

CO ORDINATE GEOMETRY

1. Distance between two points $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

2. Mid- point of the line segment $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

3. Section Formula

a) Internal division $\left[\frac{m x_2 + n x_1}{m+n}, \frac{m y_2 + n y_1}{m+n}\right]$

b) External division $\left[\frac{m x_2 - n x_1}{m-n}, \frac{m y_2 - n y_1}{m-n}\right]$

4. Centroid of a triangle $\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$

5. Heron's Formula (sides are given)

Area of a triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$

6. Area of the triangle (vertices are given)

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

or

$$= \frac{1}{2} \begin{vmatrix} x_1 & x_2 & x_3 \\ y_1 & y_2 & y_3 \end{vmatrix}$$

$= \frac{1}{2}\{(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)\}$ sq. units

7. Area of a triangle can never be negative

8. Area of a triangle must take the absolute value in case area happens to be negative.

9. Condition for Collinearity

$$x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) = 0$$

or

$$x_1y_2 + x_2y_3 + x_3y_1 = x_1y_3 + x_2y_1 + x_3y_2$$

SRIHARI MATHEMATICS ACADEMY

(TUITION CENTER),

2/276-G, K.G.NAGAR, KALANGAL(P.O), (VIA) SULUR (T.K),

COIMBATORE(D.T) – 641402

MOBILE NO: 9944196663

E-mail: rangarajankg@gmail.com

10. Area of a Quadrilateral

$$A = \frac{1}{2} \{(x_1 - x_3)(y_2 - y_1) - (x_2 - x_4)(y_1 - y_3)\} \text{ sq. units}$$

or

$$= \frac{1}{2} \begin{vmatrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{vmatrix}$$
$$= \frac{1}{2} \{(x_1y_2 + x_2y_3 + x_3y_4 + x_4y_1) - (x_2y_1 + x_3y_2 + x_4y_3 + x_1y_4)\}$$

sq. units

11. The inclination of X axis and every line parallel to X axis is 0°

12. The inclination of Y axis and every line parallel to Y axis is 90°

13. Slope of the straight line $m = \tan \theta$, $0 \leq \theta < 180^\circ$, $\theta \neq 90^\circ$

14. The slope of the line (x_1, y_1) and $(x_2, y_2) = \frac{y_2 - y_1}{x_2 - x_1}$

15. The slope of the line $ax + by + c = 0$ is $m = \frac{-a}{b} = \frac{-\text{coefficient of } x}{\text{coefficient of } y}$

16. Slope of the vertical line is undefined.

17. Two non-vertical lines are parallel if and only if their slopes are equal

i.e. $m_1 = m_2$

18. Two non-vertical lines with slopes m_1 and m_2 are perpendicular if and only if

$$m_1 \times m_2 = -1$$

19. In any triangle, exterior angle is equal to sum of the opposite interior angles

20. If the slopes of both the pairs of opposite sides are equal then the quadrilateral is a parallelogram

21. The equation of Y axis is $X = 0$

22. The equation of X axis is $Y = 0$

23. The equation of a straight line parallel to X axis is $y = b$

24. The equation of a straight line parallel to Y axis is $x = c$

25. If $c > 0$, then the line $x = c$ lies right to the side of the Y axis

26. If $c < 0$, then the line $x = c$ lies left to the side of the Y axis

27. If $c = 0$, then the line $x = c$ is the Y axis itself

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28.Slope Intercept form

$$y = mx + c \quad m - \text{slope} \quad c - y \text{ intercept}$$

29.If a line with slope m , $m \neq 0$ makes x intercept d then the equation of the straight line is $y = m(x - d)$

30.If a line with slope m and passing through the origin, then the equation of the straight line is $y = mx$

31.For, the point (x, y) in a xy plane, the x coordinate x is called "Abscissae". and the y coordinate y is called "Ordinate"

32.For converting Celsius to Fahrenheit is $F = \frac{9}{5} C + 32$

33.Point-Slope Form

The equation of the straight line passing through a given point (x_1, y_1) and having a slope m $y - y_1 = m(x - x_1)$

34. Two Point Form

The equation of the straight line passing through (x_1, y_1) and (x_2, y_2)

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

35.Intercept Form

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

36.Equation of a line parallel to the line $ax + by + c = 0$ is $ax + by + k = 0$

37.Equation of a line perpendicular to the line $ax + by + c = 0$ is

$$bx - ay + k = 0$$

38.Two straight lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ where the coefficients are non-zero are

(i) parallel if and only if $\frac{a_1}{a_2} = \frac{b_1}{b_2}$ i.e. $a_1b_2 - a_2b_1 = 0$

(ii) perpendicular if and only if $a_1a_2 + b_1b_2 = 0$