (c) **No real roots, if $b^2 - 4ac < 0$**

4. **Quadratic formula:** The roots of a quadratic equation $ax^2 + bx + c = 0$ are given by $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ provided $b^2 - 4ac \geq 0$.

Formula

Chapter: - 5

ARITHMETIC PROGRESSIONS

(i) *Arithmetic Progression (AP):* An arithmetic progression is a list of numbers in which each term is obtained by adding a fixed number to the preceding term except the first term.

This **fixed number** is called the **common difference** of the AP and AP can be **positive, negative or zero**.

a, a + d, a + 2d, a + 3d, . . .

a = first term, d = common difference

Example: -

(a) **4, 10, 16, 22, . . .**

$a = 4$ **and** $d_1 = 10-4 = 6$

$d_2 = 16-10 = 6$

$d_3 = 22-16 = 6$

This given series is known as an A.P. because d has equal value.

(b) ***1, 3, 9, 27, . . .***

$a = 1$ ***and*** $d_1 = 3-1 = 2$

$d_2 = 9-3 = 6$

$d_1 \neq d_2$

(ii) nth Term of an AP: -

The n^{th} term an of the AP with **first term** "a" and **common difference** "d" is given by

$$a_n = a + (n-1)\,d.$$

a_n also write as l (***a_n=l***) if you know the last term of A.P.

(iii) Sum of First "n" Terms of an AP: -

$$S = \frac{n}{2}(2a + (n-1)d)$$

$$S = \frac{n}{2}(a + a + (n-1)d)$$

$$S = \frac{n}{2}(a + a_n)$$

(a) If the series is finite means you know the last term of A.P. ($a_n = l$)

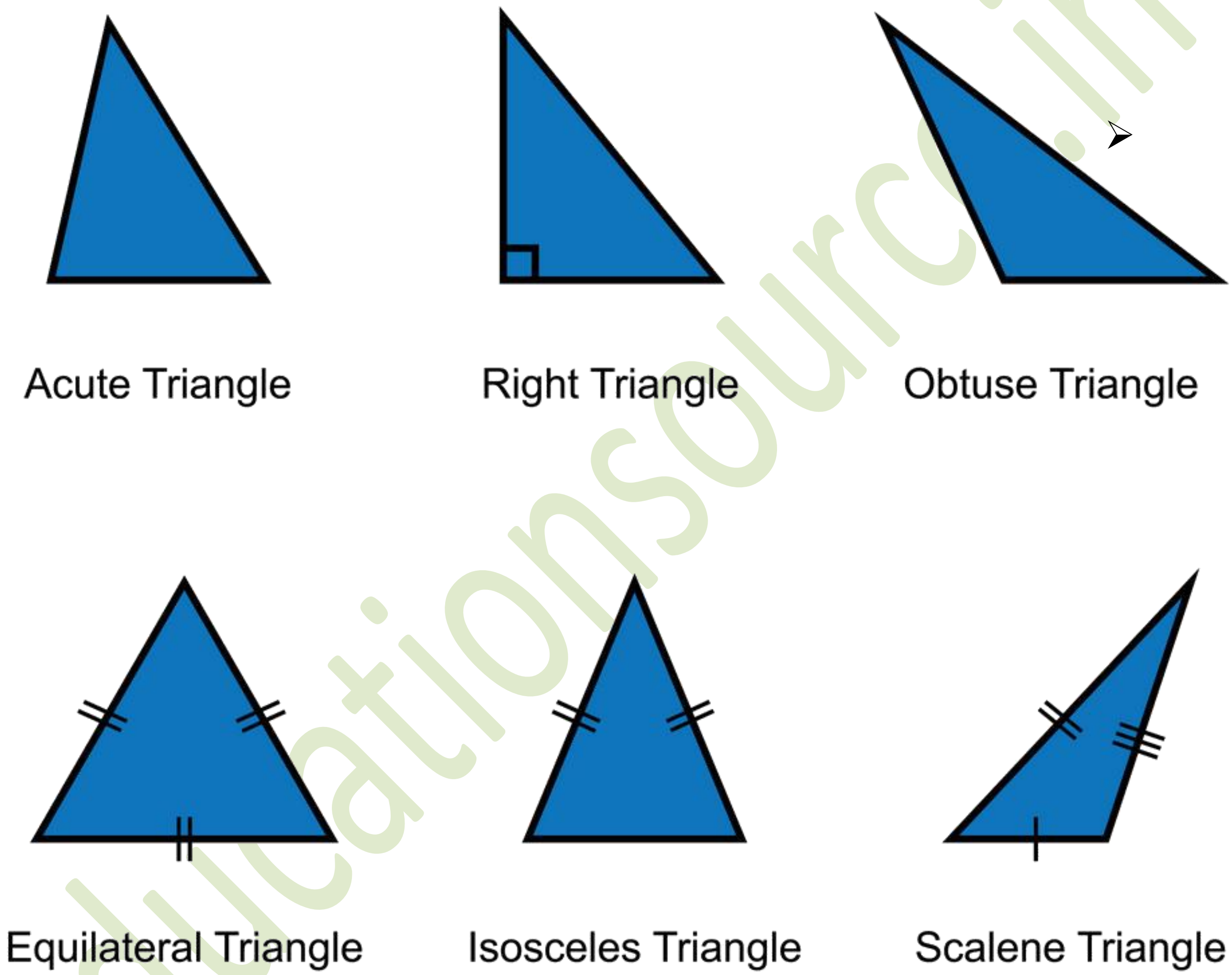
$$S = \frac{n}{2}(a + l)$$

(b) The sum of first n positive integers is given by

$$S = \frac{n(n+1)}{2}$$

Formula
TRIANGLES
Chapter: - 6

- **Type of triangles: -**

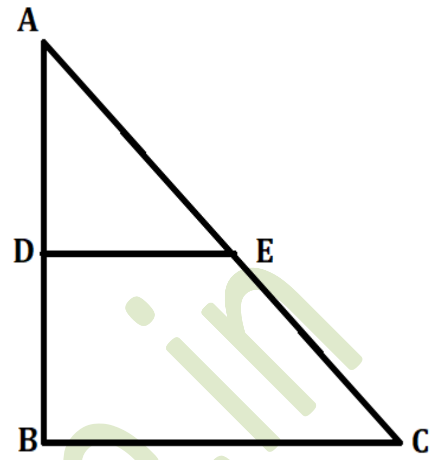


- **Similar Polygons**: - Two polygons of the same number of sides are similar, if (i) their corresponding angles are equal and (ii) their corresponding sides are in the same ratio (or proportion).

- **Similarity of Triangles: -** Two triangles are similar, if
  (i) their corresponding angles are equal and
  (ii) their corresponding sides are in the same ratio (or proportion).

1. **Theorem 6.1: -** If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

$$\frac{AD}{DB} = \frac{AE}{EC}$$

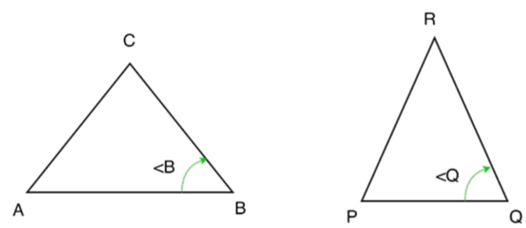


2. **Theorem 6.2: -** If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.

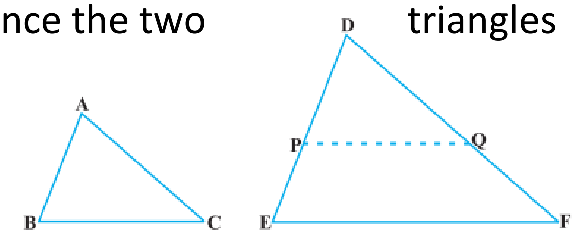
$$\frac{AD}{DB} = \frac{AE}{EC}$$

- **Criteria for Similarity of Triangles: -**

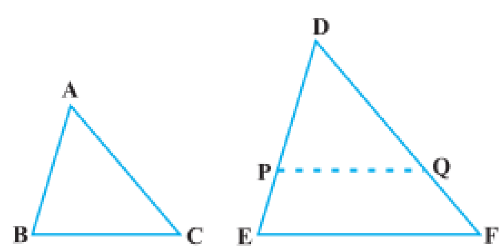
3. **Theorem 6.3: -** If in two triangles, corresponding angles are equal, then their corresponding sides are in the same ratio (or proportion) and hence the two triangles are similar.
   This criterion is referred to as the AAA (Angle–Angle–Angle) criterion of similarity of two triangles.



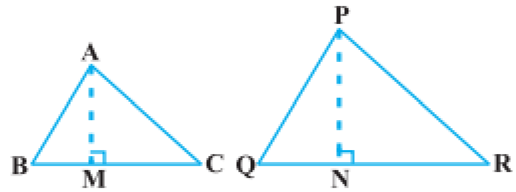
4. **Theorem 6.4:** If in two triangles, sides of one triangle are proportional to the sides of the other triangle (i.e., in the same ratio of), then their corresponding angles are equal and hence the two triangles are similar.
   This criterion is referred to as the SSS (Side–Side–Side) similarity criterion for two triangles.



Theorem 6.5: If one angle of a triangle is equal to one angle of the other triangle and the sides including these angles are proportional, then the two triangles are similar.
This criterion is referred to as the SAS (Side–Angle–Side) similarity criterion for two triangles.

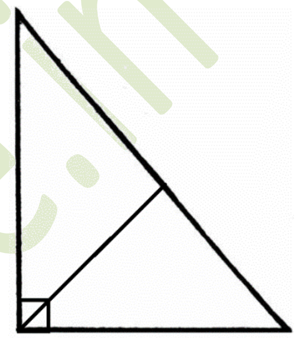


5. **Theorem 6.6:** The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

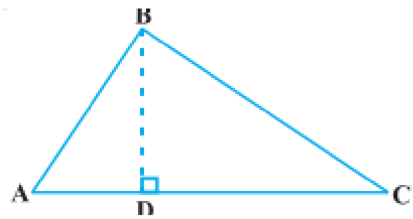


$$\frac{ar\ (ABC)}{ar\ (PQR)} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{QR}\right)^2 = \left(\frac{CA}{RP}\right)^2$$

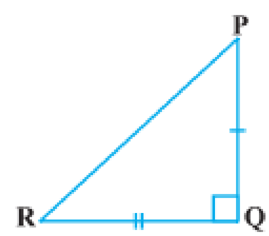
6. **Theorem 6.7:** If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, then triangles on both sides of the perpendicular are similar to the whole triangle and to each other.



7. **Theorem 6.8:** In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.
   $AC^2 = AB^2 + BC^2$
   AC = Hypotenuse(H)
   AB = Base(B)
   BC = Perpendicular(P)
   i.e., $(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$
   $(H)^2 = (B)^2 + (P)^2$

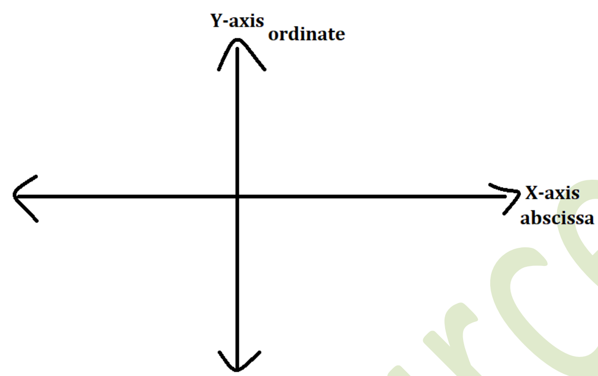


8. **Theorem 6.9:** In a triangle, if square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle.
   If $(PR)^2 = (PQ)^2 + (QR)^2$
   i.e., $\angle PQR = 90^o$



Formula
COORDINATE GEOMETRY
Chapter: - 7

a) COORDINATES



b) Distance Formulas

The distance between P (x_1, y_1) and Q (x_2, y_2) is

PQ = $\sqrt{(x_2 - x_1)^2 - (y_2 - y_1)^2}$

c) section formula

The coordinates of the point P (x, y) which divides the line segment joining the points A (x_1, y_1) and B (x_2, y_2) internally in the ratio m_1: m_2 are: -

X = $\frac{m_1x_2+m_2x_1}{m_1+m_2}$, **Y** = $\frac{m_1y_2+m_2y_1}{m_1+m_2}$

d) Mid – Point Formula

The mid-point of the line segment joining the points P (x_1, y_1) and Q (x_2, y_2) is: -

X = $\frac{X_1+X_2}{2}$, **Y** = $\frac{y_1+y_2}{2}$

e) Area of a Triangle

The area of the triangle formed by the points (x_1, y_1), (x_2, y_2) and (x_3, y_3) is the numerical value of the expression:

$$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

Chapter: - 8th and 9th
INTRODUCTION TO TRIGONOMETRY

The trigonometric ratios: -

1. $\text{Sin}\theta = \frac{Perpendicular}{Hypetenuse} = \frac{BC}{Ac}$

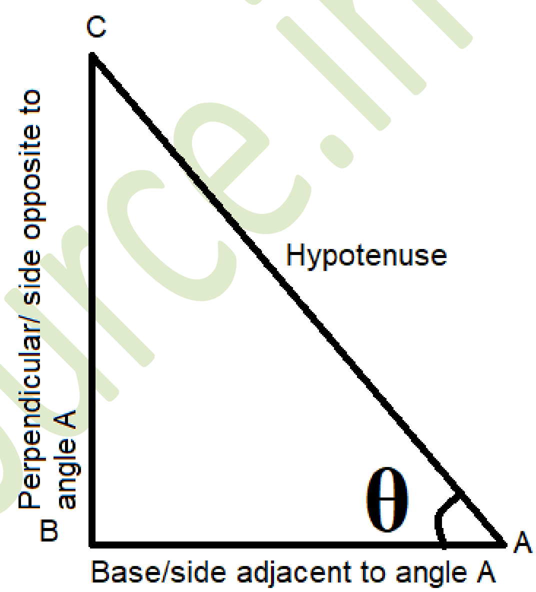
2. $\text{Cos}\theta = \frac{base}{Hypotenuse} = \frac{AB}{AC}$

3. $\text{Tan}\theta = \frac{perpendicular}{base} = \frac{BC}{AB}$

4. $\text{Cot}\theta = \frac{base}{Perpendicular} = \frac{AB}{BC}$

5. $\text{Sec}\theta = \frac{Hypotenuse}{base} = \frac{AC}{AB}$

6. $\text{Cosec}\theta = \frac{Hypotenuse}{Perpendicular} = \frac{AC}{BC}$



Sin	Cos	Tan
P	B	P
H	H	B
cosec	Sec	Cot

P B P H H B

Pandit Badri Prasad Har Har Bole

	0	30	45	60	90
	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
Sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
Cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
Tan	0	$\frac{1}{\sqrt{3}}$	1	√3	not define
Cot	Not define	√3	1	$\frac{1}{\sqrt{3}}$	0
Sec	1	$\frac{2}{\sqrt{3}}$	√2	2	Not define
Cosec	Not define	2	√2	$\frac{2}{\sqrt{3}}$	1

a) $Cos^2x+Sin^2x = 1$

b) $1 + Tan^2x = Sec^2x$

c) $1 + Cot^2x = Cosec^2x$

d) $\sin(-x) = -\sin x$

e) $\cos(-x) = \cos x$

f) $\sin(90° - A) = \cos A$

g) $\cos(90° - A) = \sin A$

h) $\tan(90° - A) = \cot A$

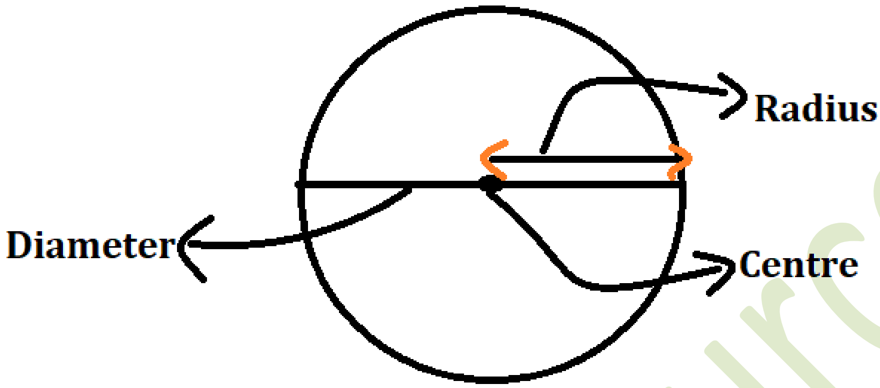
i) $\cot(90° - A) = \tan A$

j) $\sec(90° - A) = \text{cosec } A$

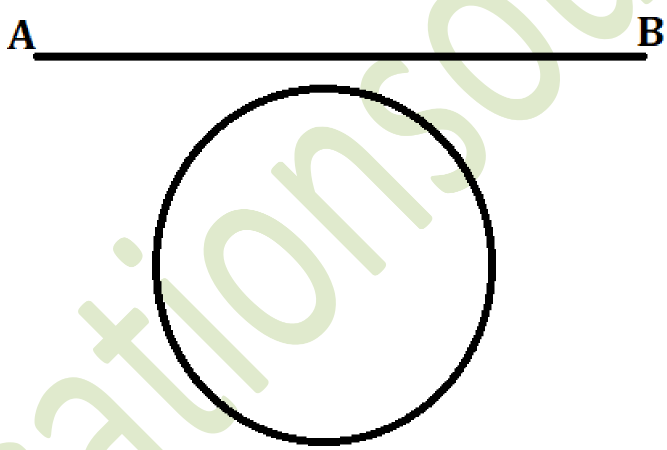
k) $\text{cosec}(90° - A) = \sec A$

Formulas
Circle
Chapter: 10th

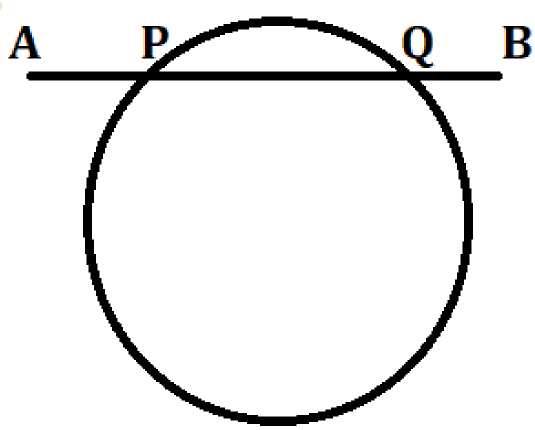
a) Circle: -



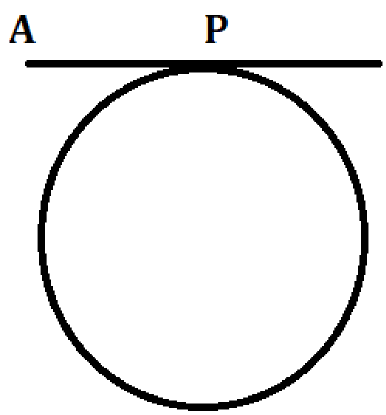
b) Non-intersecting: -



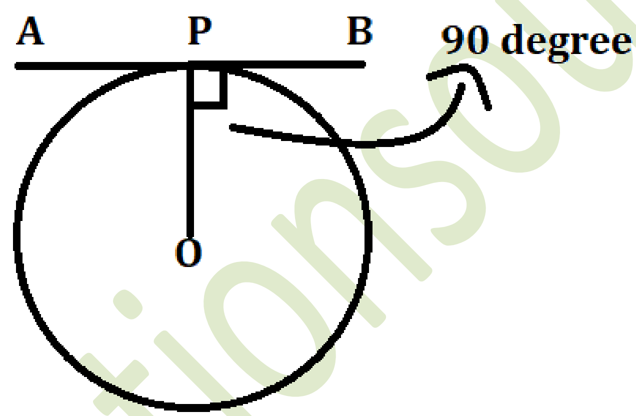
c) Secant: - AB is the Secant of circle



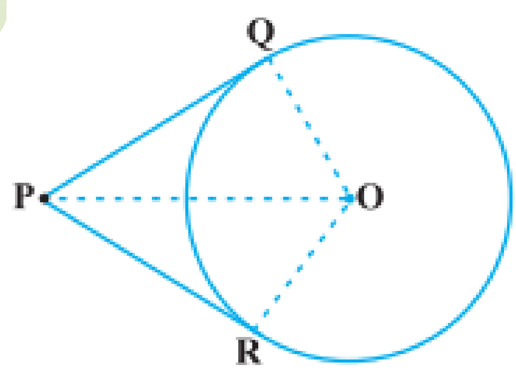
d) Tangent: - AB is the tangent to the circle at point P



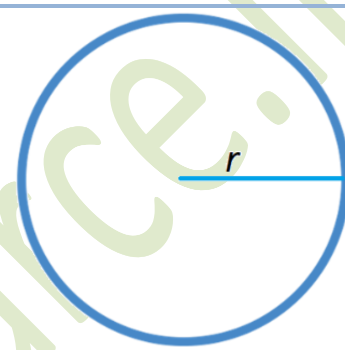
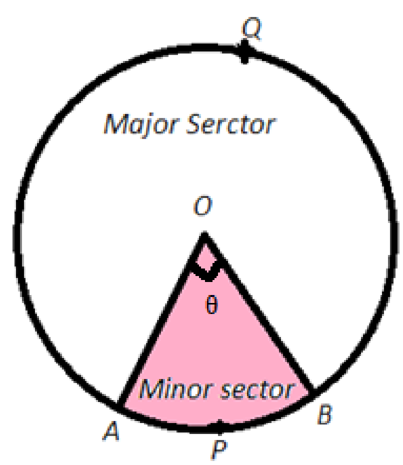
e) Theorem 10.1: The tangent at any point of a circle is perpendicular to the radius through the point of contact.

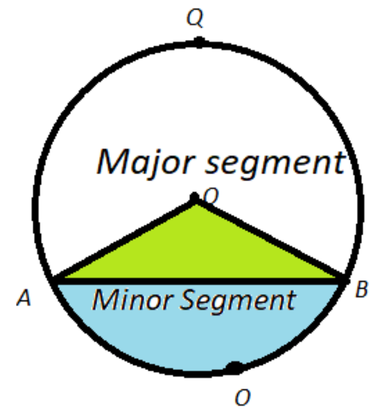
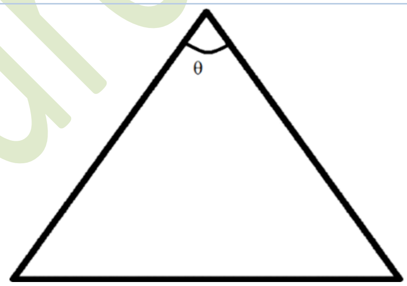
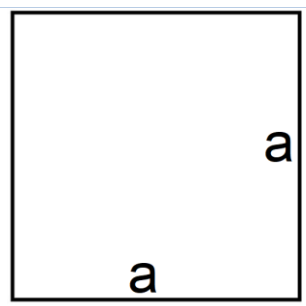
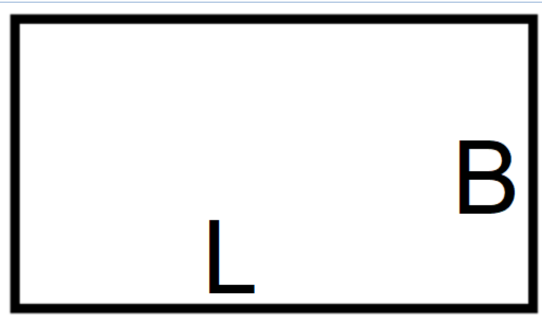


f) Theorem 10.2: The lengths of tangents drawn from an external point to a circle are equal.

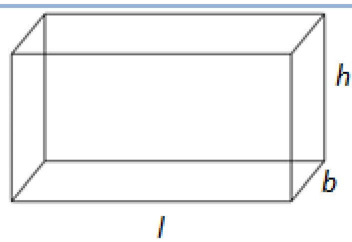
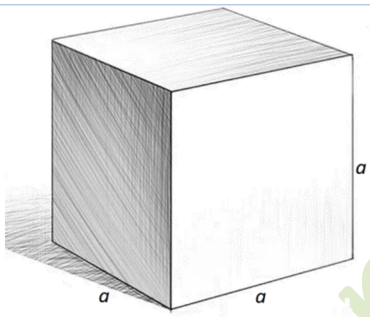
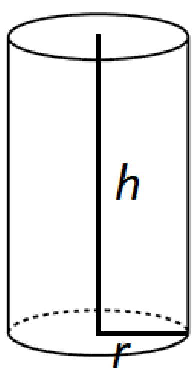
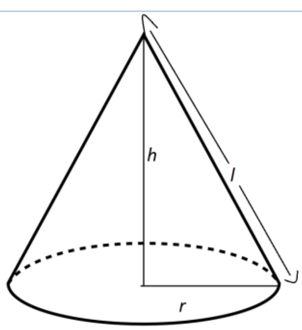


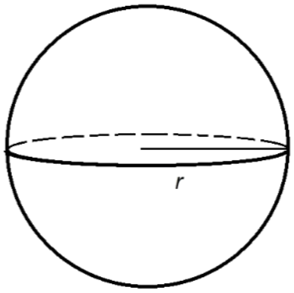
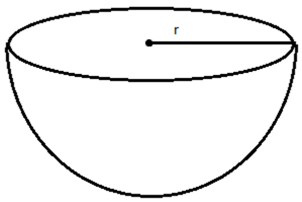
Chapter: - 12
AREAS RELATED TO CIRCLES
Formulas

SR. NO.	Formula	Shape
a)	1. Circumference/ Perimeter of the circle = $2\pi r$ 2. Area of the circle = πr^2 3. Area of Semicircle = $\frac{1}{2}\pi r^2$	
b)	1. Area of Minor sector of angle θ= $\frac{\theta}{360}\pi r^2$ 2. Area of Major Sector = (area of circle – Area minor Setor) = $(\pi r^2 + \frac{\theta}{360}\pi r^2)$ 3. length of an arc of a sector of angle θ = $\frac{\theta}{360} 2\pi r$	

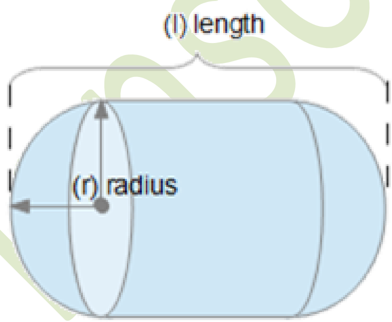
c)	1. Area of minor Segment = (Area of Minor sector – Area of triangle) = $(\frac{\theta}{360}\pi r^2 - \frac{1}{2}(base\ X\ height)$ 2. Area of Major Sector = (Area of circle – Area of Minor Sector) = $(\pi r^2 - \frac{\theta}{360}\pi r^2 - \frac{1}{2}(base\ X\ height)$	
d)	1. Area of triangle = $\frac{1}{2}(base\ X\ height)$ Or $\frac{sin\theta}{2}(side)^2$	
e)	1. Area of square = $(side)^2 = (a)^2$ 2. Perimeter of Square = sum of all sides (4a)	
f)	1. Area of rectangle = (length x breadth) = (L x B) 2. Perimeter of rectangle = (sum of all sides) = 2 (L + B)	

Formulas
SURFACE AREAS AND VOLUMES
Class: - 10th (chapter: - 13th)

SR. No.	Name	Shape	Lateral/curved Surface area	Total surface area	Volume
1.	Cuboid		2lh+2hb or 2h(l+b)	2lb+2bh+2hl or 2(lb+bh+hl)	lbh
2.	Cube		$4a^2$	$4a^2+2a^2$ or $6a^2$	a^3
3.	Cylinder		$2\pi rh$	$2\pi r^2+2\pi rh$ Or $2\pi r(r+h)$	Πr^2h
4.	Right circular Cone	 $(l = \sqrt{h^2+r^2})$	πrl	$\Pi r^2+\pi rl$ Or $\Pi r(r+l)$	$\frac{1}{3}\pi r^2 h$

	Name	Shape	Lateral/curved Surface area	Total surface area	Volume
5.	Sphere		$4\pi r^2$	$4\pi r^2$	$\frac{4}{3}\pi r^3$
6.	Hemi Sphere		$2\pi r^2$	$2\pi r^2+\pi r^2$ Or $3\pi r^3$	$\frac{2}{3}\pi r^3$

Example: -



TSA of new solid = CSA of one hemisphere + CSA of cylinder + CSA of another hemisphere

TSA of new solid = $(2\pi r^2 + 2\pi rh + 2\pi r^2) = (2\pi rh + 4\pi r^2) = 2\pi r(h + 2r)$

Volume of Solid = Volume of one hemisphere + Volume of cylinder + Volume of another hemisphere

Volume of Solid = $(\frac{2}{3}\pi r^3 + \pi r^2 h + \frac{2}{3}\pi r^3) = (\pi r^2 h + \frac{4}{3}\pi r^3) = \pi r^2(h + \frac{4}{3}r)$

Formula
Chapter: 14
STATISTICS

1) Mean of Grouped Data: -

Class mark = $\frac{Upper\ class\ limit + Lower\ class\ limit}{2}$

(a) Direct Method

$$\overline{x} = \frac{\sum_{i=0}^{n} f_i x_i}{\sum_{i=0}^{n} f_i}$$

(b) Assumed Mean Method: -

$$\overline{x} = a + \frac{\sum_{i=0}^{n} f_i d_i}{\sum_{i=0}^{n} f_i}$$

(c) Step-deviation method

$$\overline{x} = a + \left(\frac{\sum_{i=0}^{n} f_i u_i}{\sum_{i=0}^{n} f_i}\right) \times h$$

2) Mode of Grouped Data: -

Mode = $l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

l = lower limit of the modal class

h = size of the class interval

$f_1 = frequency\ of\ the\ modal\ class$

$f_0 = frequency\ of\ the\ class\ preceding\ the\ modal\ class.$

$f_2 = frequency\ of\ the\ class\ succeeding\ the\ modal\ class.$

3) Median of Grouped Data: -

n = Sum of frequency

(a) if ‘n’ is odd = $\frac{n+1}{2}$

(b) if ‘n’ is even = $\left(\frac{n}{2}\right)$, $\left(\frac{n}{2}+1\right)$

(c) Median = $l+\left(\frac{\frac{n}{2}-cf}{f}\right)\times h$

l = lower limit of median class,
n = number of observations,
cf = cumulative frequency of class preceding the median class,
f = frequency of median class,
h = class size

4) Empirical relationship between the three measures of central tendency:

3 Median = Mode + 2 Mean

Chapter: 15
PROBABILITY

(a)PROBABILITY: - *The theory of probabilities and the theory of errors now constitute a formidable body of great mathematical interest and of great practical importance.*

$$P(E) = \frac{\text{Number of trials in which the event happened}}{\text{Total number of trials}}$$

$$P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Number of all possible outcomes of the experiment}}$$

(b) The probability of an event E is a number P(E) such that

$$0 \le P(E) \le 1$$

(c) The probability of a sure event (or certain event) is 1.

(d) The probability of an impossible event is 0.

(e) For any event E, P (E) + P ($\bar{E}$) = 1, where ($\bar{E}$) stands for 'not E'. E and ($\bar{E}$) are called complementary events.

(f) An event having only one outcome is called an elementary event. The sum of the probabilities of all the elementary events of an experiment is 1.