CHAPTER - 5

# CO - ORDINATE GEOMETRY

LONG QUESTIONS AND ANSWERS

Find distances of points C (-3, -2) and D (5, 2) from x-axis and y-axis.

#### **Solution:**

Distances of point C (-3, -2) from x-axis is 2 units in the negative direction and from y-axis is 3 units in the negative direction. Distances of point D (5, 2) from x-axis is 2 units and from y-axis is 5 units.

### Q. 2

Find the values of x and y, if two ordered pairs (x - 3, -6) and (4, x + y) are equal.

### **Solution:**

Here, two ordered pairs are equal.

⇒ Their first components are equal and their second components are separately equal.

$$\Rightarrow$$
 x - 3 = 4 and x + y = -6

$$\Rightarrow$$
 x = 7 and 7 + y = -6  $\Rightarrow$  y = -13

Hence, 
$$x = 7$$
 and  $y = -13$ 

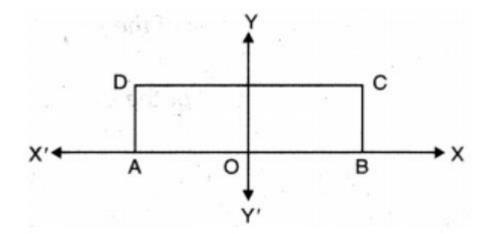
What is the shape of the quadrilateral formed by joining (1, 1), (6, 1), (4, 5) and (3, 5) on graph paper?



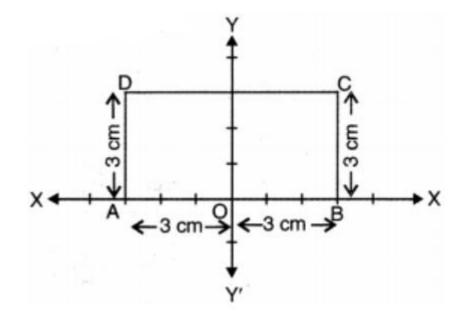
### Shape is trapezium

### Q. 4

In the given figure, ABCD is a rectangle with length 6 cm and breadth 3 cm. O is the mid-point of AB. Find the coordinates of A, B, C and D.



### **Solution:**



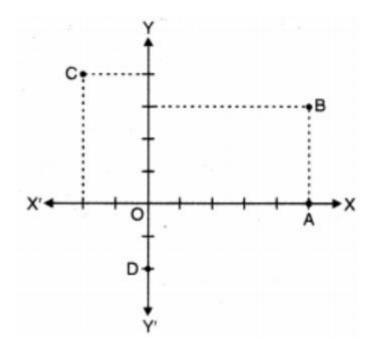
We have taken 1 cm = 1 unit and origin O is the midpoint of AB

 $\therefore$  OA = OB = 3 cm and BC = AD = 3 cm

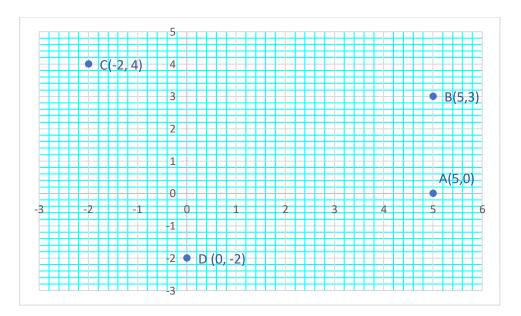
Thus, the coordinates of A are (-3, 0) the coordinates of B are (3, 0) the coordinates of C are (3, 3) the coordinates of D are (-3, 3)

Q. 5

Write the coordinates of A, B, C and D from the figure given alongside.



### **Solution:**



Coordinates of the point A are (5, 0)

Coordinates of the point B are (5, 3)

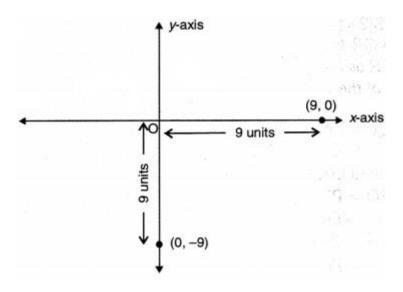
Coordinates of the point C are (-2, 4)
Coordinates of the point D are (0, -2)

### **Q.** 6

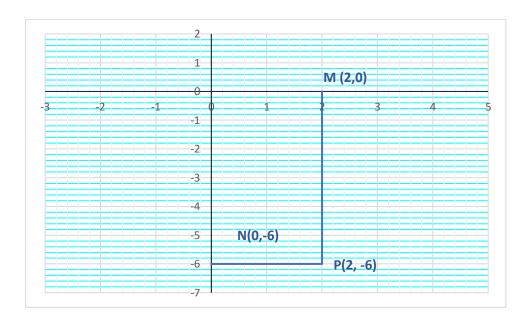
A point lies on x-axis at a distance of 9 units from y-axis. What are its coordinates? What -2 will be the coordinates of a point, if it lies on y-axis at a distance of -9 units from x-axis?

#### **Solution:**

As shown in graph, the coordinates of a point which lies on x-axis at a distance of 9 units from y-axis are (9, 0) and the coordinates of a point which lies at a distance of -9 units from x-axis are (0, -9).



Plot the point P (2, -6) on a graph paper and from it draw PM and PN perpendiculars to x-axis and y-axis respectively. Write the coordinates of the points M and N.



as shown in graph, coordinates of M are (2, 0) and coordinates of N are (0, -6).

### Q. 8

Without plotting the points indicate the quadrant in which they lie, if:

(i) ordinate is 5 and abscissa is -3

- (ii) abscissa is -5 and ordinate is -3
- (iii) abscissa is -5 and ordinate is 3
- (iv) ordinate is 5 and abscissa is 3

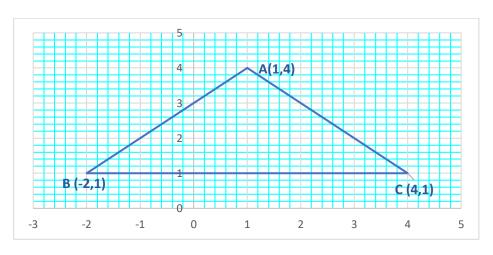
#### **Solution:**

- (i) Clearly, point (-3, 5) lies in 2nd quadrant.
- (ii) Clearly, point (-5, -3) lies in 3rd quadrant.
- (ii) Clearly, point (-5, 3) lies in 2nd quadrant.
- (iv) Clearly, point (3, 5) lies in 1st quadrant.

# Q. 9

Plot the points A(1, 4), B(-2, 1) and C(4, 1). Name the figure so obtained on joining them in order and also, find its area.

### **Solution:**



### Triangle.

Area of  $\triangle ABC = 1/2 \times BC \times Height$ 

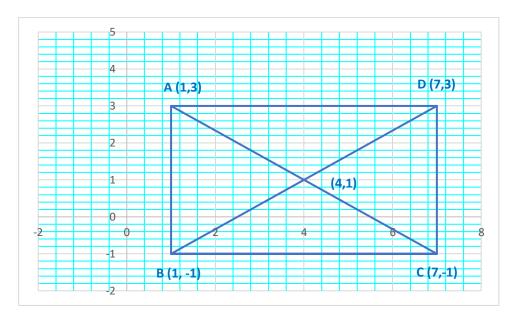
$$= 1/2 \times 6 \times 3$$

= 9 sq. units

### Q. 10

Plot the following points, join them in order and identify the figure thus formed: A (1, 3), B (1, -1), C (7, -1) and D (7, 3). Write the coordinates of the point of intersection of the diagonals.

### **Solution:**

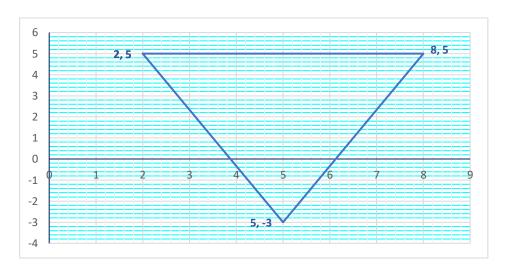


ABCD is a rectangle.

Point of intersection of the diagonals AC and BD is (4, 1).

Q. 11

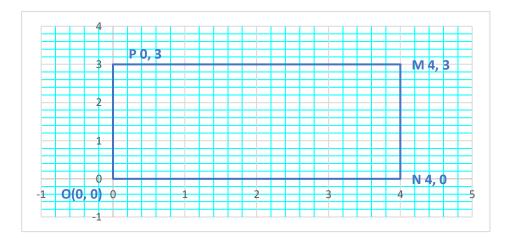
Plot the points A(2, 5), B(8,5) and C(5, -3) and join AB, BC and CA. What figure do you obtain? Solution:



We obtain an isosceles triangle in which AC = BC.

### Q. 12

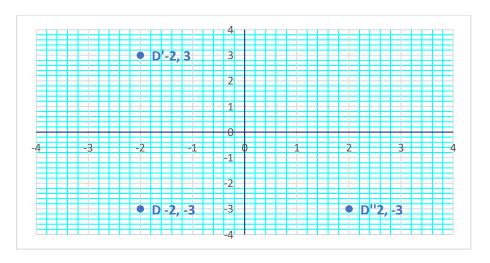
- (i) Plot the points M(4, 3), N(4, 0), O(0, 0), P(0, 3).
- (ii) Name the figure obtained by joining MNOP.
- (iii) Find the perimeter of the figure. Solution:



- (ii) As shown in graph, the figure obtained by joining MNOP is rectangle.
- (iii) Perimeter of rectangle MNOP = 2 (ON + OP) =  $2(4+3) = 2 \times 7 = 14$  units.

Plot D (-2, -3) on the graph paper. Also, plot reflections of D in x-axis and y-axis.

### **Solution:**



Reflection of D(-2, -3) in x-axis is D'(-2, 3) and reflection of D(-2, -3) in y-axis is D'(2, -3).

### Q. 14

If the coordinates of a point M are (-2, 9) which can also be expressed as (1 + x, y) and y > 0, then find in which quadrant do the following points lie: P (y, x), Q (2, x), R (x, y - 1), S (2x, -3y).

#### **Solution:**

Here, M(-2, 9) can also be expressed as  $(1 + x, y^2)$ 

$$\therefore (1+x, y^2) \Leftrightarrow (-2, 9) \text{ and } y > 0$$

$$\Rightarrow$$
 1 + x = -2 and y<sup>2</sup> = 9

$$\Rightarrow$$
 x = -3 and y =  $\sqrt{9}$  = 3 ( $\because$  y > 0)

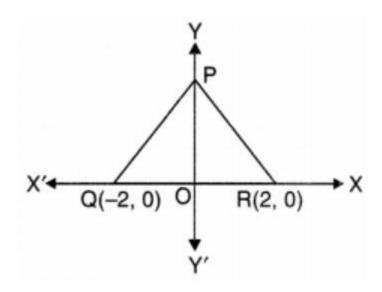
P(y, x) = P(3, -3), it lies in IV quadrant

Q(2, x) = Q(2, -3), also lies in IV quadrant

 $R(x^2, y - 1) = R(-3)^2, 3 - 1) = R(9, 2)$ , it lies in I quadrant

$$S(2x, -3y) = S(2 \times (-3), -3 \times 3) = S(-6, -9)$$
, it lies in III quadrant

In the given figure, PQR is an equilateral triangle with coordinates of Q and R as (-2, 0) and (2, 0) respectively. Find the coordinates of the vertex P. Solution:



### Here,

$$QR = OQ + OR$$
.

$$= 2 + 2 = 4$$
 units

 $\therefore \triangle PQR$  is an equilateral triangle.

$$\therefore PQ = PR = QR = 4 \text{ units}$$

In right-angled  $\triangle OPQ$ ,  $\angle POQ = 90^{\circ}$ 

: We have 
$$PQ^2 = OP^2 + OQ^2$$

$$\Rightarrow \mathbf{OP}^2 = \mathbf{PQ}^2 - \mathbf{OQ}^2$$

$$=4^2-2^2=16-4=12$$

$$\Rightarrow$$
 **OP** =  $\sqrt{12}$  =  $2\sqrt{3}$  units

: The coordinates of P are  $(0, 2\sqrt{3})$ .

### Q. 16

Find the distance between each of following pairs of points. A (3,4), B (5,2)

### **SOLUTION**

**Suppose coordinates of point** 

A are A  $(x_1, y_1)$  and of point B are B $(x_2, y_2)$ 

$$x_1 = 3$$
  $y_1 = 4$   $x_2 = 5$ ,  $y_2 = 2$ 

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

$$AB = \sqrt{(5-3)^2 + (2-4)^2}$$

$$AB = \sqrt{(2)^2 + (-2)^2}$$

$$AB = \sqrt{4+4}$$

$$AB = \sqrt{8}$$

$$AB=2\sqrt{2}$$

Determine whether points are collinear. A (1, -3), B

$$(2, -5), C(-4, 7)$$

**SOLUTION** 

$$\mathbf{d}(\mathbf{A},\mathbf{B}) = \sqrt{(\mathbf{x}_2 - \mathbf{x}_1)^2 + (\mathbf{y}_2 - \mathbf{y}_1)^2}$$

$$d(A,B) = \sqrt{(2-1)^2 + (-5-(-3))^2}$$

$$d(A,B) = \sqrt{(1)^2 + (-5+3)^2}$$

$$d(A,B) = \sqrt{(1)^2 + (-2)^2}$$

$$d(A,B) = \sqrt{1+4}$$

$$d(A,B) = \sqrt{5}$$
 -----(1)

$$\mathbf{d}(\mathbf{B},\mathbf{C}) = \sqrt{(-4-2)^2 + \{7-(-5)\}^2}$$

$$d(A,C) = \sqrt{(-6)^2 + (12)^2}$$

$$d(B,C) = \sqrt{36 + 144}$$

$$d(A,B) = \sqrt{180}$$

$$\mathbf{d}(\mathbf{A},\mathbf{B}) = \sqrt{2X2X3X3X5}$$

$$d(A,B) = 6\sqrt{5}$$
-----(2)

Determine whether points are P (2, -2), Q (7, 3), R (11, -1) and R (6, -6) are vertices of parallelogram SOLUTION

$$PQ = \sqrt{(8-3)^2 + \{(4-(-3))^2\}^2}$$

$$PQ = \sqrt{(5)^2 + (-5)^2}$$

$$PQ = \sqrt{25 + 25}$$

**PQ** = 
$$\sqrt{50}$$

$$PQ = \sqrt{5X5X2}$$

$$PQ = 5\sqrt{2}$$
 -----(1)

$$\mathbf{QR} = \sqrt{(12-8)^2 + \{-1-(3)\}^2}$$

$$\mathbf{QR} = \sqrt{(4)^2 + (-4)^2}$$

$$QR = \sqrt{16 + 16}$$

$$QR = \sqrt{32}$$

$$\mathbf{QR} = \sqrt{2X2X2X2X2}$$

$$QR = 4\sqrt{2}$$
-----(2)

$$RS = \sqrt{(7-12)^2 + (-6-(-1))^2}$$

$$RS = \sqrt{(-5)^2 + \{-5\}^2}$$

$$RS = \sqrt{25 + 25}$$

$$RS = \sqrt{50}$$

$$RS = \sqrt{5X5X2}$$

$$RS = 5\sqrt{2}$$
 -----(3)

$$PS = \sqrt{(6-2)^2 + (-6-(-2))^2}$$

$$PS = \sqrt{(4)^2 + \{-4\}^2}$$

$$PS = \sqrt{32}$$

$$PS = \sqrt{2X2X2X2X2}$$

$$PS = 2X2\sqrt{2}$$

$$PS = 4\sqrt{2}$$
-----(4)

In **PQRS** 

$$PQ = RS$$
 -----{From (1) and (3)}

$$QR = PS$$
 -----{From (2) and (4)}

A quadrilateral is parallelogram, if both the pairs of opposite sides are congruent

☐ PQRS is parallelogram

ANS: P(2,-2), Q(7,3), R(11,-1) and R(6,-6) are vertices of parallelogram

# Q. 19

Prove that the points. A (-4, -7), B (-1, 2), C (8, 5) and D (5, -4) are vertices of rhombus ABCD

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**SOLUTION** 

A (-4,-7), B(-1,2), C(8,5) and D(5,-4)

### Using the distance formula

$$AB = \sqrt{\{(-1 - (-4))^2 + \{(2 - (-7))^2\}^2 + ((2 - (-7))^2\}^2}$$

$$AB = \sqrt{(3)^2 + (9)^2}$$

$$AB = \sqrt{9 + 81}$$

$$AB = \sqrt{80}$$

$$AB = \sqrt{2X3X3X5}$$

$$AB = 3\sqrt{10}$$
 -----(1)

$$BC = \sqrt{\{(8-(-1))^2 + (5-2)^2\}}$$

$$BC = \sqrt{(9)^2 + (3)^2}$$

$$BC = \sqrt{90}$$

$$BC = \sqrt{2X3X3X5}$$

$$BC = 3\sqrt{10} \tag{2}$$

$$AD = \sqrt{\{5 - (-4)\}^2 + \{-4 - (-7)\}^2}$$

$$\mathbf{AD} = \sqrt{9^2 + 3^2}$$

$$AD = \sqrt{81 + 9}$$

$$AD = \sqrt{90}$$

$$AD = \sqrt{2X3X3X5}$$

$$AD = 3\sqrt{10}$$
 ----(3)

$$CD = \sqrt{(5-8)^2 + (-4-(5))^2}$$

$$CD = \sqrt{(-3)^2 + (-9)^2}$$

$$CD = \sqrt{9 + 81}$$

$$CD = \sqrt{90}$$

$$CD = \sqrt{2X3X3X5}$$

$$CD = 3\sqrt{10}$$
-----(4)

$$AB = BC = CD = AD$$
-----{From (1), (2), (3), (4)}

As all the sides of the quadrilateral are equal

**□ABCD** is rhombus

ANS A (-4,-7), B(-1,2), C(8,5) and D(5,-4) are vertices of rhombus

Q. 20

If the distance between P(m, 7) & Q(1, 15), is 10 Find m NAVNEET PAGE 108

**SOLUTION** 

P(m, 7) and Q(1, 15)

### By distance formula

$$PQ = \sqrt{(m-1)^2 + (7-15)^2}$$

$$10 = \sqrt{(m-1)^2 + (-8)^2}$$

### **Squaring Both sides**

$$100 = (m-1)^2 + (-8)^2$$

$$(m-1)^2 = 100 - 64$$

$$(m-1)^2 = 36$$

m-1=+/-6 --- (Taking square root on both the sides)

#### **Either**

$$m-1=6$$
 or  $m-1=-6$ 

$$m = 7$$
 or  $m = -5$ 

ANS: 
$$m = 7$$
 or  $m = -5$ 

### Q. 21

Check whether the points. L (1, 2), M (1, 6), N (1 +

 $2\sqrt{3}$ , 4) are vertices of an equilateral triangle

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#### **SOLUTION**

L (1, 2), M (1, 6), N (1+ 
$$2\sqrt{3}$$
, 4)

$$LM = \sqrt{(1-1)^2 + (6-2)^2}$$

$$LM = \sqrt{(0)^2 + (4)^2}$$

$$LM = \sqrt{(4)^2}$$

$$LM = 4$$

$$MN = \sqrt{\{(1+2\sqrt{3})-(1)\}^2+\{4-6\}^2}$$

$$MN = \sqrt{(2\sqrt{3})^2 + \{-2\}^2}$$

$$MN = \sqrt{12 + 4}$$

$$MN = \sqrt{16}$$

$$MN = 4$$

$$LN = \sqrt{\{(1+2\sqrt{3})-(1)\}^2+\{4-2\}^2}$$

$$LN = \sqrt{(2\sqrt{3})^2 + \{2\}^2}$$

$$LN = \sqrt{12 + 4}$$

$$LN = \sqrt{16}$$

$$LN = 4$$

$$\therefore$$
 LM = MN = LN

∴ ∆LMN is an equilateral triangle

ANS: L ( 1,2), M (1,6), N (1+2 $\sqrt{3}$ , 4) are vertices of an equilateral triangle

Q. 22

Point M divides the line segment joining the points P (-1, 7) and Q (4, -3) in the ratio 2:3 Find the coordinates of point M. NAVNEET PAGE 110 SOLUTION

P(-1, 7) and Q(4,-3), Let M(x,y)

Asume coordinates of point P are  $(x_1, y_1)$  and Q are  $(x_2, y_2)$ , then  $x_1 = -1$ ,  $y_1 = 7$ ,  $x_2 = 4$ ,  $y_2 = -3$ 

M divides PQ in the ratio 2:3

..m : n = 2:3

By section formula

$$\therefore \mathbf{x} = \frac{\mathbf{m}x_2 + \mathbf{n}x_1}{m + n}$$

$$\therefore \mathbf{x} = \frac{2(4) + 3(-1)}{2 + 3}$$

$$\therefore \mathbf{x} = \frac{8-3}{5}$$

$$\therefore \mathbf{x} = \frac{5}{5}$$

$$\therefore x = 1$$

$$\therefore \mathbf{y} = \frac{\mathbf{m}y_2 + \mathbf{n}y_1}{m+n}$$

$$y = \frac{2(-3)+3(7)}{2+3}$$

$$\therefore y = \frac{-6+21}{5}$$

$$\therefore y = \frac{15}{5}$$

$$\therefore$$
 y = 3

ANS: M(1,3) divides the line segment joining the points P(-1,7), Q(4,-3) in the ratio 2:3

Determine the ratio in which R (-1, 6) divides the line segment joining the points A (-3, 10) and B (6, -1)

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#### **SOLUTION**

P (-3, 10) and Q (6, -8) and R (-1, 6)

Let A has co-ordinate ( $x_1$ ,  $x_2$ ) and B has coordinates ( $y_1$ ,  $y_2$ ) and R has coordinates ( $x_1$ ,  $x_2$ )

Here, 
$$x_1 = -3$$
,  $y_1 = 10$ ,  $x_2 = 6$ ,  $y_2 = -8$ ,  $x = -1$  and  $y = 6$ 

# By section formula

$$\therefore \mathbf{x} = \frac{\mathbf{m}x_2 + \mathbf{n}x_1}{m + n}$$

$$\therefore -1 = \frac{m(6) + n(-3)}{m + n}$$

$$\therefore$$
 -1  $(m+n) = m(6) + n(-3)$ 

$$m - n = m(6) + n(-3)$$

$$\therefore$$
 -  $m - n = 6m - 3n$ 

$$\therefore$$
 6 $m + m = 3n - n$ 

$$\therefore 7m = 2n$$

$$\therefore \frac{m}{n} = \frac{2}{7}$$

m: n = 2: 7

ANS: R divides line segment AB in the ratio 2:7

### Q. 24

Find the ratio in which R (a, 7) divides the line segment joining the points P (8, 9) and Q (1, 2). Also find a NAVNEET PAGE 111

#### **SOLUTION**

P(8, 9) and Q(1, 2), R(a, 7)

Let the point R divide the segment PQ in the ratio m: n

$$7 = \frac{m(2) + n(9)}{m+n}$$

$$\therefore 7 = \frac{2m+9n}{m+n}$$

$$\therefore 7 (m+n) = 2m + 9n$$

$$\therefore 7 m + 7n = 2m + 9n$$

$$\therefore 7 m - 2m = 9n - 7n$$

$$\therefore 5 m = 2n$$

$$\frac{m}{n}=\frac{2}{5}$$

R divides segment PQ in the ratio 2:5

By section formula

$$a = \frac{2(1) + 5(8)}{2 + 5}$$

$$\therefore a = \frac{2+40}{2+5}$$

$$\therefore a = \frac{42}{7}$$

$$\therefore a = 6$$

ANS: R divides line segment PQ in the ratio 2:5 and value of a is 6

### Q. 25

What are the coordinates of midpoint of the segment joining the points (24, 20) and (0, 6)?

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**SOLUTION** 

Let P (24, 20) and Q (0, 6)

Let A (x, y) be its midpoint

If A  $(x_1, y_1)$  and B  $(x_2, y_2)$ 

$$x_1 = 24$$
,  $y_1 = 20$  and

$$x_2 = 0$$
,  $y_2 = 6$ 

By midpoint formula

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

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

$$\therefore \mathbf{x} = \frac{24+0}{2}$$

$$y = \frac{20+6}{2}$$

$$\therefore \mathbf{x} = \frac{24}{2}$$

$$y=\frac{26}{2}$$

$$\therefore \mathbf{x} = \mathbf{12}$$

$$y = 13$$

ANS: Coordinates of midpoint of the segment joining the points P (22, 20) and Q (0, 16) are A(12, 13)

# Q. 26

Find the centroid of triangle whose vertices are given below (-6, 5) and (1, -1), (7, 4) NAVNEET PAGE 112

### **SOLUTION:**

Let P (-6, 5) and Q (1, -1), R (7, 4)

Let G (x, y) be centroid

If A  $(x_1, y_1)$ , B  $(x_2, y_2)$  and C  $(x_3, y_3)$ 

$$x_1 = -6$$
,  $y_1 = 5$ ,

$$x_2 = 1$$
,  $y_2 = -1$ 

$$x_3 = 7$$
,  $y_3 = 4$ 

By centroid formula

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

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

$$\therefore x = \frac{-6+1+7}{3}$$
  $y = \frac{5-1+4}{3}$ 

$$y = \frac{5-1+4}{3}$$

$$\therefore \mathbf{x} = \frac{2}{3}$$

$$y=\frac{8}{3}$$

$$\therefore X = \frac{2}{3}$$

$$y = \frac{8}{3}$$

ANS: the centroid of triangle is  $(\frac{2}{3}, \frac{8}{3})$ 

Q. 27

In  $\triangle$  PQR, G (-4, -7) the centroid. If P (-14, -19) and

Q(3, 5), then find the coordinates of R

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#### **SOLUTION**

Let P (-14, -19) and Q (3, 5), G (-4, -7)

Suppose P has coordinates  $(x_1, y_1)$ , Q has coordinates  $(x_2, y_2)$ , and C has coordinates (x, y)

Here 
$$x_1 = -14$$
,  $y_1 = -19$ ,  $x_2 = 3$ ,  $y_2 = 5$ ,  $x_3 = -4$ ,  $y_3 = -7$ 

# By centroid formula

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

$$\therefore -4 = \frac{-14+3+x_3}{3}$$

$$-12 = -11 + x_3$$

$$\therefore x_3 = -1$$

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

$$\therefore -7 = \frac{-19+5+y_3}{3}$$

$$\therefore -21 = -14 + y_3$$

$$\therefore y_3 = +14-21$$

$$\therefore y_3 = -7$$

ANS: C has coordinates (-1, -7)

In  $\triangle$  PQR, P (a, -6), Q (2, 3) and R (-6, b), are the coordinates of vertices of triangle whose centroid is G (1, 5), Find a and b NAVNEET PAGE 113 SOLUTION:

Let

P(h, -6), and Q(2, 3), R(-6, k), G(1, 5),

Suppose P has coordinates  $(x_1, y_1)$ , Q has coordinates  $(x_2, y_2)$ , and R has co-ordinates  $(x_3, y_3)$ 

Here 
$$x_1 = \mathbf{h}$$
,  $y_1 = -6$ ,  $x_2 = 2$ ,  $y_2 = 3$ ,  $x_3 = -6$ ,  $y_{3=}$  k

By centroid formula

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

$$\therefore 1 = \frac{h+2-6}{3}$$

$$\therefore$$
 3 = h - 4

$$\therefore$$
 h = 4 + 3

$$\therefore$$
 h = 7

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

$$\therefore 5 = \frac{-6+3+y}{3}$$

$$\therefore 15 = -3 + k$$

$$k = 15 + 3$$

$$\therefore k = 18$$

**ANS:** 
$$a = 7$$
,  $b = 18$ 

A line is passing through points A (1, 2), B (3, 6) Find the slope. NAVNEET PAGE 117

### **SOLUTION**

Let A (1, 2), and B (3, 6),

Suppose A has coordinates  $(x_1, y_1)$ , B has coordinates  $(x_2, y_2)$ ,

then 
$$x_1 = 1$$
,  $y_1 = 2$ ,  $x_2 = 3$ ,  $y_2 = 6$ ,

Slope of line AB = 
$$\frac{y_2 - y_1}{x_2 - x_1}$$

Slope of line AB = 
$$\frac{6-2}{2-1}$$

Slope of line AB 
$$=\frac{2}{1}$$

Slope of line 
$$AB = 2$$

ANS: Slope of line AB = 2

### Q. 30 navneet 118.

Determine whether the points are collinear P (-1, -

#### **SOLUTION**

$$P(-1, -1), Q(0, 1), R(1, 3)$$

Slope of line PQ = 
$$\frac{y_2 - y_1}{x_2 - x_1}$$

Slope of line PQ = 
$$\frac{1-(-1)}{0-(-1)}$$

Slope of line PQ = 
$$\frac{2}{1}$$

Slope of line 
$$PQ = 2$$

Slope of line QR = 
$$\frac{3-1}{1-0}$$

Slope of line  $QR = \frac{2}{1}$ 

Slope of line QR = 2

Slope of line PQ = Slope of line QR and Q is the common point

ANS∴Points P, Q and R are collinear

### Q. 31 navneet 119.

A (2, -2), B (0, 8), C (-10, 6) are vertices of triangle, then find the slope of each side.

# **SOLUTION**

Let A (2, -2) and B (0, 8),

Slope of line AB = 
$$\frac{8-(-2)}{0-2}$$

Slope of line AB 
$$=\frac{10}{-2}$$

Slope of line 
$$AB = -5$$

Slope of line BC = 
$$\frac{6-8}{-10-0}$$

Slope of line BC = 
$$\frac{-2}{-10}$$

Slope of line BC 
$$=\frac{2}{10}=\frac{1}{5}$$

Slope of line AC = 
$$\frac{6-(-2)}{-10-2}$$

Slope of line AC = 
$$\frac{8}{-12}$$

Slope of line AC = 
$$\frac{2}{-3}$$

**ANS**:

Slope of line AB is-5, Slope of line BC is  $\frac{1}{5}$  and Slope of line AC is  $\frac{2}{-3}$ 

Q. 32

Show that P (-4, -7), Q (-1, 2), R (8, 5) and S (5, -

4) are vertices of a parallelogram

#### **SOLUTION**

Slope of line PQ = 
$$\frac{2-(-7)}{-1-(-4)}$$

Slope of line PQ = 
$$\frac{2+7}{-1+4}$$

Slope of line PQ = 
$$\frac{9}{3}$$
  
Slope of line PQ = 3

Slope of line QR = 
$$\frac{5-2}{8-(-1)}$$

Slope of line QR =  $\frac{3}{9}$ 

Slope of line QR =  $\frac{1}{3}$  ......(2)

Slope of line RS =  $\frac{-4-5}{5-9}$ 

Slope of line RS =  $\frac{-9}{-2}$ 

Slope of line RS = 3 .....(3)

**Slope of line PS** =  $\frac{-4-(-7)}{5-(-4)}$ 

Slope of line PR =  $\frac{-4+7}{5+4}$ 

Slope of line PR =  $\frac{3}{6}$ 

Slope of line PR =  $\frac{1}{3}$ .....(4)

From (1) and (2)

Slope of line AB = Slope of line CD

Line AB || line CD

(If two lines have equal slopes then they are parallel)

**Slope of line PQ = Slope of line RS** 

Line PQ | line RS

(If two lines have equal slopes then they are parallel)

☐ PQRS is parallelogram

ANS: P (- 4, -7), Q (-1, 2), R (8, 5) and S (5, -4) are vertices of parallelogram

Q. 33 navneet 120.

Find k if P (2, -3), Q (-2, k), and slope of the line PQ is -5

**SOLUTION** 

$$P(2, -3), Q(-2, k)$$

Slope of line PQ = -5

$$-5 = \frac{k - (-3)}{-2 - 2}$$

$$-5 = \frac{\mathbf{k} - (-3)}{-4}$$

$$\therefore 20 = (k+3)$$

$$\therefore \mathbf{k} = (20 - 3)$$

$$\therefore k = 17$$

ANS: Value of k is 17

# **Q. 34** navneet 120

If  $PQ \parallel RS P(2, 4), Q(3, 6), R(3, 1), S(5, m)$ . Find

m

#### **SOLUTION**

P(2,4), Q(3,6), R(3,1), S(5,m)

# Line PQ | Line RS

$$\frac{6-(4)}{3-2} = \frac{m-(1)}{5-3}$$

$$\frac{2}{1} = \frac{m-1}{2}$$

$$\therefore 4 = m-1$$

$$\therefore = 4+1$$

$$\therefore m = 5$$

ANS: Value of m is 5

# Q. 35 navneet 121

Find the coordinates of mid-point of the line segment joining the points  $A\ (0,3)$  and  $B\ (6,10)$ 

### **SOLUTION**

A (0, 6) and B (12, 20)

Let M(x, y) be the midpoint of seg PQ

Let A 
$$(x_1, y_1)$$
 and B  $(x_2, y_2)$ 

Here 
$$x_1 = 0$$
,  $y_1 = 3$ ,  $x_2 = 6$ ,  $y_2 = 10$ 

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

$$\therefore x = \frac{0+6}{2}$$

$$\therefore x = \frac{6}{2}$$

$$\therefore x = 3$$

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

$$\therefore y = \frac{3+10}{2}$$

$$\therefore y = \frac{13}{2}$$

$$\therefore y = \frac{13}{2}$$

ANS : Coordinates of the midpoint of line segment PQ are  $(3, \frac{13}{2})$ 

## Q. 36 navneeT

A line segment joining the points P (3, 8) and Q (-9,

3) is divided by the Y axis. Find the ratio.

### **SOLUTION**

P (3, 8) and Q (-9, 3)

Let PQ intersect Y axis at R

R lies on Y axis

 $\therefore$  its x coordinate is 0

Let R(0, y)

Let the Ratio in which M divides segment AB be m:n

By section formula

**x coordinate of R** = 
$$\frac{m(-9)+n(3)}{m+n_{-}}$$

$$\therefore 0 = \frac{m(-9) + n(3)}{m + n}$$

$$0 (m+n) = m(-9) + n(3)$$

$$0 = m(-9) + n(3)$$

$$\therefore m(9) = n(3)$$

$$\therefore m(9) = n(3)$$

$$\therefore \frac{m}{n} = \frac{3}{9}$$

$$\therefore \frac{m}{n} = \frac{1}{3}$$

$$\therefore$$
 m :n = 1:3

Ans The line segment joining P(3,8) and Q(-9,

3) is divided by the Y axis. in the ratio 1:3

# **Q. 37 navneet** 122

Find the point on X - axis in which is equidistant from P(2, -5) and Q(-2, 9)

# **SOLUTION**

P (2, -5) and B (-2, 9)

Let point A (x, y) and X axis be equidistant from the points P and Q

A lie on X axis

 $\therefore \mathbf{A}(x,0)$ 

By distance formula,

$$\sqrt{(x-2)^2 + (0-(-5))^2} = \sqrt{(x-(-2))^2 + (0-9)^2}$$

$$\therefore \sqrt{(x-2)^2 + (5)^2} = \sqrt{(x+2)^2 + (-9)^2}$$

$$\therefore \sqrt{(x-2)^2 + 25} = \sqrt{(x+2)^2 + 81}$$

Squaring both the sides, we get

$$(x-2)^2 + 25 = (x+2)^2 + 81$$

$$\therefore x^2 - 4x + 4 + 25 = x^2 + 4x + 4 + 81$$

$$\therefore -4x - 4x + = 81 - 25$$

$$\therefore -8x = 81 - 25$$

∴
$$-8x = 56$$

$$\therefore x = \frac{56}{-8}$$

$$\therefore x = -7$$

 $\therefore$  A has coordinates (-7,0)

Ans (-7,0) lies on X – axis and is equidistant from the points P and Q

## **Q. 38** navneet 123

Find k, if line passing through A (-12, -3) and B (4, k) has slope  $\frac{1}{4}$ 

### **SOLUTION**

P (-12, -3) and Q (4, k) Let point P  $(x_1, y_1)$  and Q  $(x_2, y_2)$  here

$$x_1 = -12$$
,  $y_1 = -3$ ,  $x_2 = -4$ ,  $y_2 = k$ 

Slope of the line = m = 
$$\frac{1}{4} = \frac{y_2 - y_1}{x_2 - x_1}$$
  

$$\frac{1}{4} = \frac{k - (-3)}{4 - (-12)}$$

$$\frac{1}{4} = \frac{k + 3}{4 + 12}$$

$$\frac{1}{4} = \frac{k + 3}{4 + 12}$$

$$\frac{1}{4} = \frac{k+3}{16}$$

$$4(k+3) = 16$$

$$(k+3)=\frac{16}{4}$$

$$\therefore (k+3) = 4$$

$$\therefore k = 4 - 3$$

$$\therefore k = 1$$

Ans: k = 1

# **Q. 39 navneet** 130

Find the type of the quadrilateral if point P(-4, -2),

Q(-3,-7), R(3,-2) and S(2,3) are joined serially.

### **SOLUTION**

$$P(-4, -2), Q(-3, -7), R(3, -2) \text{ and } S(2, 3)$$

$$AB = \sqrt{(-3 - (-4))^2 + (-7 - (-2)^2)^2}$$

$$AB = \sqrt{(-3+4)^2 + (-7-(-2)^2)^2}$$

$$AB = \sqrt{1 + 25} = \sqrt{26}$$
....(1)

BC = 
$$\sqrt{(3-(-3))^2+(-2-(-7))^2}$$

$$BC = \sqrt{6^2 + 5^2}$$

$$BC = \sqrt{36 + 25}$$

$$BC = \sqrt{61}$$
....(2)

CD = 
$$\sqrt{(2-3)^2 + (3-(-2))^2}$$

$$CD = \sqrt{(-1)^2 + (5)^2}$$

$$CD = \sqrt{1 + 25}$$

$$CD = \sqrt{26}$$
 .....(3)

$$AD = \sqrt{(2 - (-4))^2 + (3 - (-2))^2}$$

$$AD = \sqrt{(6)^2 + (5)^2}$$

$$AD = \sqrt{36 + 25}$$

$$AC = \sqrt{(3-(-4))^2 + (-2-(-2))^2}$$

$$AD = \sqrt{(7)^2 + (0)^2}$$

$$AD = \sqrt{49}$$

$$AD = 7$$

BD = 
$$\sqrt{(2-(-3))^2+(3-(-7))^2}$$

$$AD = \sqrt{(5)^2 + (10)^2}$$

$$\mathbf{AD} = \sqrt{\mathbf{125}}$$

$$AD = \sqrt{5X \ 5X5}$$

$$AD = 5\sqrt{5}$$

 $\Box$ **ABCD** 

From (1), (3),

$$AB = CD$$

From (2), (4)

$$BC = AD$$

 $AC \neq BD$ 

**□ABCD** is Parallelogram

(A quadrilateral is a parallelogram ,if its opposite sides are congruent )

ANS: Point A(-4,-2),B(-3,-7),C(3,-2) and D(2,3) form a parallelogram.

## **Q.** 40 navneet 129

A point divides segment AB in the ratio 3:1 find the co-ordinates of the point. Given A(4, -3), B(8, 5), Solution:

A(4, -3), B(8, 5)

Let P (x, y) divide the segment AB in the ratio 3:1

m: n = 3:1

Let A  $(x_1, y_1)$ , B  $(x_2, y_2)$ 

By section formula

$$\therefore \mathbf{x} = \frac{\mathbf{m}x_2 + \mathbf{n}x_1}{m + n}$$

$$x = \frac{3(8)+1(4)}{3+1}$$

$$\therefore x = \frac{24+4}{4}$$

$$\therefore x = \frac{28}{4}$$

$$\therefore x = 7$$

$$\therefore \mathbf{y} = \frac{\mathbf{m}y_2 + \mathbf{n}y_1}{m+n}$$

$$y = \frac{3(5)+1(-3)}{3+1}$$

$$\therefore y = \frac{15-3}{4}$$

$$\therefore y = \frac{12}{4}$$

$$\therefore$$
 y = 3

ANS: Point C divides segment AB in the ratio 3:1

# **Q. 41 atharva 437**

If point A (-4, 6) divides the line segment PQ with P (-6, 10) and Q (r, s) in the ratio of 2:1 find the coordinates of Q

### **Solution:**

# By section formula

$$\therefore \mathbf{x} = \frac{\mathbf{m}x_2 + \mathbf{n}x_1}{m + n}$$

$$\therefore -4 = \frac{2(r) + 1(-6)}{2 + 1}$$

$$\therefore -4 = \frac{2r-6}{3}$$

$$\therefore -12 = 2r - 6$$

$$\therefore 2r = 6 - 12$$

$$\therefore 2r = -6$$

$$\therefore r = -3$$

#### **Also**

$$\therefore 6 = \frac{2(s)+1(10)}{2+1}$$

$$\therefore 6 = \frac{2(s)+10}{3}$$

$$18 = 2(s) + 10$$

$$\therefore 2s = 8$$

$$\therefore \quad \therefore \quad s = 4$$

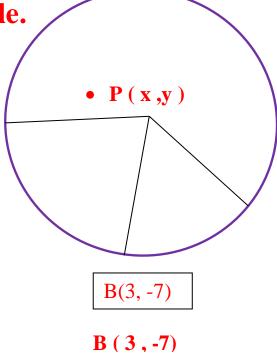
Coordinates of Q are (-3,4)

# **Q. 42** navneet 131

A circle with centre P is passing through the points

A (6, -6), B (3, -7) and C (3, 3) Find the coordinates

of the centre of the circle.



**SOLUTION:** 

C(3,3)

A (6, -6), B (3, -7) and C (3, 3)

Let O (x, y) be the centre of the circle passing through the points A, B & C

PA = PB ... (Radii of the same circle)

$$\sqrt{(x-6)^2 + (y-(-6))^2} = \sqrt{(x-3)^2 + (y-(-7))^2}$$

Squaring both the sides, we get

$$(x-6)^2 + (y-(-6))^2 =$$

$$(x-3)^2 + (y-(-7))^2$$

$$\therefore (x)^2 - 12x + 36 + (y)^2 + 12y + 36 =$$

$$(x)^2 - 6x + 9 + (y)^2 + 14y + 49$$

$$\therefore -12x + 12y + 72 = -6x + 14y + 58$$

$$\therefore -12x + 6x + 12y - 14y = 58 - 72$$

$$\therefore -6x - 2y = -14$$

$$\therefore (3x+y) = \frac{-14}{-2}$$

$$\therefore (3x + y) = 7$$

PB = PC ... (Radii of the same circle)

$$\sqrt{(x-3)^2 + (y-(-7))^2} = \sqrt{(x-3)^2 + (y-3)^2}$$

Squaring both the sides, we get

$$(x-3)^2 + (y+7)^2 = (x-3)^2 + (y-3)^2$$
  $(y)^2 +$ 

$$14y + 49 = (y)^2 - 6y + 9$$

$$\therefore 14y + 6y = 9 - 49$$

$$\therefore 20y = -40$$

$$\therefore y = \frac{-40}{20}$$

$$\therefore y = -2$$

substituting y-2 in (1), we get

$$(3x + (-2)) = 7$$

$$\therefore (3x-2)=7$$

$$3x = 7 + 2$$

$$3x = 9$$

$$\therefore x = \frac{9}{3}$$

$$\therefore x = 3$$

Ans: Co-ordinates of the centre of the circle are

$$(3, -2)$$

# Q. 43 navneet 134 unsolved

A triangle has its vertices are (0, 6), (8, 12), and (8,

0). Find the co-ordinates of centroid of the triangle.

Solution: A (0, 6), B (8, 12), C (8, 0)

Let G(x, y) be the centroid of the triangle

Let A  $(x_1, y_1)$ , B  $(x_2, y_2)$ , C  $(x_3, y_3)$ 

By centroid formula

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

$$\therefore x = \frac{0+8+8}{3}$$

$$\therefore x = \frac{16}{3}$$

$$\therefore y = \frac{6+12+0}{3}$$

$$\therefore y = \frac{18}{3}$$

$$\therefore$$
 y = 6

ANS: Point G ( $\frac{8}{3}$ , 6) is centroid of triangle

## Q. 44 navneet 134 unsolved

**Prove that the points A (0, -1), B (6, 7), and C (-2, 3)** 

D (8, 3) are the vertices of a rectangle

**Solution:** 

Let A (0. -1), B (6, 7), C (-2, 3) and D (8, 3)

For rectangle, the diagonals are equal, hence we have to prove diagonals are equal. And frontier side are parallel



1)

We have to prove diagonal are equal in length.

$$d(A, C) = d(B, D)$$

d (A, C) = 
$$\sqrt{[0-(-2)]^2 + [-1-(3)]^2}$$
)

$$d(A, C) = \sqrt{4 + 16}$$

**d** (**A**, **C**) = 
$$\sqrt{20}$$

d (B, D) = 
$$\sqrt{[8-(6)]^2+[7-3]^2}$$
)

$$d(B, D) = \sqrt{[2]^2 + [4]^2}$$

$$d(B, D) = \sqrt{4 + 16}$$

**d** (**B**, **D**) = 
$$\sqrt{20}$$

$$d(A, C) = d(B, D)$$

2) To prove frontier sides parallel i.e. AD || BC and AB || DC

Slope of AD 
$$=\frac{3-(-1)}{8-0} = \frac{3+1}{8-0} = \frac{4}{8} = \frac{1}{2}$$

Slope of BC 
$$=\frac{3-(7)}{-2-6} = \frac{-4}{-8} = \frac{4}{8} = \frac{1}{2}$$

**Slope of AD = Slope of BC** 

Slope of AB=
$$\frac{7-(-1)}{6-0} = \frac{8}{6} = \frac{4}{3} = \frac{4}{3}$$

Slope of DC=
$$\frac{7-(-1)}{6-0} = \frac{8}{6} = \frac{4}{3} = \frac{4}{3}$$

Q. 45 navneet page 134

Examine whether points A(3, 3), B(-4, -1) and C(3, -1)

5) are the vertices of isosceles triangle

**Solution** 

We have to show any two-side equal to examine whether the triangle is isosceles triangle.

d (A, B) = 
$$\sqrt{[3 - (-4)]^2 + [3 - (-1)]^2}$$
)  
=  $\sqrt{[7]^2 + [4]^2}$ )  
=  $\sqrt{49 + 16}$ 

$$=\sqrt{65}$$

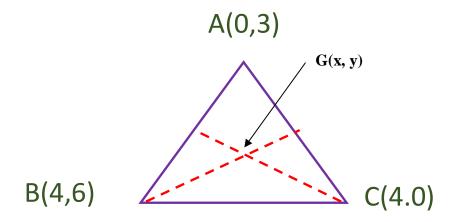
d (B, C)=
$$\sqrt{[-4-(3)]^2 + [-1-(-5)]^2}$$
)  
=  $\sqrt{[-7]^2 + [4]^2}$ )  
=  $\sqrt{49+16}$   
=  $\sqrt{49+16}$   
=  $\sqrt{65}$ 

$$d(A, B) = d(B, C)$$

Sides AB and BC are equal so the Triangle is isosceles

# Q. 46 navneet page 134

Find the co-ordinates of centroid of the triangle whose vertices are (0, 3), (4, 6) and (4, 0).



### **Solution**

By centroid formula centroid G(x,y)

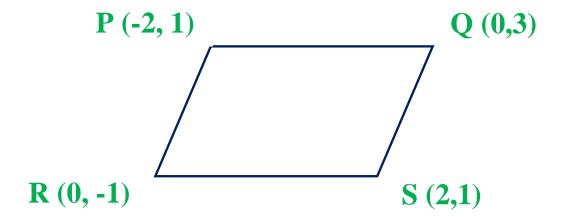
A 
$$(x_{1,}y_{1})$$
, B $(x_{2,}y_{2})$ , C $(x_{3,}y_{3})$   

$$x = \frac{x_{1} + x_{2} + x_{3}}{3} = \frac{0 + 4 + 4}{3} = \frac{8}{3}$$

$$y = \frac{y_1 + y_2 + y_3}{3} = \frac{3 + 6 + 0}{3} = \frac{9}{3} = 3$$
centroid G (x,y) = G ( $\frac{8}{3}$ , 3)

# Q. 47 navneet page 135

Prove P (-2, 1), Q(0, 3), R(2, 1) and S(0, -1) are the vertices of parallelogram , using the slope concept Solution:



By slope concept we have to prove that

slope of 
$$PR = slope$$
 of  $QS$ 

slope of PQ = slope of RS

**Slope of PR** = 
$$\frac{1-(-1)}{-2}$$

Slope of PR = 
$$\frac{1-(-1)}{-2} = \frac{2}{-2} = -1$$

Slope of QS = 
$$\frac{3-(1)}{0-2} = \frac{2}{-2} = -1$$

Slope of PR = Slope of QS = -1

slope of PQ = 
$$\frac{3-1}{0-(-2)} = \frac{2}{2} = 1$$

slope of RS = 
$$\frac{1-(-1)}{2-(0)} = \frac{2}{2} = 1$$

slope of PQ = slope of RS

# Q. 48 JEEVAN DEEP PAGE 143

Using slope concept prove P (3,9), Q(1,3), R(5,k) are collinear then find the value of k

## **Solution**

Let P (3, 9) = P 
$$(x_1, y_1)$$
, Q (1, 3) = Q $(x_2, y_2)$ , R(5,  $k$ ) = R $(x_3, y_3)$ 

Slope of PQ= 
$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 9}{1 - 3} = \frac{-6}{-2} = 3$$

Slope of QR= 
$$\frac{y_3-y_2}{x_3-x_2} = \frac{k-3}{5-1} = \frac{k-3}{4}$$

Since the points P, Q, R are collinear, their slopes are equal

$$\frac{k-3}{4} = 3$$

$$k-3=4X3$$

$$k - 3 = 12$$

$$k = 12 + 3$$

$$k = 15$$

# Q. 49 JEEVAN DEEP PAGE 22

The vertices of a triangle are A (1, 2), B (4, 6), C (3,

5), then find the equation of straight line passing through the midpoint of the segments AB and AC.

Solution: Given A (1, 2), B (4, 6), C (3, 5)

Let the midpoint of the segment ab and AC be P  $(x_1, y_1)$  and Q  $(x_2, y_2)$ 

Midpoint of the segment =  $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ 

Coordinate of P  $(x_1, y_1)$ 

$$x_1 = \frac{1+4}{2}, y_1 = \frac{2+6}{2}$$

$$x_1=\frac{5}{2}, y_1=4$$

$$P(x_2, y_2)$$

$$x_2 = \frac{1+3}{2}, y_2 = \frac{2+5}{2}$$

$$x_2 = 2$$
,  $y_2 = \frac{7}{2}$ 

**Equation of straight-line PQ** 

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

$$\frac{y-4}{x-\frac{5}{2}} = \frac{\frac{7}{2}-4}{2-\frac{5}{2}}$$

$$\frac{y-4}{x-\frac{5}{2}} = \frac{-\frac{1}{2}}{-\frac{1}{2}}$$

$$\frac{y-4}{x-\frac{5}{2}} = \frac{-\frac{1}{2}}{-\frac{1}{2}} = \mathbf{1}$$

$$y-4=x-\frac{5}{2}$$

$$2y - 8 = 2x - 5$$

$$2y = 2x - 5 + 8$$

$$2y = 2x + 3$$

$$0 = 2x + 3 - 2y$$

$$2x + 3 - 2y = 0$$

Equation of straight line 2x - 2y + 3 = 0

### Q. 50 JEEVAN DEEP PAGE 22

Slope of straight line passing through point A (-2, -

3) is  $m = \frac{3}{4}$  then find the equation of straight line in the form of y = mx + c

Solution: If slope of a straight line passing through point  $(x_1, y_1)$  is m then equation of straight line is  $y - y_1 = m(x - x_1)$ 

Here 
$$x_1 = -2$$
 ,  $y_1 = -3$  ,  $m = \frac{3}{4}$ 

Equation of straight line

$$y - (-3) = \frac{3}{4}[x - (-2)]$$

$$y + 3 = \frac{3}{4}x + \frac{3}{2}$$

$$y = \frac{3}{4}x + \frac{3}{2} - 3$$

$$\mathbf{y} = \frac{3}{4}\mathbf{x} - \frac{3}{2}$$

Equation of line

$$y = \frac{3}{4}x - \frac{3}{2}$$

### Q. 51 JEEVAN DEEP PAGE 47

A line is passing through point A (2, -1) is parallel to straight line 3x + 4y = 10 then find the equation of straight line.

#### **Solution:**

Slope of a straight line with equation ax + by +

$$c = 0$$
 is  $-\frac{a}{b}$ 

Slope of equation 
$$3x + 4y = 10$$
 is  $-\frac{3}{4}$ 

Equation of line parallel to the straight line 3x + 4y = 10 and passing through the point (2, -1)

$$y - (-1) = -\frac{3}{4}(x - 2)$$

$$y + 1 = -\frac{3}{4}x + 2$$

$$4y + 4 = -3x + 6$$

$$3x + 4y = 2$$

$$3x + 4y - 2 = 0$$

**Equation of straight line** 

$$3x + 4y - 2 = 0$$

## Q. 52 JEEVAN DEEP PAGE 84

Find the value of k, if points (k, 3), (2, -4) and (-k +1, -2)

**Solution:** 

Suppose A (k, 3), B (2, -4) and C (-k + 1, -2) slope of line AB = slope of line AC

$$\frac{3-(-4)}{k-2} = \frac{3-(-2)}{k-(-k+1)}$$

$$\frac{3+4}{k-2} = \frac{3+2}{k+k-1)}$$

$$\frac{7}{k-2} = \frac{5}{2k-1}$$

$$14k - 5k = -10 + 7$$

$$9k = -3$$

$$k = \frac{-1}{3}$$