Quantitative Aptitude

Co-ordinate Geometry

A point in the plane is represented as (x, y) where x and y are coordinates.
The plane is divided into four quadrants by the x-axis and y-axis.

Distance Formula:	**Distance between two points (x_1, y_1) and (x_2, y_2) is:** **Distance =** $\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$
Midpoint Formula:	Midpoint of line segment joining (x_1, y_1) and (x_2, y_2) is: Midpoint = $\left(\frac{x^1 + x^2}{2}, \frac{y^1 + y^2}{2}\right)$
Section Formula:	Coordinates of point dividing the segment joining (x_1, y_1) and (x_2, y_2) in ratio m:n: Point = $\left(\frac{m\,x^2 + n\,x^1}{m+n}, \frac{m\,y^2 + n\,y^1}{m+n}\right)$
Slope of a Line:	• Slope (m) = $\frac{y^2 - y^1}{x^2 - x^1}$ • Horizontal line slope = 0 • Vertical line slope = undefined
Equation of a Line:	• Slope-Intercept Form: y = mx + c • Point-Slope Form: y - y_1 = m(x - x_1) • Two-Point Form: $\frac{y - y^1}{y^2 - y^1} = \frac{x - x^1}{x^2 - x^1}$ • General Form: Ax + By + C = 0
Distance of a Point from a Line:	Distance d of point (x_0, y_0) from line Ax + By + C = 0 is: d = $\frac{\lvert Ax^0 + By^0 + C \rvert}{\sqrt{A^2 + B^2}}$
Area of Triangle Formed by Points:	Area = $\frac{1}{2}\lvert x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) \rvert$
Conditions for Collinearity:	Points (x_1, y_1), (x_2, y_2), (x_3, y_3) are collinear if area = 0
Reflection of Points	• Reflection about x-axis: If point is (x, y), its reflection is (x, -y). • Reflection about y-axis: If point is (x, y), its reflection is (-x, y). • Reflection about origin: Point (x, y) reflects to (-x, -y). • Reflection about line y = x: Point (x, y) reflects to (y, x). • Reflection about line y = -x: Point (x, y) reflects to (-y, -x).
Circle Concept	**A circle is the set of all points equidistant from a fixed point called the center.** $(x - h)^2 + (y - k)^2 = r^2$ **Circle with center at origin (0, 0):** $x^2 + y^2 = r^2$ **Radius Formula:** $r = \sqrt{[(x - h)^2 + (y - k)^2]}$ **General form of circle:** $x^2 + y^2 + 2gx + 2fy + c = 0$ **Center:** (-g, -f) **Radius:** √(g^2 + f^2 - c) **Tangent to a circle:** If tangent touches circle at (x_1, y_1): $(x - h)(x_1 - h) + (y - k)(y_1 - k) = r^2$

System of Linear Equations	For two variables x and y, a system of two linear equations can be written as: $a_1x + b_1y = c_1$ $a_2x + b_2y = c_2$ where a_1, b_1, c_1, a_2, b_2, c_2 are constants. **Types of Solutions:** **1. Unique Solution:** • The two lines intersect at exactly one point. • Equations are consistent and independent. • Occurs when $\left(\frac{a^1}{a^2}\right) \neq \left(\frac{b^1}{b^2}\right)$. **2. No Solution:** • The lines are parallel and never intersect. • Equations are inconsistent. • Occurs when $\left(\frac{a^1}{a^2}\right) = \left(\frac{b^1}{b^2}\right) \neq \left(\frac{c^1}{c^2}\right)$. **3. Infinite Solutions:** • The lines coincide (are the same line). • Equations are consistent and dependent. • Occurs when $\left(\frac{a^1}{a^2}\right) = \left(\frac{b^1}{b^2}\right) = \left(\frac{c^1}{c^2}\right)$