STRAIGHT LINES

Straight Line

Straight Line is a geometrical shape which has no breadth . It extends in both directions with no end points.

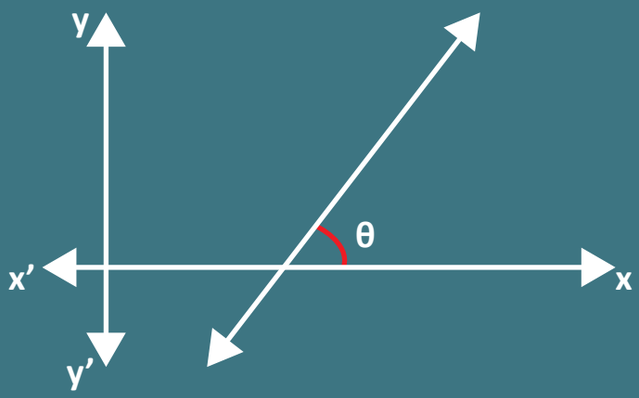
Slope of Line

Slope of line is a number that measures its steepness. It is denoted by m. Slope of line can be either positive, zero or negative.

Calculation slope of Line

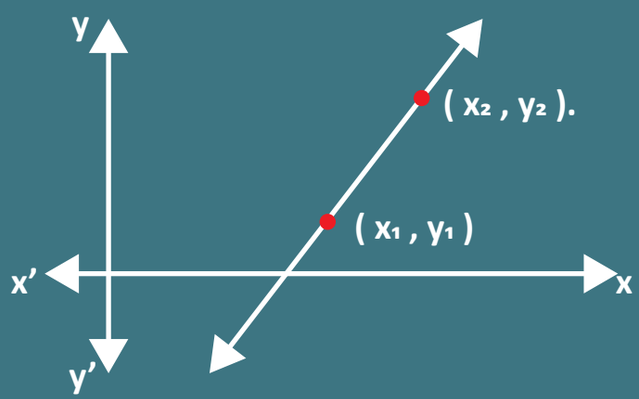
1. When line makes an angle θ with the positive direction of *x* - axis.

Slope = tan θ



2. When the line passess through the point (x_1 , y_1) and (x_2 , y_2).

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$



Results Based on Slopes of Two lines

For two lines with slope m_1 and m_2 we have,

1. If $m_1 = m_2$, then the two lines are parallel.
2. If $m_1 m_2 = -1$, then the two lines are perpendicular to each other.
3. If the lines are intersecting, then the acute angle between them is given as

$$\tan\theta = \left| \frac{m_1 - m_2}{1 + m_1 m_2} \right|$$

Collinearity of Three points

A(x_1 , y_1) , B(x_2 , y_2) and C(x_3 , y_3) are collinear iff

Slope of AB = Slope of BC

$$\text{ie} \quad \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_3 - y_2}{x_3 - x_2}$$

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Various forms of Equation of Line

1. Horizontal line

$y = k$

where k = distance of line from x-axis

2. Vertical line

$x = h$

where h = distance of line from y-axis

3. Slope point form

Line passing through (x_1 , y_1) and having slope m

$(y-y_1) = m\,(x-x_1)$

4. Two point form

Line passing through (x_1 , y_1) and (x_2 , y_2)

$$\frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$$

5. Slope Intercept form

Line having slope m and y-intercept as c

$y = mx + c$

6. Intercept form

Line having x-intercept as a and y-intercept as b

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

General Equation of Line

General equation for any line is $Ax + By + C = 0$

for the line $Ax + By + C = 0$

$$\text{slope} = \frac{-A}{B}$$

$$\text{x-intercept} = \frac{-C}{A} \text{ , y-intercept} = \frac{-C}{B}$$

Distance

1. Distance between Two Points :- Distance between two points (x_1 , y_1) and (x_2 , y_2) is.

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

2. Distance between Points and Line :- Perpendicular distance between point (x_1 , y_1) and line $Ax+By+C=0$ is.

$$d = \left| \frac{Ax_1+By_1+C}{\sqrt{A^2+B^2}} \right|$$

3. Distance between Two Parallel Lines :- Perpendicular distance between two parallel lines $Ax+By+C_1=0$ and $Ax+By+C_2=0$ is.

$$d = \left| \frac{C_1 - C_2}{\sqrt{A^2+B^2}} \right|$$