Chapter-1: Real Numbers

Laws of logarithms:
If a, x, and y are positive real numbers and $a \neq 1$, then

(i) $\log_a xy = \log_a x + \log_a y$
(ii) $\log_a \frac{x}{y} = \log_a x - \log_a y$
(iii) $\log_a x^m = m \log_a x$
(iv) $\log_a 1 = 0$
(v) $\log_a a = 1$

Chapter-2: Sets

(i) A is a subset of B if 'a' is an element of A implies that 'a' is also an element of B. This is written as $A \subseteq B$ if $a \in A \Rightarrow a \in B$, where A, B are two sets.
(ii) Two sets, A and B are said to be equal if every element in A belongs to B and every element in B belongs to A.
(iii) The difference of two sets A, B is defined as A - B
$A - B = \{x : x \in A \text{ and } x \notin B\}$

Chapter-3: Polynomials

(i) Quadratic Polynomial Formula:
If a and b are the zeroes of the quadratic polynomial $ax^2 + bx + c$, $a \neq 0$, then $\alpha+\beta = -b/a$, $\alpha\beta = c/a$.

(ii) Cubic Polynomial Formula
If α,β,γ are the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$, $a \neq 0$, then
- $\alpha+\beta+\gamma = -b/a$
- $\alpha\beta+\beta\gamma+\gamma\alpha = c/a$
- $\alpha\beta\gamma = -d/a$

Chapter-4: Pair of Linear Equations in Two Variables
There exists a relation between the coefficients and the nature of the system of equations.
- $a_1/a_2 \neq b_1/b_2$ then the pair of linear equations is consistent.
- $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ then the pair of linear equations is inconsistent.
- $a_1/a_2 = b_1/b_2 = c_1/c_2$ then the pair of linear equations is dependent and consistent.

Chapter-5: Quadratic Equations

(i) **The standard form of a quadratic equation** is $ax^2 + bx + c = 0$ ($a \neq 0$). Here condition $a \neq 0$ is extremely important. If "a" equals zero, the highest power will be 'one' in $bx^1 + c = 0$ which doesn't make it a quadratic equation.

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

Some important conditions to determine what kind of roots a quadratic equation has.

(iii) A quadratic equation $ax^2 + bx + c = 0$ ($a\neq0$) has
(a) two distinct real roots if $b^2 - 4ac > 0$,
(b) two equal roots (i.e., coincident roots), if $b^2 - 4ac = 0$, and
(c) no real roots if $b^2 - 4ac < 0$.

Chapter-6: Progressions

(a) Arithmetic Progression Formulas:

(i) The sum of the first n terms of an AP is given by:
S= n/2[2a+(n-1)d]

(ii) If ℓ is the last term of the finite AP, say the nth term, then the sum of all terms of the AP is given by, S = n/2(a+ℓ)

(iii) If ℓ is the last term of the finite AP, say the nth term, then the sum of all terms of the AP is given by,
S = n/2(a+ℓ)

Terminology: **a** is the first term, **d** is a common difference, **n** is the number of terms, a_n is the nth term, and **ℓ** is the last term.

(b) Geometric Progression Formulas:

(i) nth term of a Geometric Progression is given by an = tn = ar^{n-1}
(ii) Sum of n terms of a Geometric Progression is given by $S_n = a[(r^n - 1)/(r - 1)]$ if $r \neq 1$ and $r > 1$
Terminology: **a** is the first term, **r** is the common ratio, **n** is the number of terms

(c) Harmonic Progression Formulas:

(i) The nth term of a harmonic progression is given by $\frac{1}{[a+(n-1)d]}$
Where **a** is the first term, **d** is the common difference, **n** is the number of terms in AP.

(ii) The Sum of the **n** terms in a Harmonic Progression:
$S_n = \frac{1}{d}\ell_n \{\frac{2a+(2n-1)d}{2a-d}\}$
Where **ℓ_n** is the natural algorithm, **a** is the first term, **n** is the total number of terms, and **d** is the common difference.

Chapter-7: Coordinate Geometry

1. **Distance formula in Coordinate Geometry:**

The distance between two points $P(x_1,y_1)$ and $Q(x_2, y_2)$ is $\sqrt{}$**$(x_2-x_1)^2+(y_2-y_1)^2$**

2. **Coordinate Geometry Midpoint Formula:**

If (x_1, y_1) and (x_1 , y_2) are coordinates of two points, and the coordinates of another point which equidistant from these two points can be found using the formula, **($\frac{x1+x2}{2}$, $\frac{y1+y2}{2}$)**

3. **Circle Formula Coordinate Geometry:**

In a circle, if we suppose, **(h,k)** as coordinates of the center and **r** is the radius of the circle, then the equation of the circle formula is given by $(x – h)^2 + (y – k)^2 = r^2$

Along with these three important formulas, let's check out some other formulas from coordinate geometry class tenth that can help you score big in your board exams.

4. The distance of a point P(x, y) from the origin is $\sqrt{x^2+y^2}$
5. The distance between two points (x_1, y_1) and (x_1 , y_2) on a line parallel to Y-axis is $|y_2 - y_1|$
6. The distance between two points (x_1, y_1) and (x_2 , y_1) on a line parallel to X-axis is $|x_2 - x_1|$
7. Area of a triangle is given by 'Heron's Formula' as

A= √(s-a)(s-b)(s-c), where s= (a+b+c)/2 where a,b,c are three sides of a triangle ABC.

8. The centroid of a triangle is the point of intersection of its medians. Hence the coordinates of the centroid are $[(x_1+x_2+x_3)/3, (y_1+y_2+y_3)/3]$ where (x_1, y_1) (x_2, y_2) and (x_3 , y_3) are the vertices of the triangle.

Chapter-8: Similar Triangles

(i) **AAA Similarity:** In two triangles, if corresponding angles are equal, then their corresponding sides are in the same ratio and hence the two triangles are similar.

(ii) **SSS Similarity:** In two triangles, if the corresponding sides are in the same ratio, then their corresponding angles are equal and hence the triangles are similar.

(iii) **SAS similarity:** If one angle of a triangle is equal to one angle of another triangle and the including sides of these angles are in the same ratio, then the triangles are similar.

(iv) **Pythagorean Theorem:** In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

(v) **Angle Sum Property:** If two angles of a triangle are equal to the two angles of another triangle, then the third angles of both triangles are equal by the angle sum property of the triangle.

Chapter-9: Tangents and Secants to a Circle

(i) Area of a segment of a circle = Area of the corresponding sector - Area of the corresponding triangle.
(ii) The lengths of the two tangents from an external point to a circle are equal.

Chapter-10: Mensuration

Cuboid:
(i) Lateral Surface Area = 2h(l+b)
(ii) Total Surface Area = 2(lb+bh+hl)
(iii) Volume = lbh

Cube:
(i) Lateral Surface Area = $4a^2$
(ii) Total Surface Area = $6a^2$
(iii) Volume = a^3

Prism:
(i) Lateral Surface Area = Perimeter of Base x Height
(ii) Total Surface Area = Lateral Surface area + 2(Area of the end surface)
(iii) Volume = Area of Base x Height

Cylinder:
(i) Lateral Surface Area = $2\pi rh$
(ii) Total Surface Area = $2\pi r(r+h)$
(iii) Volume = $\pi r^2 h$

Pyramid:
(i) Lateral Surface Area = ½(Perimeter of Base)x Slant Height
(ii) Total Surface Area = Lateral Surface Area + Area of the Base
(iii) Volume = ⅓(Area of Base)x height

Circular Cone:
(i) Lateral Surface Area = $\pi r\ell$
(ii) Total Surface Area = $\pi r(\ell+r)$
(iii) Volume = $\frac{1}{3}\pi r^2 h$

Sphere:
(i) Lateral Surface Area = $\pi r\ell$
(ii) Total Surface Area = $\pi r(\ell+r)$
(iii) Volume of = $\frac{1}{3}\pi r^2 h$

Hemishpere:
(i) Lateral Surface Area = $\pi r\ell$
(ii) Total Surface Area = $\pi r(\ell+r)$
(iii) Volume = $\frac{1}{3}\pi r^2 h$

Chapter-11: Trigonometry

Trigonometric Values Table:

θ	0°	30°	45°	60°	90°	180°
Sin	0	1/2	1/√2	√3/2	1	0

Cos	1	√3/2	1/√2	1/2	0	-1
Tan	0	1/√3	1	√3	∞	0
Cosec	∞	2	√2	2/√3	1	∞
Sec	1	2/√3	√2	2	∞	-1
Cot	∞	√3	1	1/√3	0	∞

Important Trigonometric Relations:
(i) sin (90° - A) = cos A, cos (90° - A) = sin A
(ii) tan (90° - A) = cot A, cot (90° - A) = tan A
(iii) sec (90° - A) = cosec A, cosec (90° - A) = sec A
(iv) $\sin^2 A + \cos^2 A = 1$
(v) $\sec^2 A - \tan^2 A = 1$ for $0° < A < 90°$
(vi) $\operatorname{cosec}^2 A - \cot^2 A = 1$ for $(0° < A < 90°)$

Chapter-12: Applications of Trigonometry

(i) The line of sight is the line drawn from the eye of an observer to a point on the object being viewed by the observer.
(ii) The angle of elevation of the object viewed, is the angle formed by the line of sight with the horizontal when it is above the horizontal level, i.e., the case when we raise our head to look at the object.
(iii) The angle of depression of an object viewed is the angle formed by the line of sight with the horizontal when it is below the horizontal level, i.e., the case when we lower our head to look at the object.

Chapter-13: Probability

(i) The theoretical (classical) probability of an event E, written as P(E), is defined as P (E) = $\frac{Number\ of\ outcomes\ favourable\ to\ E}{Total\ number\ of\ all\ possible\ outcomes\ of\ the\ experiment}$

(ii) The probability of an event E is a number P(E) such that 0 ≤ P (E) ≤ 1

Chapter-14: Statistics

(i) Formulas for the mean for grouped data:
(a) The direct method: $\overline{x} = \frac{\Sigma\ fi\, xi}{\Sigma fi}$
(b) The assumed mean method: $\overline{x} = a + \frac{\Sigma\ fi\, di}{\Sigma fi}$
(c) The step deviation method: $\overline{x} = a + [\frac{\Sigma\ fi\, ui}{\Sigma fi}] \times h$

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

(iii) Mode: $\ell + [\frac{f1 - f0}{2f1 - f0 - f2}] x h$

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

Median = $\ell + \left[\frac{n/2 - cf}{f}\right] \times h$