SHIKSHA CLASSES

Subject : Geometry — **Answer Paper** — **Total Marks : 20**

Class : X — **5. Co-ordinate Geometry**

Q.1 A) Choose the correct alternative from the following questions. 2

1) Seg AB is parallel to Y – axis and coordinates of point A are (1, 3) then co-ordinates of point B can be ________

Ans: (1, -3)

2) Distance of point (-3, 4) from the origin is _____

Ans: 5

B) Attempt Any ONE of the following. 1

1) Find the slope of the line whose inclination is 45^0

Ans: Slope of line $= \tan\theta = \tan 45^0 = 1$

Q.2 A) : Attempt Any ONE of the following. 2

1) Find the slopes of the lines passing through the points, L(-2,-3) and M(-6,-8)

Ans.: Solution :

$L(-2, -3) = (x_1, y_1)$ and

$M(-6, -8) = (x_2, y_2)$

Slope of line

$$LM = \frac{\boxed{y_2 - y_1}}{\boxed{x_2 - x_1}} = \frac{-8-(-3)}{-6-(-2)} = \frac{-8+3}{-6+2}$$

$$= \frac{\boxed{-5}}{\boxed{-4}} = \frac{5}{4}$$

2) Find the distance between the points A(2,3) and B(4,1)

Ans: Let A (2, 3) = (x_1, y_1) and $B(4,1) = (x_2\ y_2)$

According to distance formula

$$d(A_1B) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

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

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

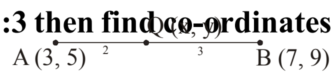
$$= \sqrt{4+4}$$

$$= \sqrt{8}$$

$$= 2\sqrt{2}$$

B) Attempt Any ONE of the following. 2

1) If A (3,5), B (7,9) and point Q divides seg AB in the ratio 2:3 then find co-ordinates of point Q.



Ans: Let $A(3, 5) = (x_1, y_1)$ and

$B(7, 9) = (x_2, y_2)$

m : n = 2 : 3

According to section formula

$$x = \frac{mx_2 + nx_1}{m+n} = \frac{2x7 + 3x3}{2+3} = \frac{14+9}{5} = \frac{23}{5}$$

$$y = \frac{my_2 + ny_1}{m+n} = \frac{2x9 + 3x5}{2+3} = \frac{18+15}{5} = \frac{33}{5}$$

$\therefore$ co-ordinates of Q are $\left[\frac{23}{5}, \frac{33}{5}\right]$

2) Find the co-ordinates of a point on y-axis which is equidistant from M(–5, –2) and N(3, 2).

Ans. Let the point P(0, y) on y-axis be equidistant from M(–5, –2) and N(3, 2)

$\therefore$ PM = PN

$\therefore$ $PM^2 = PN^2$

$\therefore$ $[0 - (-5)]^2 + [y - (-2)]^2$

$= (0 - 3)^2 + (y - 2)^2$

$\therefore$ $25 + (y + 2)^2 = 9 + y^2 - 4y + 4$

$25 + y^2 + 4y + 4 = 13 + y^2 - 1y$

$\therefore\ 8y = -16$

$\therefore\ y = -2$

$\therefore$ The co-ordinates of a point on y-axis which is equidistant from M and N are M (0, –2)

Q.3 A) Attempt Any ONE of the following. 3

1) Verify, whether points P (6, -6), Q (3,-7) and R (3, 3) are collinear.

Ans: $PQ = \sqrt{(6-3)^2 + (-6+7)^2}$

[By distance formula]

$= \sqrt{3^2 + 1^2} = \sqrt{10}$ ______ (1)

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

$= \sqrt{0^2 + (-10)^2} = \sqrt{100}$ ______ (2)

$PR = \sqrt{(3-6)^2 + (3+6)^2}$

$= \sqrt{(-3)^2 + (9)^2} = \sqrt{90}$ ______ (3)

From (1), (2) and (3) out of $\sqrt{10}, \sqrt{100}$ and $\sqrt{90}$ $\sqrt{100}$ is the largest number now we will verify whether $(\sqrt{100})$ and $(\sqrt{10} + \sqrt{90})$ are unequal For this compare $(\sqrt{100})^2$ and $(\sqrt{10} + \sqrt{90})^2$

$\therefore (\sqrt{10} + \sqrt{90}) > \sqrt{100}$

$\therefore PQ + PR \neq QR$

$\therefore$ Points P(6, -6), Q (3, -7) and R (3, 3) are not collinear.

2) Find the value of K, if the points A(2,1), B (k, 3) and C(-3, -4) are collinear.

Ans: Let $A(2, 1) = (x_1, y_1)$

$B(k, 3) = (x_2, y_2)$,

$C(-3, -4) = (x_3, y_3)$

The given points are collinear

$\therefore$ Slope of line AB = Slope of line BC

$$\frac{\boxed{y_2 - y_1}}{\boxed{x_2 - x_1}} = \frac{\boxed{y_3 - y_2}}{\boxed{x_3 - x_2}}$$

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

$$\frac{2}{k-2} = \frac{-7}{-3-k}$$

$$\boxed{-6-2k} = \boxed{-7k+14}$$

$-2k + 7k = 14 + 6$

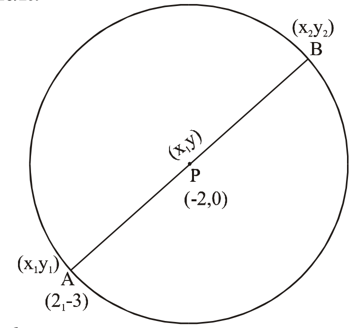
$5k = 20$

$\therefore\ k = \boxed{4}$

B) Attempt Any ONE of the following. 3

1) Point p is the centre of the circle and AB is a diameter Find the co-ordinates of point B if co-ordinates of point A and P are (2, -3) and (-2, 0) respectively.

Ans: Here P is midpoint of diameter AB According to midpoint formula



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

$$-2 = \frac{2 + x_2}{2}$$

$-4 = 2 + x_2$

$x_2 = -4 - 2 = -6$

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

$$o = \frac{-3 + y_2}{2}$$

$\therefore -3 + y_2 = 0$

$\therefore y_2 = 3$

The co-ordinates of point B (-6, 3)

2) Show that A (-4, -7), B (-1, 2), C (8, 5) and D (5,-4) are the vertices of a parallelogram.

Ans: Slope of line $= \dfrac{y_2 - y_1}{x_2 - x_1}$ [Fromula]

Slope of line $AB = \dfrac{2-(-7)}{-1-(-4)} = \dfrac{2+7}{-1+4} = \dfrac{9}{3} = 3$ ___ I

Slope of line $BC = \dfrac{5-2}{8-(-1)} = \dfrac{3}{9} = \dfrac{1}{3}$ ____ II

Slope of line $CD = \dfrac{-4-5}{5-8} = \dfrac{-9}{-3} = 3$ ______ III

Slope of line $DA = \dfrac{-7-(-4)}{-4-5} = \dfrac{-3}{-9} = \dfrac{1}{3}$ – IV

Slope of line AB = Slope of line CD [from I and III]

$\therefore$ line AB|| line CD

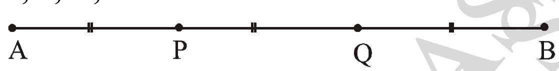
Slope of line BC = slope of line DA - [from II and IV]

$\therefore$ line BC|| line DA

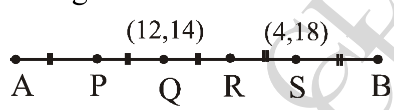
$\therefore$ □ABCD is a parallelogram.

Q.4 : Attempt Any ONE of the following. 4

1) **The line seg AB is divided into five congruent parts at P, Q, R and S such that A –P –Q-R-S-B. If point Q (12, 14) and S(4,18) are given find the coordinates of A, P, R, B.**



Ans. : Line seg AB is divided into five equal parts



$\therefore AP = PQ = QR = RS = SB$ ______ I

$\therefore QR = RS [\because \text{from} - I]$

Let A (x_1, y_1) B (x_2, y_2) P $(x_3 y_3)$ & R$(x_4 y_4)$ be the given points

Point R is midpoint of seg QS

$\therefore$ By mid point fromula

Coordinate of R $= \left(\dfrac{12+4}{2}, \dfrac{14+18}{2}\right)$

$= \left(\dfrac{16}{2}, \dfrac{32}{2}\right)$

$(x_4, y_4) = (8,16)$

Point Q is the mid point of seg PR By mid point formula

Coordinaties of $Q = \left(\dfrac{x_3+8}{2}, \dfrac{y_3+16}{2}\right)$

$(12,14) = \left(\dfrac{x_3+8}{2}, \dfrac{y_3+16}{2}\right)$

$\dfrac{x_3+8}{2} = 12$ and $\dfrac{y_3+16}{2} = 14$

$x_3 + 8 = 24$ and $y_3 + 16 = 28$

$x_3 = 16$ and $y_3 = 12$

Coordinate of P = (16, 12)

Point P is the midpoint of seg AQ By mid point formula

Coorinates of $P = \left(\dfrac{x_1+12}{2}, \dfrac{y_1+14}{2}\right)$

$(16,12) = \left(\dfrac{x_1+12}{2}, \dfrac{y_1+14}{2}\right)$

$\dfrac{x_1+12}{2} = 16$ and $\dfrac{y_1+14}{2} = 12$

$x_1 + 12 = 32$ $\quad$ $y_1 + 14 = 24$

$x_1 = 20$ $\quad$ $y_1 = 10$

Coordinates of $A = (20,10)$

S is the mid point of Seg RB

By mid point formula

Coordinate of $S = \left(\dfrac{8+x_2}{2}, \dfrac{16+y_2}{2}\right)$

$(4,18) = \left(\dfrac{8+x_2}{2}, \dfrac{16+y_2}{2}\right)$

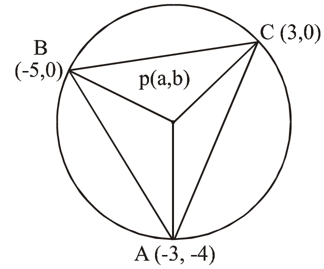
$\dfrac{8+x_2}{2} = 4$ and $\dfrac{16+y_2}{2} = 18$

$8 + x_2 = 8$ and $16 + y_2 = 36$

$x_2 = 0$ and $y_2 = 20$

The coordinates of point A, P, R, and B are (20, 10) (16, 12) (8, 16) and (0,20) respectively.

2) **A (-3, -4), B (-5, 0), C (3,0) are the vertices of ΔABC. Find the co-ordinates of the circumcenter of ΔABC.**



Ans :

Let P (a, b) be the circumcentre of ΔABC

$\therefore$ point p is equidistant from A, B and C

$\therefore (PA)^2 = (PB)^2 = (PC)^2$ _____ I

$\therefore (PA)^2 = (PB)^2$ (from I)

$(a+3)^2 + (b+4)^2 = (a+5)^2 + (b-0)^2$

$\therefore$ Point P is equidistant from A, B and C.

$\therefore PA^2 = PB^2 = PC^2$ _______ I

$\therefore PA^2 = PB^2$ (from I)

$$(a+3)^2 + (b+4)^2 = (a+5)^2 + (b-0)^2$$

$$\therefore a^2 + 6a + 9 + b^2 + 8b + 16 = a^2 + 100 + 25 + b^2$$

$$\therefore -4a + 8b = 0$$

$\therefore a - 2b = 0$ ____ II

Similarly $PA^2 = PC^2$ - (From I)

$$(a+3)^2 + (b+4)^2 = (a-3)^2 + (b-0)^2$$

$$a^2 + 6a + 9 + b^2 + 8b + 16 = a^2 - 6a + 9 + b^2$$

$$\therefore 12a + 8b = -16$$

$\therefore 3a + 2b = -4$ ____ III

solving II and III we get a = -1, $b = \frac{-1}{2}$

$\therefore$ Coordinates of circumcentre are $\left[-1, -\frac{1}{2}\right]$

Q.5: Attempt Any ONE of the following. 3

1) **Find the type of the quadrilateral if points A(-4,-2), B(-3, -7), C(3, -2) and D (2, 3) are joined serially.**

Ans: Solution :

Slope of line $= \frac{y_2 - y_1}{x_2 - x_1}$ [fromula]

Slope of line

$$AB = \frac{-7-(-2)}{-3-(-4)} = \frac{-7+2}{-3+4} = \frac{-5}{1} = -5 \rightarrow I$$

Slope of line

$$BC = \frac{-2-(-7)}{3-(-3)} = \frac{-2+7}{3+3} = \frac{5}{6} \rightarrow II$$

Slope of line

$$CD = \frac{3-(-2)}{2-3} = \frac{3+2}{-1} = -5 \rightarrow III$$

Slope of line $AD = \frac{3-(-2)}{2-(-4)} = \frac{+5}{2+4} = \frac{+5}{6} - IV$

From equation - I and III

slope of line AB = slope of line CD

$\therefore$ line AB$\parallel$ line CD

From equation - II and IV

slope of line BC = Slope of line AD

line BC$\parallel$ line AD

$\square$ABCD is a parallelogram

2) **Find the co-ordinates of the points of trisection of the line segment AB with A (2,7) and B (-4, -8)**

Ans:

Let points P and Q be the points of trisection of the line segment joining the points A and B.

Point P and Q divide line segment AB in three parts.

AP = PQ = QB - I

$$\frac{AP}{PB} = \frac{AP}{PQ+QB} = \frac{AP}{AP+AP} = \frac{AP}{2AP} = \frac{1}{2}$$

(from I)

Point P divides seg AB in the ratio 1:2

x - coordinate of point

$$P = \frac{1\times(-4)+2\times 2}{1+2} = \frac{-4+4}{3} = \frac{0}{3} = 0$$

y - coordinate of point

$$P = \frac{1\times(-8)+2\times 7}{1+2} = \frac{-8+14}{3} = \frac{6}{3} = 2$$

point Q divides seg AB in the ratio 2:1

$\therefore \frac{AQ}{QD} = \frac{2}{1}$ x - coordinate of point

$$Q = \frac{2\times(-8)+1\times 7}{2+1} = \frac{-16+7}{3} = \frac{-9}{3} = -3$$

$\therefore$ Co-ordinates of points of trisection are (0, 2) and (-2, -3)

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