DAY 30

MCA CET 2025

MATHS

RECTANGULAR CARTESIAN SYSTEM

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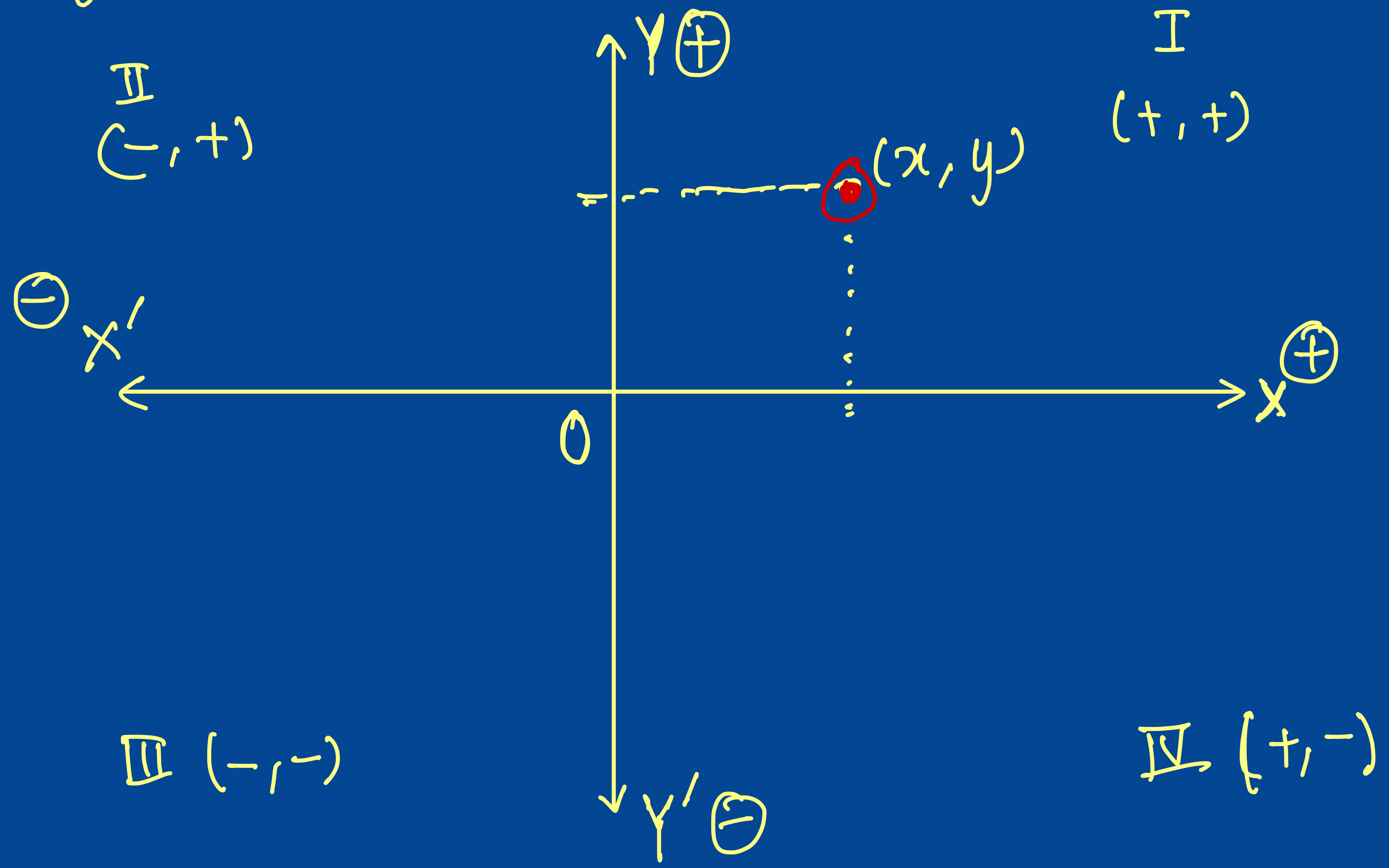
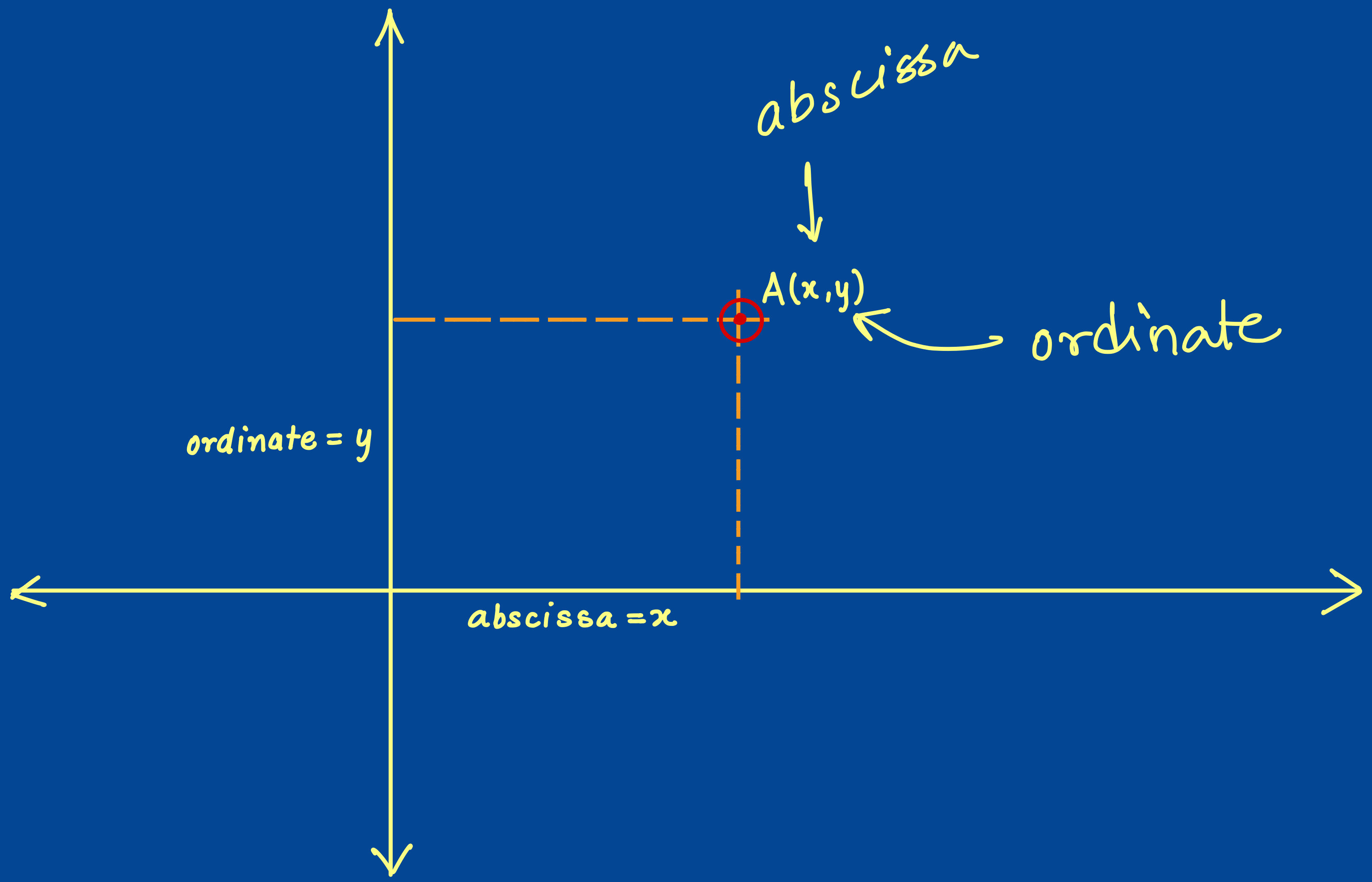
Rectangular Co-ordinate Axes.





abscissa
A(x,y)
ordinate
ordinate = y
abscissa = x

Distance Formula

between two points $A(x_1, y_1)$ and $B(x_2, y_2)$

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

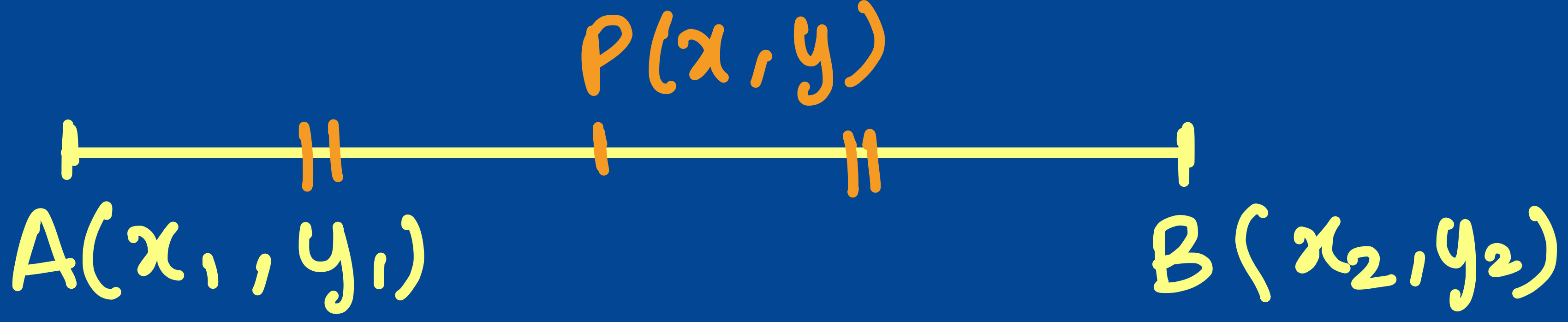
Section Formula

Point $P(x, y)$ divides seg $A(x_1, y_1)$ and $B(x_2, y_2)$ in a ratio of $m:n$

$$x = \frac{mx_2 + nx_1}{m+n} \qquad y = \frac{my_2 + ny_1}{m+n}$$

Midpoint Formula.

$m : n = 1 : 1$



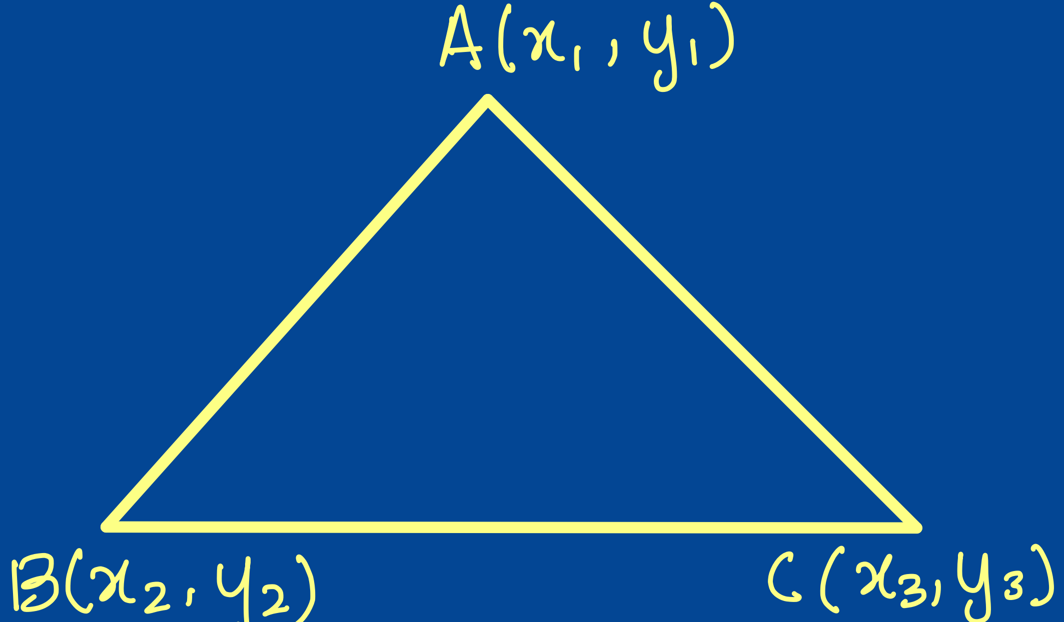
$$x = \frac{x_2 + x_1}{2}$$

$$y = \frac{y_2 + y_1}{2}$$

$$\boxed{x = \frac{x_1 + x_2}{2}}$$

$$\boxed{y = \frac{y_1 + y_2}{2}}$$

Area of triangle



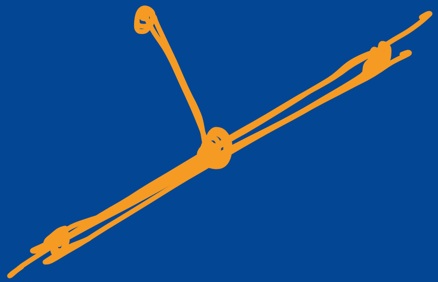
$$\text{Area} = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

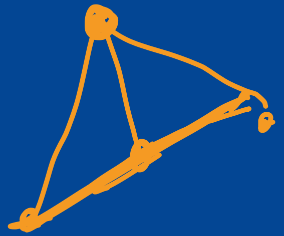
$$= \frac{1}{2}\left|\left[x_1(y_2 - y_3) - x_2(y_1 - y_3) + x_3(y_1 - y_2)\right]\right|$$

$$+\; x_2(y_3 - y_1)$$

Condition of collinearity of 3 points

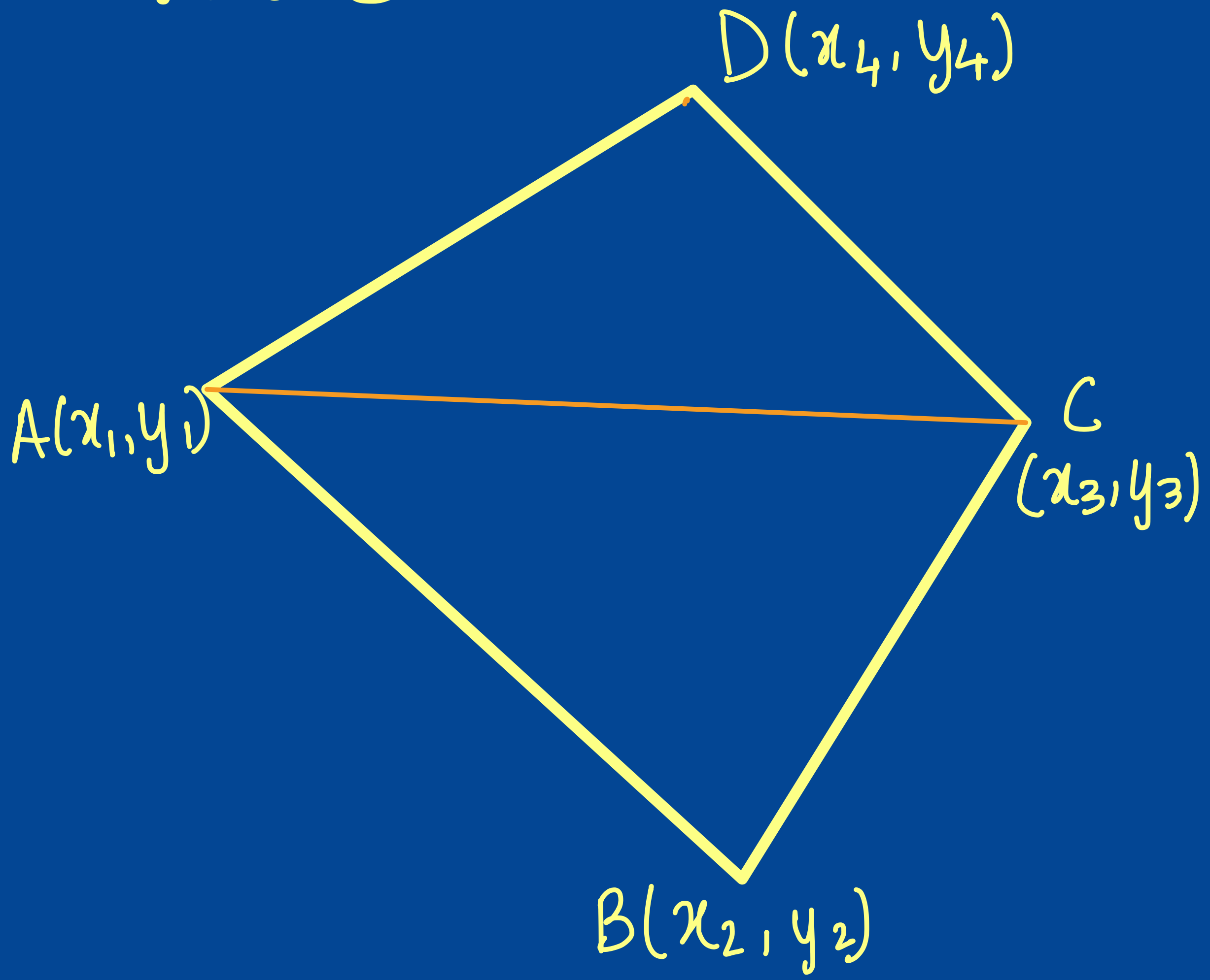
$A(\Delta) = 0$





$$\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = 0$$

Area of a quadrilateral

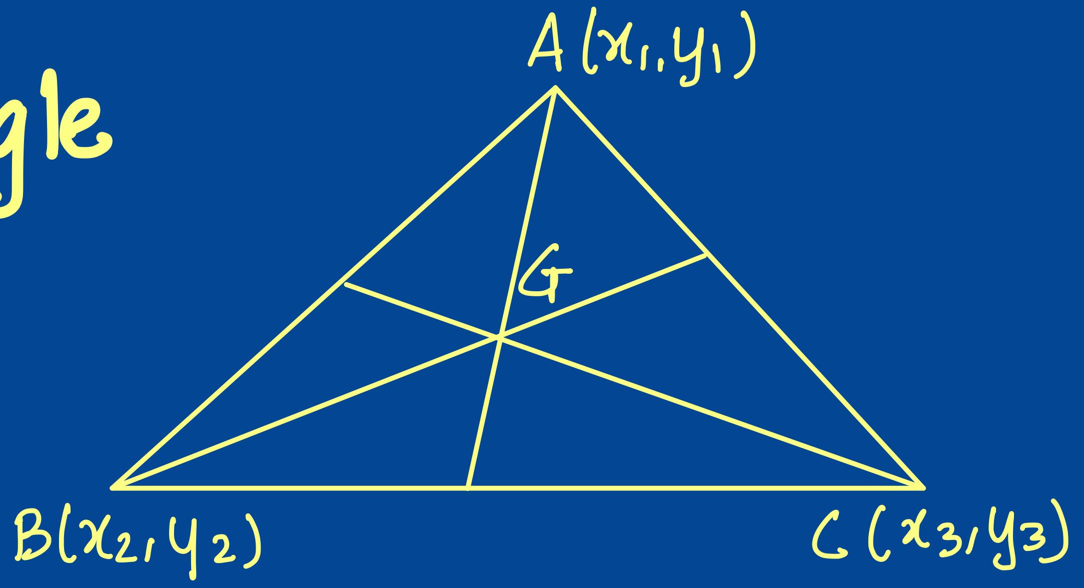


Area of quadrilateral

= |Area of ΔABC| + |Area of ΔACD|

$$= \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} + \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_3 & y_3 & 1 \\ x_4 & y_4 & 1 \end{vmatrix}$$

Centroid of a triangle

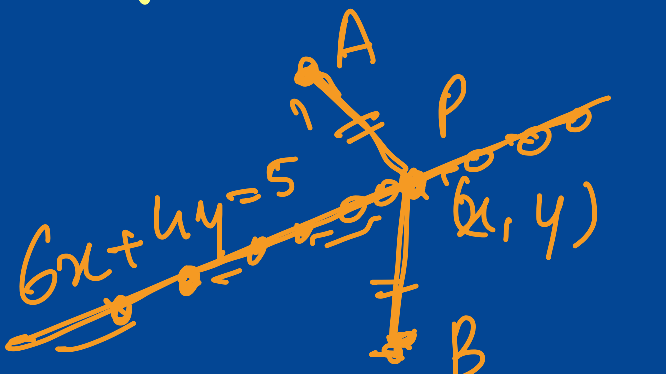


$$G = \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right)$$

LOCUS

The curve described by any point which moves under the given condition is called locus.

e.g. The equation of locus of a point equidistant from the point A(1, 3) and B(-2, 1) is ______



$$PA = PB$$

$$(x-1)^2 + (y-3)^2 = (x+2)^2 + (y-1)^2$$

$$x^2 + 1 - 2x + y^2 + 9 - 6y = x^2 + 4 + 4x + y^2 + 1 - 2y$$

$$-2x - 4x - 6y + 2y = 4 + 1 - 1 - 9 \Rightarrow -6x - 4y = -5$$

$$\Rightarrow \boxed{6x + 4y = 5}$$

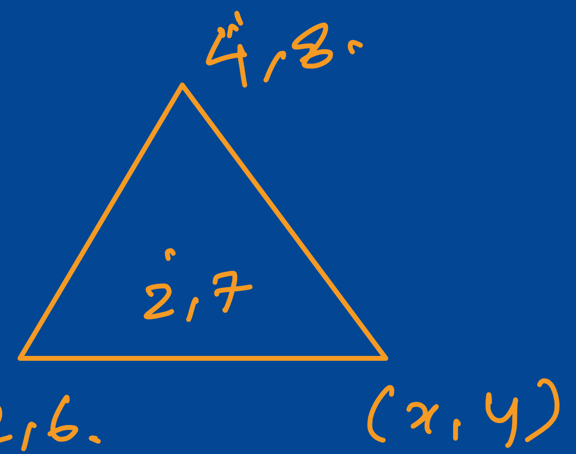
The centroid of a triangle is (2, 7) and two of its vertices are (4, 8) and (-2, 6). The third vertex is

(a) (0, 0)

(b) (4,7)

(c) (7, 4)

(d) (7,7)



$$x = \frac{x_1 + x_2 + x_3}{3}$$

$$2 = \frac{4 - 2 + x_3}{3} \Rightarrow 6 = 2 + x_3 \Rightarrow x_3 = 4$$

$$y = \frac{y_1 + y_2 + y_3}{3}$$

$$7 \times 3 = 21 = 14 + y_3$$

$$y_3 = 7$$

If the points (k, 3), (2, k) and (-k, 3) are collinear, then the values of k are

(a) 2, 3

(b) 1, 0

(c) 1, 2

(d) 0, 3

$$\begin{vmatrix} k & 3 & 1 \\ 2 & k & 1 \\ -k & 3 & 1 \end{vmatrix} = 0$$

$$k(k-3) - 2(3-3) - k(3-k) = 0$$

$$k^2 - 3k - 3k + k^2 = 0$$

$$2k^2 - 6k = 0$$

$$(2k)(k-3) = 0$$

$2k = 0$

$k = 0$

$k - 3 = 0$

$k = 3$

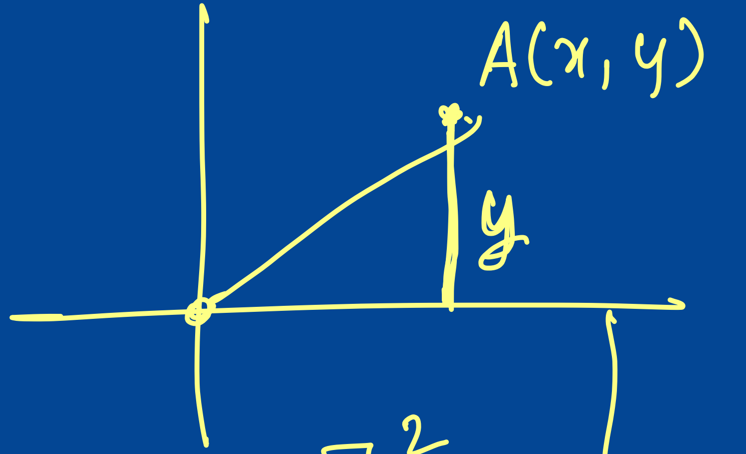
What is the equation of the locus of a point, which moves such that 4 times its distance from the X-axis, is the square of its distance from the origin?

(a) $x^2 + y^2 - 4y = 0$

(b) $x^2 + y^2 - 4|y| = 0$

(c) $x^2 + y^2 - 4x = 0$

(d) $x^2 + y^2 - 4|x| = 0$



$4|y| = x^2 + y^2$

$\left[\sqrt{(x-0)^2 + (y-0)^2}\right]^2$ • $A(x, -y)$

$x^2 + y^2 - 4|y| = 0$

$x^2 + y^2$

If the area of the triangle with vertices (x, 0), (1, 1) and (0, 2) is 4 sq units, then the value of x is

(a) -2 (b) -4 (c) -6 (d) 8

$$\begin{vmatrix} x & 0 & 1 \\ 1 & 1 & 1 \\ 0 & 2 & 1 \end{vmatrix} = 4 \times 2 = 8$$

$$x(1-2) - 1(0-2) + 0(\ldots) = 8$$

$$-x + 2 = 8$$

$$-x = 8 - 2 \Rightarrow -x = 6$$

$$x = -6$$

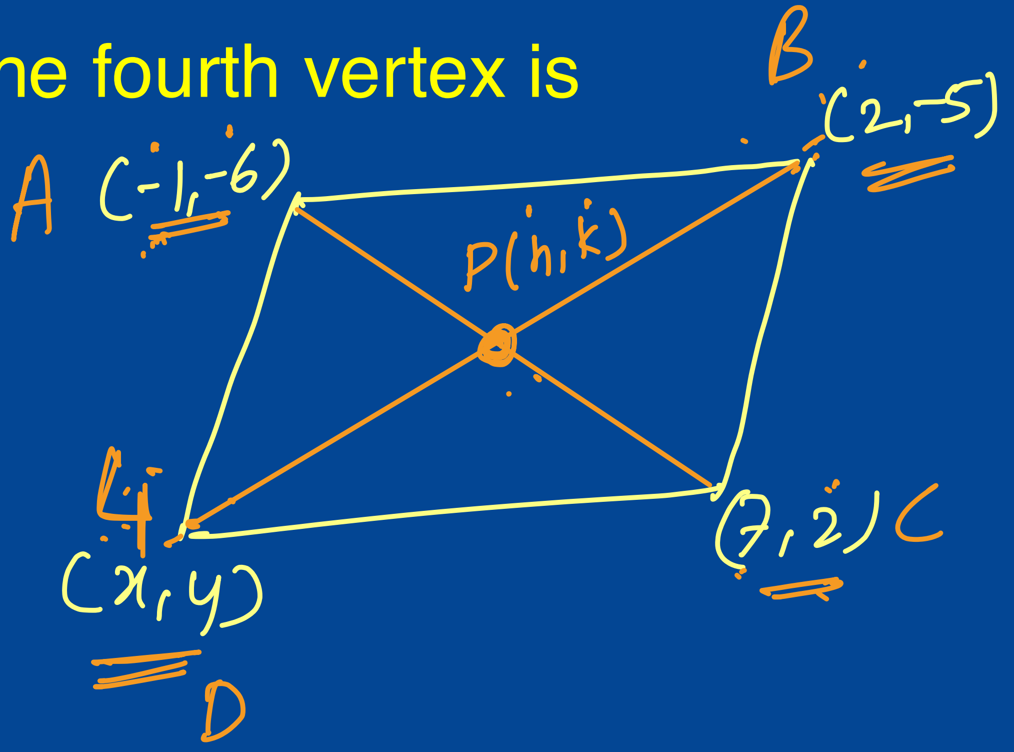
Three vertices of a parallelogram taken in order are (-1, -6), (2, -5) and (7, 2). The fourth vertex is

(a) ~~(1, 4)~~

(b) (4, 1)

(c) ~~(1, 1)~~

(d) ~~(4, 4)~~



$h = \frac{6}{2} = 3$

$3 = \frac{2+x}{2}$

$6 = 2 + x$

$x = 4$

$h = 3$

$\frac{-6+2}{2} = k$

$\frac{-4}{2} = k$

$k = -2$

$\frac{-5+y}{2} = -2$

$-4 + 5$

$y = 1$

If (a,b), (c,d) and (a-c,b-d) are collinear, then which one of the following is correct?

(a) bc - ad=0

(b) ab - cd=0

(c) bc + ad=0

(d) ab + cd=0

ad

bc

$$\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ a-c & b-d & 1 \end{vmatrix} = 0$$

$$a(d-b+d) - c(b-b+d) + (a-c)(b-d) = 0$$

$$a(2d-b) - cd + ab - ad - cb + cd = 0$$

$$2ad - ab - cd + ab - ad - cb + cd = 0$$

$$ad - cb = 0 \quad / \quad bc - ad = 0$$

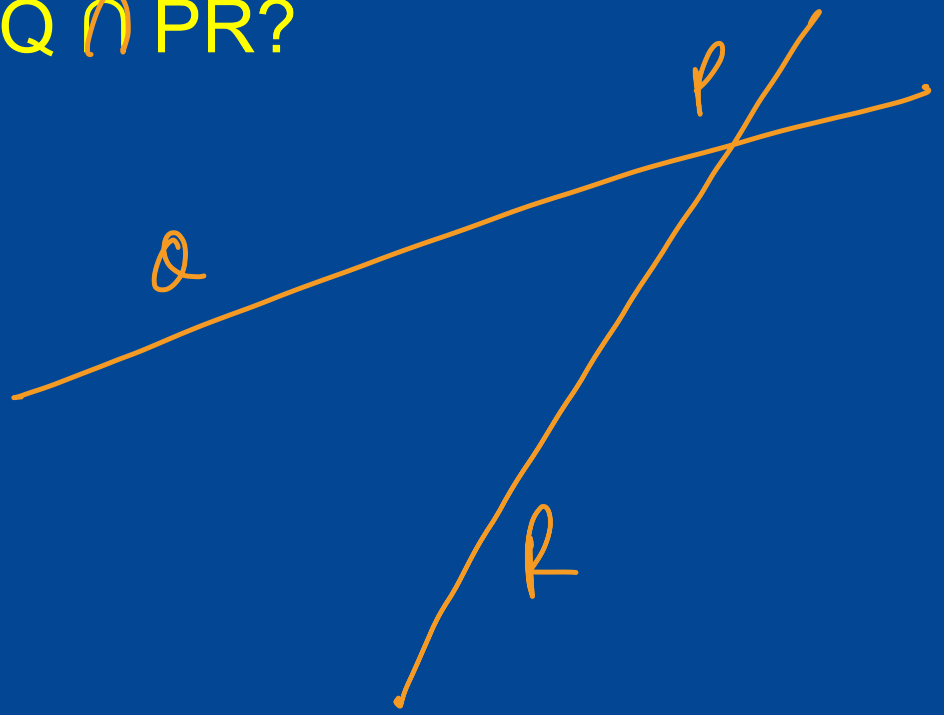
If P, Q and R are three non-collinear points, then what is the value of $PQ \cap PR$?

(a) Null set

(b) {P}

(c) {P,Q,R

(d) {Q,R)



If (a,0), (0,b) and (1,1) are collinear, what is the value (a + b - ab) ?

(a) 2 (b) 1 (c) 0 (d) -1

$$\begin{vmatrix} a & 0 & 1 \\ 0 & b & 1 \\ 1 & 1 & 1 \end{vmatrix} = 0$$

$$a(b-1) - 0[\quad] + 1[0-b] = 0$$

$$ab - a - b = 0$$

$$a + b - ab = 0$$

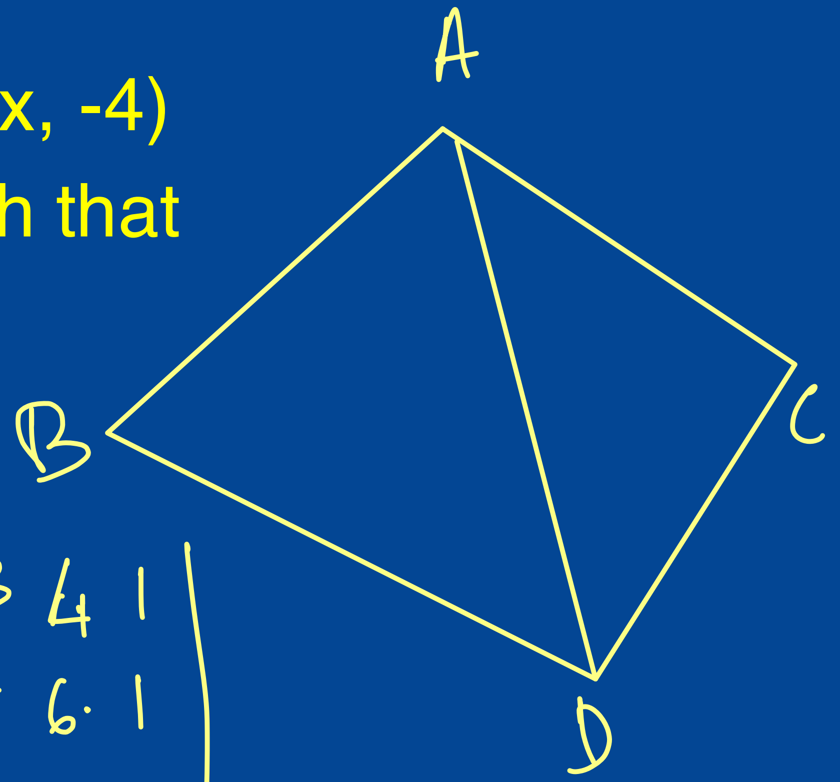
If A=(-3,4), B=(-1,-2), C=(5,6) and D=(x, -4) are the vertices of a quadrilateral, such that $A(\Delta ABD) = 2A(\Delta ACD)$ then x is

(a) 6

(b) 9

(c) 69

(d) 96



$$\frac{1}{2}\begin{vmatrix} -3 & 4 & 1 \\ -1 & -2 & 1 \\ x & -4 & 1 \end{vmatrix} = 2 \times \frac{1}{2}\begin{vmatrix} -3 & 4 & 1 \\ 5 & 6 & 1 \\ x & -4 & 1 \end{vmatrix}$$

$$\frac{1}{2}\left[-3[-2+4]+1[4+4]+x[4+2]\right] = \left[-3(6+4)-5(4+4)+x(4-6)\right]$$

$$\frac{1}{2}\left[-6+8+6x\right] = \left[-30-40-2x\right] \Rightarrow \frac{1}{2}\left|[+2+6x]\right| = \left|[70+2x]\right|$$

$$2+6x = 2(70+2x)$$

$$2+6x = 140+4x$$

$$2x = 138$$

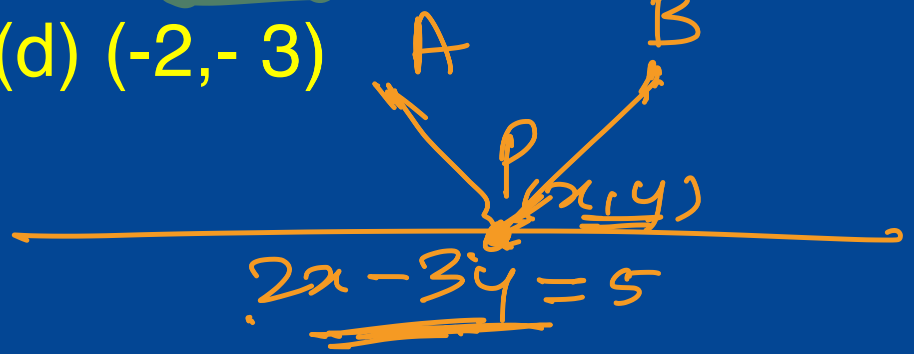
$$x = 69$$

P(x, y)

MCA CET

Which one of the following points on the line $2x - 3y = 5$ is equidistant from (1, 2) and (3, 4)? [2020]

(a) (7, 3) (b) (4, 1) (c) (1,-1) (d) (-2,- 3)



$$AP^2 = PB^2$$

$$(x-1)^2 + (y-2)^2 = (x-3)^2 + (y-4)^2$$

$$x^2 + 1 - 2x + y^2 + 4 - 4y = x^2 + 9 - 6x + y^2 + 16 - 8y$$

$$-2x + 6x - 4y + 8y = 9 + 16 - 1 - 4$$

$$4x + 4y = 20 \Rightarrow x + y = 5$$

$$3x + 3y = 15$$

$$2x - 3y = 5$$

$$3x + 3y = 15$$

$$5x = 20$$

$$x = 4$$

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