

Straight Lines

CBSE Class 11 Maths · Knowledge organiser

KEY DEFINITIONS

Slope

$m = \tan \theta$, the steepness of a line; $m = (y_2 - y_1)/(x_2 - x_1)$.

Intercept

Where a line crosses an axis.

Perpendicular distance

The shortest distance from a point to a line.

YOU SHOULD BE ABLE TO...

- Find slopes, test parallel and perpendicular lines and write simple line equations.
- Use every form of the line equation, test collinearity and find distances from a point to a line.
- Combine line equations, distances and areas in triangle problems.
- Find lines at a given angle, reflections of points and distances between parallel lines.

COMMON MISTAKES

- ✗ Slope written as $\frac{x_2 - x_1}{y_2 - y_1}$, or with the points in a different order on top and bottom.
- ✗ Forgetting the modulus in the angle and distance formulae.
- ✗ Distance between parallel lines without first making the coefficients of x and y the same.
- ✗ Slope of $Ax + By + C = 0$ taken as $\frac{A}{B}$ instead of $-\frac{A}{B}$.

KEY FORMULAS

Slope; angle between

$$m = \tan \theta = \frac{y_2 - y_1}{x_2 - x_1}; \quad \tan \phi = \left| \frac{m_2 - m_1}{1 + m_1 m_2} \right|$$

Parallel $m_1 = m_2$;

perpendicular

$$m_1 m_2 = -1$$

$$y - y_1 = m(x - x_1), \quad y = mx + c,$$

$$\frac{x}{a} + \frac{y}{b} = 1$$

Point to line

$$\frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}}$$

Parallel lines

$$Ax + By + C_1 = 0, \quad \frac{|C_1 - C_2|}{\sqrt{A^2 + B^2}}$$

$$Ax + By + C_2 = 0 \quad (\text{same } A, B)$$

WORKED EXAMPLE

Find the equation of the line through $(2, -1)$ parallel to $3x - y + 4 = 0$.

Slope 3: $y + 1 = 3(x - 2)$, i.e. $3x - y - 7 = 0$.