

1. Co-ordinates can lie in X-axis and Y-axis, or any of the 4 quadrants.
2. Quadrant-I and Quadrant-III have parity, since former covers all (+, +) and latter all (-, -) pairs
3. Quadrant-II and Quadrant-IV have parity, since former covers all (-, +) and latter all (+, -) pairs
4. Distance between two points is

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

5. If a line AB is divided by the point P in the ratio m:n, the point P is given by the section formula

$$\left(x = \frac{mx_2 + nx_1}{m+n}, y = \frac{my_2 + ny_1}{m+n} \right)$$

6. Area of a triangle bounded by points A (x1, y1), B(x2, y2), C (x3, y3) in the anti-clockwise direction is given by

$$A(\triangle ABC) = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|.$$

7. Area of a triangle should be equal to 0, if the 3 points are co-linear.
8. Change in y with respect to x is called slope/gradient. Horizontal line has slope of 0, while slope is undefined for a vertical line. It can be expressed in terms of angle also ($\tan \theta$)
9. Two non-vertical lines l1 and l2 are parallel if and only if their slopes are equal.
10. Two non-vertical lines l1 and l2 are perpendicular if and only if their slopes multiply to give -1.
Thus $m_1 * m_2 = -1$
11. Acute angle θ between two lines with slopes m1 and m2 is given by

$$\tan \theta = \tan(\alpha_2 - \alpha_1) = \frac{\tan \alpha_2 - \tan \alpha_1}{1 + \tan \alpha_1 \tan \alpha_2} = \frac{m_2 - m_1}{1 + m_1 m_2}, m_1 m_2 \neq -1.$$

where α_1 and α_2 are angles formed by the lines with X-axis.

12. Obtuse angle ϕ between two lines with slopes m1 and m2 is given by
 $\tan(\phi) = (m_1 - m_2) / (1 + m_1 m_2) = -\tan(\theta)$
13. If Lines l1 and l2 are perpendicular to each other with slopes m1 and m2 and with inclinations α and β respectively, $\beta = 90 + \alpha$, and $\tan \alpha = -\cot \beta$. It also means, $\tan \beta = -\cot \alpha$
14. $y = a$ represents the line parallel to X-axis and a unit from it.
15. $x = a$ represents the line parallel to Y-axis and a unit from it.
16. Equation of a line in a **point-slope form** is

$$(y - y_0) = m(x - x_0) \text{ (Point-Slope form)}$$

$$m = \frac{y - y_0}{x - x_0}$$

where m is

17. Equation of a line in a **2-point form** is

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

18. Equation of a line in a **slope-intercept form** is $y = mx + c$, where c is the y-intercept.
19. Equation of a line in a **slope-intercept form** is $y = m(x - d)$, where d is the x-intercept.
20. Equation of a line whose x-intercept is a and y-intercept is b is given as

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

This is called the **intercept form**