CBSE CLASS 10 FORMULAE SHEET

CHAPTER 1: REAL NUMBERS

1.Euclid's division lemma:
Given positive integers *a* and *b*, there exist whole numbers *q* and *r* satisfying $a=bq+r$, $0 \leq r < b$.

2. Euclid's division algorithm: This is based on Euclid's division lemma. According to this, the HCF of any two positive integers *a* and *b*, with $a > b$, is obtained as follows:
Step 1: Apply the division lemma to find *q* and *r* where $a = bq + r$, $0 \leq r < b$.
Step 2: If $r = 0$, the HCF is *b*. If *r* ¹ 0, apply Euclid's lemma to *b* and *r*.
Step 3: Continue the process till the remainder is zero. The divisor at this stage will be HCF (*a*, *b*). Also, HCF(*a*, *b*) = HCF(*b*, *r*).

3. The Fundamental Theorem of Arithmetic:
Every composite number can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.

4. If *p* is a prime and *p* divides *a*2, then *p* divides *a*, where *a* is a positive integer.

5. Let *x* be a rational number whose decimal expansion terminates. Then we can express *x* in the form $\frac{p}{q}$, where p and q are co-primes and the prime factorization of q is of the form 2^n5^m, where n, m are non-negative integers.

6. Let x = $\frac{p}{q}$, Let *x* be a rational number whose decimal expansion terminates. Then we can express *x* in the form 2^n5^m where *n*, *m* are non-negative integers. Then *x* has a decimal expansion which terminates.

7. Let, x = $\frac{p}{q}$, be a rational number, such that the prime factorisation of *q* is not of the form, 2^n5^m, where *n*, *m* are non-negative integers. Then *x* has a decimal expansion which is non-terminating repeating (recurring).

8. HCF (*p*, *q*, *r*) × LCM (*p*, *q*, *r*) ¹ *p* × *q* × *r*, where *p*, *q*, *r* are positive integers. However, the following results hold good for three numbers *p*, *q* and *r*:

LCM (p, q, r) =$\frac{p*q*r*HCF\ (p,q,r)}{HCF\ (p,q)\ HCF\ (q,r)\ HCF\ (p,r)}$

HCF (p, q, r) = $\frac{p*q*r*LCM\ (p,q,r)}{LCM\ (p,q)\ LCM\ (q,r)\ LCM\ (p,r)}$

CHAPTER 2: POLYNOMIALS

1. Polynomials of degrees 1, 2 and 3 are called linear, quadratic and cubic polynomials respectively.

2. A quadratic polynomial in x with real coefficients is of the form $ax^2 + bx + c$, where a, b, c are real numbers with $a \neq 0$.

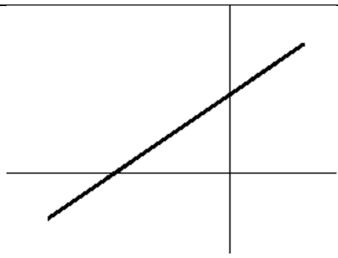
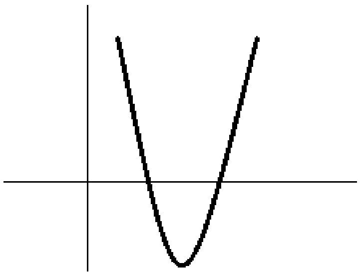
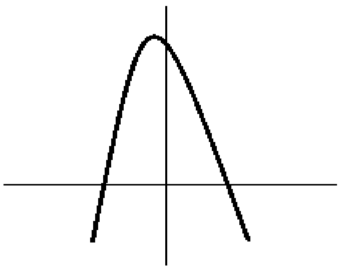
3. The zeroes of a polynomial $p(x)$ are precisely the x-coordinates of the points, where the graph of $y = p(x)$ intersects the x- axis.

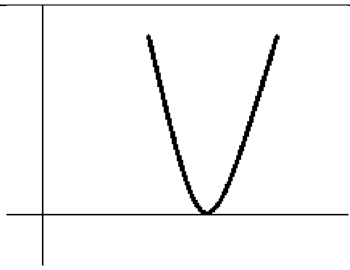
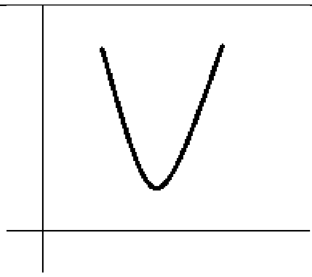
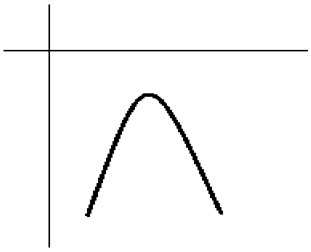
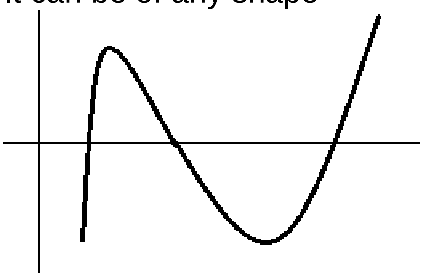
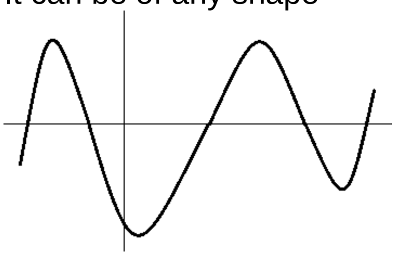
4. A quadratic polynomial can have at most 2 zeroes and a cubic polynomial can have at most 3 zeroes.

5. <u>Geometric meaning of the Zeroes of the Polynomial:</u>
Let us assume,

Y = p(x) where, p(x) is the polynomial of the any form.
Now we can plot the equation y=p(x) on the cartesian plane by talking various values of x and y obtained by putting the values. The values or graph obtained can be of any shapes. The zeroes of the polynomial are the points where the graph meet x-axis in the Cartesian plane. If the graph does not meet x-axis, then the polynomial does not have any zeroes.

Table. To be inserted

S.No.	**y=p(x)**	**Graph obtained**	**Name of the graph**	**Name of the equation**
1.	Y=ax+b Where a and b can be any values ($a\neq 0$) Example y=2x+3		Straight line It intersects the x-axis at (-b/a,0) Example: (-3/2,0)	Linear polynomial
2.	$y=ax^2+bx+c$ Where $b^2-4ac>0$ and $a\neq0$ and $a>0$ Example: $y=x^2-7x+12$		Parabola It intersects the x-axis at two points Example: (3,0) and (4,0)	Quadratic polynomial
3.	$y=ax^2+bx+c$ Where $b^2-4ac>0$ and $a\neq0$ and $a<0$ Example: $y=x^2+2x+8$		Parabola It intersects the x-axis at two points Example: (-2,0) and (4,0)	Quadratic polynomial
4.	$y=ax^2+bx+c$ Where $b^2-4ac=0$ and $a\neq0$ and $a>0$ Example: $y=(x-2)^2$		Parabola It intersects the x-axis at one point. Example:	Quadratic polynomial

			(2,0)	
5.	$y=ax^2+bx+c$ Where $b^2-4ac<0$ and $a\neq 0$ and $a>0$ Example: $y=x^{2-}2x+6$		Parabola It does not intersect the x-axis It has no zero's	Quadratic polynomial
6.	$y=ax^2+bx+c$ Where $b^2-4ac<0$ and $a\neq 0$ and $a<0$ Example: $y=x^{2-}2x-6$		Parabola It does not intersect the x-axis. It has no zero's	Quadratic polynomial
7.	$y=ax^3+bx^2+cx+d$ where $a\neq 0$	It can be of any shape 	It will cut the x-axis at the most 3-times	Cubic polynomial
8.	$a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \ldots\ldots + a_1 x^1 + a_0=0$ where $a_n\neq 0$	It can be of any shape 	It will cut the x-axis at the most n-times.	Polynomial of n degree

Sl. No.	Type of polynomial	General form	Zeroes	Relationship between zero's and co-efficient
1.	Linear polynomial	ax + b, a≠0	1	k= $\frac{-\,constant\ term}{co-efficient\ of\ x}$ i.e., k=$\frac{-b}{a}$
2.	Quadratic polynomial	ax^2 +b + c, a≠0	2	$k_1 + k_2 = -\frac{Coefficient\ of\ x}{Coefficient\ of\ x^2}$ i.e. , $-\frac{b}{a}$ $k_1k_2 = \frac{Constant\ term}{Coefficient\ of\ x^2}$ i.e. , $\frac{c}{a}$
3.	Cubic polynomial	ax^3 + bx^2 +cx + d, a≠0	3	$k_1 + k_2 + k_3 = -\frac{Coefficient\ of\ x^2}{Coefficient\ of\ x^3}$ i.e., $-\frac{b}{a}$ $k_1k_2 + k_2k_3 + k_3k_1 = \frac{Coefficient\ of\ x}{Coefficient\ of\ x^3}$ i.e., $\frac{c}{a}$ $k_1k_2k_3 = -\frac{Constant\ term}{Coefficient\ of\ x^3}$ i.e., $-\frac{d}{a}$

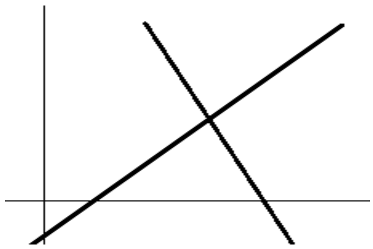
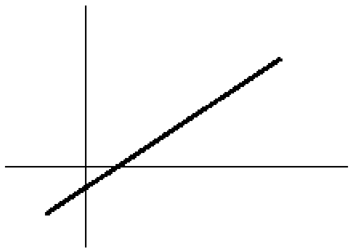
Formation of polynomial when zeroes are given:

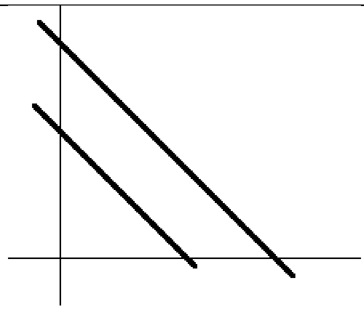
Types of polynomial	Zeroes	Polynomial formed
Linear	k=a	(x-a)
Quadratic	k_1=a and k_2=b	(x-a)(x-b) or x^2 – (a+b)x + ab or x^2 – (sum of the zero's) x + product of the zero's
Cubic	k_1=a, k_2=b and k_3=c	(x-a)(x-b)(x-c)

CHAPTER 3: PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

1) Two linear equations in the same two variables are called a pair of linear equations in two variables. The most general form of a pair of linear equations is
$$a_1x + b_1y + c_1 = 0$$
$$a_2x + b_2y + c_2 = 0$$
Where, $a_1, a_2, b_1, b_2, c_1, c_2$ are real numbers, such that $a_1^2 + b_1^2 \neq 0$ and $a_2^2 + b_2^2 \neq 0$.
2) A linear equation in two variable has infinite solutions.
3) A pair of linear equations in two variables can be represented, and solved, by the:
   i. Graphical method
   ii. Algebraic method
4) The graph of every linear equation in two variables is a straight line.
5) x=0 is the equation of the y-axis and y=0 is the equation of the x-axis.
6) The graph x=a is a line parallel to the y-axis, similarly a graph y=b is a line parallel to the x-axis.

Graphical Method:

Simultaneous pair of linear equation	Condition	Graphical representation	Algebraic interpretation
$a_1x + b_1y + c_1 = 0$ $a_2x + b_2y + c_2 = 0$ Example: x + 2y + 11 = 0 2x – 3y + 9 = 0	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines. The intersecting point coordinate is the only solution. 	One unique solution only
$a_1x + b_1y + c_1 = 0$ $a_2x + b_2y + c_2 = 0$ Example: x + 2y + 3 = 0 2x + 4y + 6 = 0	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Coincident lines. All the point coordinates on the line are the solution. 	Infinite Solutions
$a_1x + b_1y + c_1 = 0$ $a_2x + b_2y + c_2 = 0$ Example:	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Parallel lines	No Solution

x + 2y + 3 = 0 2x + 4y + 4 = 0			

Algebraic method:

1) Method of elimination by substitution:

   i. Let us suppose the equations are:

$$a_1x + b_1y + c_1 = 0$$
$$a_2x + b_2y + c_2 = 0$$

   ii. Find the value of any of the variable x or y in terms of the other from the first equation.

   iii. Substitute that value in the second equation, now it becomes linear equation in one variable. Find the value of the variable.

   iv. Substitute the value on the first equation to get the value of the other variable.

2) Method of elimination by equating coefficients:

   i. Let us suppose the equations are:

$$a_1x + b_1y + c_1 = 0$$
$$a_2x + b_2y + c_2 = 0$$

   ii. Find the LCM of $a_1$and a_2. Let it be k.

   iii. Multiply the first equation by the value k/a_1.

   iv. Multiply the second equation by the value k/a_2.

   v. Subtract the two equations obtained. This will eliminate one variable, resulting in a equation with one variable y. We can get the value of y.

   vi. Substitute the value in the first equation to get the value of second variable (x).

3) Cross multiplication method:

   i. Suppose the equations are

$$a_1x + b_1y + c_1 = 0$$
$$a_2x + b_2y + c_2 = 0$$

   ii. This can be written as

$$\frac{x}{\begin{array}{cc} b_1 & c_1 \\ b_2 & c_2 \end{array}} = \frac{-y}{\begin{array}{cc} a_1 & c_1 \\ a_2 & c_2 \end{array}} = \frac{1}{\begin{array}{cc} a_1 & b_1 \\ a_2 & b_2 \end{array}}$$

   iii. This can be written as:

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

iv. Value of x and y can be found using :
x : first and last expression
y: second and last expression

CHAPTER 4: QUADRATIC EQUATIONS

1) Quadratic polynomial:
   $P(x) = ax^2 + bx + c$, where $a \neq 0$
2) Quadratic equation :
   $ax^2 + bx + c = 0$, where $a \neq 0$
3) Solution or root of the equation:
   A real number α is called the root or solution of the quadratic equation if
   $$a\alpha^2 + b\alpha + c = 0$$
   A quadratic equation can have at most two roots, α and β.
   The condition for which the equation has real roots are : $b^2-4ac \geq 0$
4) Solving quadratic equation:

i. Factorisation:

Let the given equation $ax^2 + bx + c = 0$

We simplify it as, $x^2 + \frac{b}{a}x + \frac{c}{a} = 0$

Now we have to find two numbers, α and β such that

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

So that we get,

$(x - \alpha)(x - \beta) = 0$, and hence the roots α and β.

ii. Square method:

In this method we create square on LHS and RHS and then find the value.

$$ax^2 + bx + c = 0$$
$$=> x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$
$$=> (x + \frac{b}{2a})^2 - \left(\frac{b}{2a}\right)^2 + \frac{c}{a}$$
$$=> (x + \frac{b}{2a})^2 = \frac{b^2 - 4ac}{4a^2}$$
$$=> x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

iii. Quadratic method:

For quadratic equation $ax^2 + bx + c = 0$, roots are given by

$x = \frac{-b+\sqrt{b^2-4ac}}{2a}$ and $x = \frac{-b-\sqrt{b^2-4ac}}{2a}$

For $b^2 - 4ac > 0$, the equation has two real roots of different value.

For $b^2 - 4ac = 0$, the equation has one real root.

For $b^2 - 4ac < 0$, the equation has no real roots.

CHAPTER 5: ARITHMETIC PROGRESSSION

1) Arithmetic Progression:
   An Arithmetic progression is a sequence of numbers such that the difference of any two successive numbers is constant.
2) Common difference of the AP: The difference between two successive numbers is a constant, called the common difference of the AP.

   If $a_1, a_2, a_3, \ldots$ are the terms of the AP, then the common difference d,
   $d = a_2 - a_1 = a_3 - a_2 = a_4 - a_3 = \ldots$
3) General term of an AP:
   We can represent the general term of the AP, a_n as-
   $a_n = a + (n-1)d$
4) Sum of first n terms of the AP:
   $$S_n = \frac{n}{2}(2a + (n-1)d)$$
   $$or, \quad S_n = \frac{n}{2}(a_1 + a_n)$$

CHAPTER 6: TRIANGLES

1) Two figures having the same shape but not necessarily same size are called similar figures.
2) All the congruent figures are similar but the converse may not be true.
3) 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.
4) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.
5) If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.
6) Similarity of triangles :

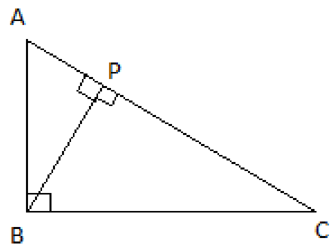
Sl. No.	Criterion	Description	Expression
1.	Angle-angle-angle (AAA) similarity	Two triangles are similar if corresponding angle are equal.	If following condition, $\angle A = \angle D$ $\angle B = \angle E$ $\angle C = \angle F$ Then, $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ then $\Delta ABC \sim \Delta DEF$
2.	Angle-angle(AA) similarity	Two triangles are similar if the two corresponding angles are equal as	If following condition, $\angle A = \angle D$ $\angle B = \angle E$ Then, $\angle C = \angle F$

		by angle property the third angle will also be equal.	Then, $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ then $\Delta ABC \sim \Delta DEF$
3.	Side-side-side(SSS) similarity	Two triangles are similar of the sides of one triangle are proportional to the sides of the other triangle.	If following condition, $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ Then, $\angle A = \angle D$ $\angle B = \angle E$ $\angle C = \angle F$ then $\Delta ABC \sim \Delta DEF$
4.	Side-angle-side(SAS) similarity	Two triangles are similar if one angle of the first triangle is equal to one angle of the second triangle, and sides including that angle are proportional.	If the following condition $\frac{AB}{DE} = \frac{AC}{DF}$ And, $\angle A = \angle D$ Then, $\Delta ABC \sim \Delta DEF$

7) Area of similar triangles:
If the two triangles $\Delta ABC \ and \ \Delta DEF$ are similar then,

$$\frac{Area\ of\ \Delta ABC}{Area\ of\ \Delta DEF} = (\frac{AB}{DE})^2 = (\frac{BC}{EF})^2 = (\frac{AC}{DF})^2$$

8) If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, then the triangles on both sides of the perpendicular are similar to the whole triangle and also to each other.

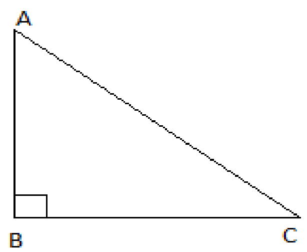


Here, $\Delta ABP \sim \Delta BCP$

$\Delta ABP \sim \Delta CAB$

$\Delta BCP \sim \Delta CAB$

9) Pythagoras theorem:
In a right triangle, the square of the hypotenuse is equal to the sum of squares of other two sides.



$(AC)^2 = (AB)^2 + (BC)^2$

CHAPTER 7: COORDINATE GEOMETRY

1) Distance formula: The distance between two points $X(x_1,y_1)$ and $Y(x_2,y_2)$ is given by

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

The distance of any point X(x,y) from the origin is

$$D = \sqrt{x^2 + y^2}$$

2) Section formula: A point P(x,y) which divide the line segment AB in the ratio m_1:m_2 is given by

$$x = \frac{m_1x_2+m_2x_1}{m_1+m_2}$$

$$y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

The mid-point P of the segment AB is given by :

$$\left(\frac{x_1+x_2}{2}\right), \left(\frac{y_1+y_2}{2}\right)$$

3) Area of triangle: The area of the triangle formed by the points A(x_1, y_1), B(x_2, y_2) and C(x_3, y_3) is given by :

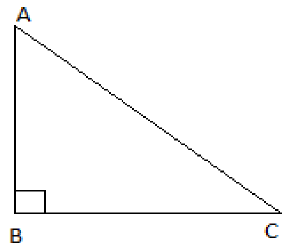
$$A = \frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

CHAPTER 8: INTRODUCTION TO TRIGONOMETRY

1) What is trigonometry:

   Trigonometry is a branch of mathematics that studies relationship involving lengths and angles of triangles. It is mostly associated with planar right angled triangles.

2) Trigonometrical Ratios: In a right-angled triangle ΔABC where $\angle B = 90°$, for angle $\angle C$ we can define the following:



Base: Side adjacent to angle, (BC)

Perpendicular: Side opposite to angle (AB)

Hypotenuse: Side opposite to right angle (AC)

We define the trigonometric ratios as:

i. Sin C = $\frac{perpendicular}{hypotenuse} = \frac{AB}{AC}$

ii. Cosec C = $\frac{hypotenuse}{perpendicular} = \frac{AC}{AB}$

iii. Cos C = $\frac{base}{hypotenuse} = \frac{BC}{AC}$

iv. Sec C = $\frac{hypotenuse}{base} = \frac{AC}{BC}$

v. Tan C = $\frac{perpendicular}{base} = \frac{AB}{BC}$

vi. Cot C = $\frac{base}{perpendicular} = \frac{BC}{AB}$

As we can see,

Sin C = $\frac{1}{Cosec\ C}$, Cos C = $\frac{1}{Sec\ C}$, Tan C = $\frac{1}{Cot\ C}$

The value of Sin and Cos is always ≤ 1

3) Trigonometric ratios of complimentary angles :
Sin$(90° - A)$= CosA
Cos$(90° - A)$= SinA
Tan$(90° - A)$= CotA
Cot$(90° - A)$= TanA
Sec$(90° - A)$= CosecA
Cosec$(90° - A)$= SecA

4) Trigonometric identities:
i. $Sin^2A + Cos^2A = 1$
ii. $1 + tan^2A = sec^2A$
iii. $1 + cot^2A = cosec^2A$

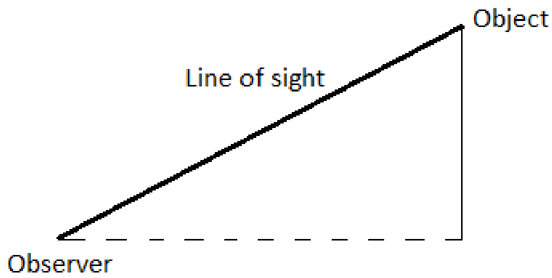
5) Trigonometric ratios of common angles:

Angles(A)	SinA	CosA	TanA	CosecA	SecA	CotA
$0°$	0	1	0	Not defined	1	Not defined
$30°$	$1/2$	$\sqrt{3}/2$	$1/\sqrt{3}$	2	$2/\sqrt{3}$	$\sqrt{3}$
$45°$	$1/\sqrt{2}$	$1/\sqrt{2}$	1	$\sqrt{2}$	$\sqrt{2}$	1
$60°$	$\sqrt{3}/2$	$1/2$	$\sqrt{3}$	$2/\sqrt{3}$	2	$1/\sqrt{3}$

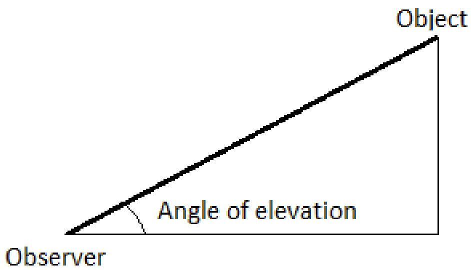
$90°$	1	0	Not defined	1	Not defined	0

CHAPTER 9: SOME APPLICATIONS OF TRIGONOMETRY

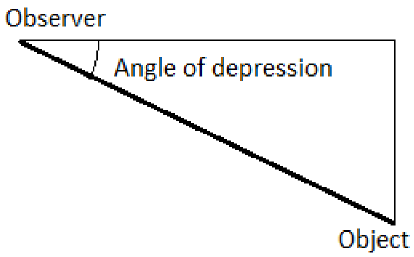
1) Line of Sight: It is the line drawn from the eye of the observer to the point in the object viewed by the observer.



2) Angle of Elevation: It is the angle formed by the line of sight with the horizontal when it is above the horizontal level.



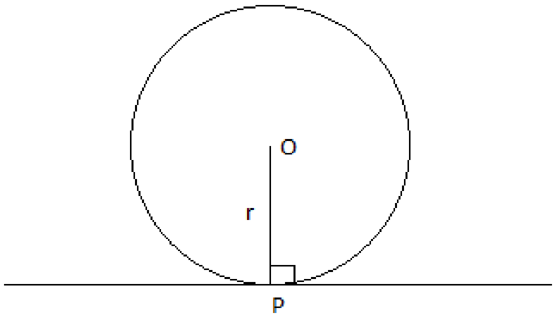
3) Angle of depression: It is the angle formed by the line of sight with the horizontal when it is below the horizontal level.



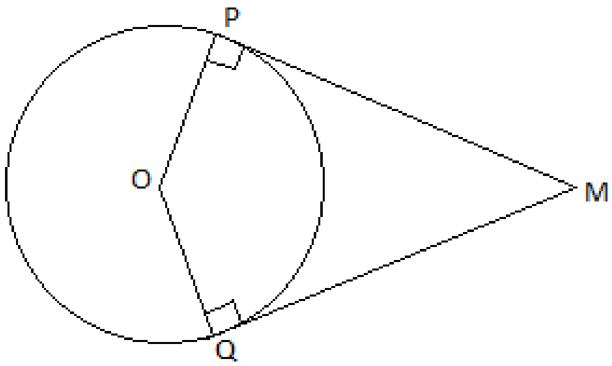
CHAPTER 10: CIRCLES

1) Tangent to a circle:

A tangent is a line that touches a circle at just at one point, called the **point of contact**. A tangent at any point is perpendicular to the radius drawn at that point.



2) Length of two tangents from an external point to the circle are equal.



Here, MP and MQ are tangents drawn from external point M to the circle.
MP = MQ

CHAPTER 12 : AREA RELATED TO CIRCLES

1) Circumference of a circle = $2\pi r$
2) Area of a circle = πr^2
3) Length of an arc of a sector of a circle with radius *r* and angle with degree measure θ is

$$\frac{\theta}{360} \times 2\pi r$$

4) Area of a sector of a circle with radius *r* and angle with degree measure θ is

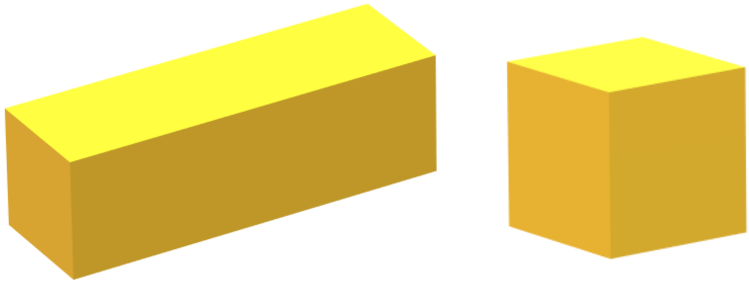
$$\frac{\theta}{360} \times \pi r^2$$

5) Area of segment of a circle =

Area of the corresponding sector - Area of the corresponding triangle

CHAPTER 13 : SURFACE AREAS AND VOLUMES

1) Surface Area and Volume of Cube and Cuboid



Type	Measurement
Surface Area of Cuboid of length L, breadth B and height H	2(LB + BH + LH)
Lateral surface area of the cuboid	2(L + B)H
Diagonal of the cuboid	$\sqrt{L^2+B^2+H^2}$
Volume of the cuboid	LBH
Length of all 12 edges of the cuboid	4(L + B + H)
Surface area of the cube of side L	$6L^2$
Lateral surface area of the cube	$4L^2$
Diagonal of the cube	$L\sqrt{3}$
Volume of the cube	L^3

2) Surface area and volume of right circular cylinder

Radius(r) - The radius of the circular base is called the radius of the cylinder.

Height(h) - The length of the axis of the cylinder is called the height of the cylinder.

Lateral surface(L) – The curved surface between the two base of the right circular cylinder is called the lateral surface.

Type	Measurement
Curved or lateral surface area of the cylinder	$2\pi rh$
Total surface area of the cylinder	$2\pi r(h+r)$
Volume of the cylinder	$\pi r^2 h$

3) Surface area and volume of right circular cone

Radius(r) - The radius of the circular base is called the radius of the cone

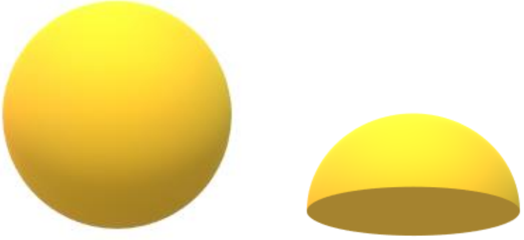
Height(h) - The length of the line joining the vertex to the centre of base is called the height of cone

Slant height(L) – The length of the segment joining the vertex to any point on the circular edge of the base is called the slant height of the cone.

Lateral surface area – The curved surface joining the base and uppermost point of a right circular cone is called Lateral surface.

Type	Measurement
Curved or lateral surface of cone	πrL
Total surface area of cone	πr(L + r)
Volume of cone	$\frac{1}{3}\pi r^2 h$

4) Surface area and volume of sphere and hemisphere

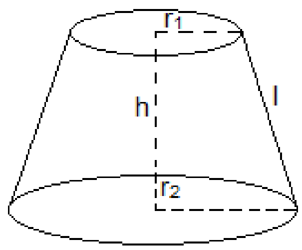


Sphere – A sphere can also be considered as a solid obtained on rotating a circle about its diameter.
Hemisphere – A plane through the centre of the sphere divides the sphere into two equal parts, each of which is called a hemisphere.
Radius – The radius of the circle by which it is formed.
Spherical shell – The difference of two solid concentric spheres is called a spherical shell.
Lateral surface area – Total surface area of the sphere
Lateral surface area of hemisphere – it is the curved surface area except the circular base.

Type	Measurement
Surface area of sphere	$4\pi r^2$
Volume of sphere	$\frac{4}{3}\pi r^3$
Curved surface area of hemisphere	$2\pi r^2$
Total surface area of hemisphere.	$3\pi r^2$

Volume of hemisphere	$\frac{2}{3}\pi r^3$
Volume of the spherical shell whose outer and inner radii and 'R' and 'r' respectively	$\frac{4}{3}\pi(R^3 - r^3)$

5) Surface area and volume of frustum of cone



h = vertical height of the frustum

l = slant height of the frustum

r_1 and r_2 are the radii of the two bases of the frustum.

Type	**Measurement**
Volume of a frustum of a cone	$\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$
Slant height of a frustum of a cone	$\sqrt{h^2 + (r_1 - r_2)^2}$
Curved surface area of a frustum of a cone	$\pi l(r_1 + r_2)$
Total surface area frustum of a cone	$\pi l(r_1 + r_2) + \pi(r_1^2 + r_2^2)$

CHAPTER 14 : STATISTICS

1) Mean for Ungroup frequency table (M) = $\frac{\Sigma f_i x_i}{\Sigma f_i}$, where f_i is the frequency and x_i is the observation.

2) Mean for grouped frequency table (in this distribution, it is assumed that frequency of each class interval is centered around its mid-point i.e., class marks):

Class mark =$\frac{upper\ class\ limit + lower\ class\ limit}{2}$

Mean can be calculated by three methods:

- **Direct method**

  M = $\frac{\sum f_i x_i}{\sum f_i}$

- **Assumed Mean method**

  M = a + $\frac{\sum f_i d_i}{\sum f_i}$ **where, "a" is the assumed mean.**

- **Step deviation Method**

  M = a + $\left(\frac{\sum f_i u_i}{\sum f_i} \times h\right)$
  Where, a is the assumed mean
  $u_i = \frac{(x_i - a)}{h}$
  h is the height between two steps, and is constant.

  With the assumption that the frequency of a class is centred at its mid-point, called its class mark.

3) The mode for grouped data can be found by using the formula:

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

   Where , l = lower limit of 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

4) The cumulative frequency of a class is the frequency obtained by adding the frequencies of all the classes preceding the given class.

5) The median for grouped data is formed by using the formula:

   Median = $l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$
   Where ,
   l = lower limit of median class,
   n = number of observations,
   cf = cumulative frequency of the class preceding the median class,
   f = frequency of median class,
   h = class size (assuming class sizes are equal)

6) Empirical formula between Mode, Median and Mean :

(3 x Median) = (Mode) + (2 x Mean)

CHAPTER 15 : PROBABILITY

1) Theoretical Probability: The theoretical (classical) probability of an event E is defined as

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

2) Elementary Elements: An event having only one outcome of the experiment is called an elementary event.
The sum of the probabilities of all the elementary elements of an experiment is 1.
So, an experiment with three elementary elements A, B and C , will have
P(A) + P(B) + P(C) = 1

3) Complementary events: The event $\bar{A}$, representing 'not A', is called the complement of the event A.
P(A) + P($\bar{A}$) = 1

4) Sure/Certain Events: The probability of an event X that is certain (or sure) to happen is 1. This is called a sure or certain event.
P(X) = 1

5) The probability of any event can be:

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