SHIKSHA CLASSES

Sub. : Maths **Answer Paper** **Total Marks : 30**

Std. X (CBSE) **7 : Co-ordinate Geometry**

Section : A (Each 1 Mark)

Multiple choice Questions (MCQs).

Q.1 : The distance of the point P(–6, 8) from the origin is

Ans : c) 10 units

Q.2 : The distance of the point P(2, 3) from the x-axis is ......

Ans : b) 3 units

Q.3 : The opposite vertices of a square are (5, –4) and (–3, 2). The length of its diagonal is

Ans : c) 10

Q.4 : Find the value of k if the distance between (k, 3) and (2, 3) is 5

Ans : c) 7

Q.5 : If the distance between the points (3, a) and (4, 1) is $\sqrt{10}$, then find the values of a.

Ans : c) 4, –2

Q.6 : If the point (x, y) is equidistant from the points (2, 1) and (1, –2) then

Ans : a) $x + 3y = 0$

Q.7 : The distance of the midpoint of the line segment joining the points (6, 8) and (2, 4) from the point (1, 2) is

Ans : c) 5

Q.8 : The end points of diameter of circle are (2, 4) and (–3, –1). The radius of the circle is

Ans : a) $\frac{5\sqrt{2}}{2}$ units

Q.9 : If the point P(k, 0) divides that line segment joining the points Q(2, –2) and R(–7, 4) in the ratio 1 : 2, then the value of k is.

Ans : d) –1

For question number 10 to 11 two statements are given one labeled Assertion and other labeled Reason select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below

Q.10 : Assertion : The distance point P(2,3) from the x-axis is 3.

Reason: The distance from x-axis is equal to its ordinate.

Ans : a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.

Q.11 : Assertion: The point(6,0) lies on x-axis.

Reason: the point (0,7) lies on y-axis.

Ans : b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.

Section : B (Each 2 Marks)

Q.12 : Find a point on the y-axis which is equidistant from the point A(6, 5) and B(–4, 3)

Ans : We know that a point on y-axis is of the form (0, y). So, let the required point be P(0, y). Then,

PA = PB

$$\Rightarrow \sqrt{(0-6)^2+(y-5)^2} = \sqrt{(0+4)^2+(y-3)^2}$$

(By Distance formula)

$\Rightarrow 36 + (y-5)^2 = 16 + (y-3)^2$

$\Rightarrow 36 + y^2 + 25 - 10y = 16 + y^2 + 9 - 6y$

$\Rightarrow 4y = 36$

$\Rightarrow y = 9$

So, the required point is (0, 9).

OR

Find the value of a so that the point (3, a) lies on the line represented by 2x – 3y + 5 = 0.

Ans : Point (3, a) lies on the line represented by

$2x - 3y + 5 = 0$

So, (3, a) satisfies equation

$2x - 3y + 5 = 0$

Therefore $2(3) - 3(a) + 5 = 0$

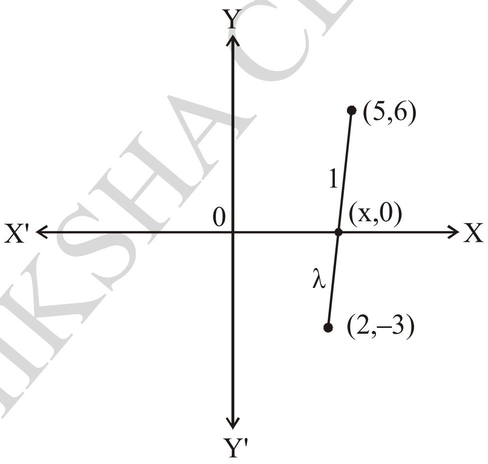
$6 - 3a + 5 = 0$

or $-3a = -11$

$$a = \frac{11}{3}.$$

Q.13 : In what ratio does the x-axis divide the line segment joining the points (2, –3) and (5, 6) ? Also find the co-ordinates of the point of intersection.

Ans : Let the required ratio be λ : 1



Then, the co-ordinates of the point of division are $\left(\frac{5\lambda+2}{\lambda+1}, \frac{6\lambda-3}{\lambda+1}\right)$

But, it is a point on x-axis.

On which y-co-ordinates of every point is zero.

$$\therefore \frac{6\lambda-3}{\lambda+1} = 0$$

$\Rightarrow 6\lambda - 3 = 0$

$$\Rightarrow \lambda = \frac{3}{6} = \frac{1}{2}$$

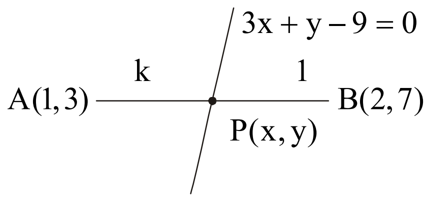
Thus, the required ratio $\frac{1}{2} : 1$ or 1:2

Putting λ = 1/2 in the co-ordinates of the point of division, we find that its co-ordinates are (3, 0).

Section : C (Each 3 Marks)

Q.14 : Determine the ratio in which the line 3x + y – 9 = 0 divides the segment joining the points (1, 3) and (2, 7).

Ans : Let ratio be k : 1 in which the line $3x + y - 9 = 0$ divides the segment joining the points A(1, 3) and B(2, 7).



By section formula

$$P(x, y) = \left(\frac{k\times 2 + 1\times 1}{k+1}, \frac{k\times 7 + 1\times 3}{k+1}\right)$$

$$= \left(\frac{2k+1}{k+1}, \frac{7k+3}{k+1}\right)$$

Now point P(x, y) line on line

$3x + y - 9 = 0$

therefore $3\left(\frac{2k+1}{k+1}\right) + \left(\frac{7k+3}{k+1}\right) - 9 = 0$

or

$6k + 3 + 7k + 3 - 9(k+1) = 0$

or $4k - 3 = 0$

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

Thus ratio 3:4 is required ratio.

Q.15 : If P and Q are two points whose co-ordinates are $(at^2, 2at)$ and $\left(\frac{a}{t^2}, \frac{2a}{t}\right)$ respectively and S is the point (a, 0). Show that $\frac{1}{SP}+\frac{1}{SQ}$ is independent of t.

Ans : We have

$$SP = \sqrt{(at^2-a)^2+(2at-0)^2}$$

$$= \sqrt{a^2t^4+a^2-2a^2t^2+4a^2t^2}$$

$$= \sqrt{a^2t^4+a^2+2a^2t^2} = \sqrt{(at^2+a)^2}$$

$SP = at^2 + a = a(t^2 + 1)$

$$\text{and } SQ = \sqrt{\left(\frac{a}{t^2}-a\right)^2+\left(\frac{2a}{t}-0\right)^2}$$

$$SQ = \sqrt{\frac{a^2(1-t^2)^2}{t^4}+\frac{4a^2}{t^2}}$$

$$\Rightarrow SQ = \sqrt{\frac{a^2}{t^4}+a^2-\frac{2a^2}{t^2}+\frac{4a^2}{t^2}}$$

$$= \sqrt{\frac{a^2}{t^4}+a^2+\frac{2a^2}{t^2}}$$

$$= \sqrt{\left(\frac{a}{t^2}+a\right)^2}$$

$$= \frac{a}{t^2}+a = a\left(\frac{1}{t^2}+1\right)$$

$$\Rightarrow SQ = \frac{a}{t^2}\left(1+t^2\right)$$

$$\therefore \frac{1}{SP}+\frac{1}{SQ} = \frac{1}{a(t^2+1)}+\frac{t^2}{a(1+t^2)}$$

$$= \frac{1+t^2}{a(1+t^2)}$$

$\Rightarrow \frac{1}{SP}+\frac{1}{SQ} = \frac{1}{a}$, which is independent of t.

OR

Point P divides the line segment joining the points A(2, 1) and B(5, –8) such that $\frac{AP}{AB}=\frac{1}{3}$, If P lies on the line $2x - y + k = 0$, find the value of k.

Ans : We have,

$$\frac{AP}{AB} = \frac{1}{3}$$

$$\Rightarrow \frac{AP}{AP+PB} = \frac{1}{3}$$

$\Rightarrow 3AP = AP + PB$

$\Rightarrow 2AP = PB$

$$\Rightarrow \frac{AP}{BP} = \frac{1}{2}$$

So, P divides AB in the ratio 1:2

$\therefore$ Co-ordinates of P are

$$\left(\frac{1\times 5+2\times 2}{1+2}, \frac{1\times(-8)+2\times 1}{1+2}\right)$$

$= (3, –2)$

Since P(3, –2) lies on the line

$2x - y + k = 0$

$\therefore 2 \times 3 - (-2) + k = 0$

$\Rightarrow 6 + 2 + k = 0$

$\Rightarrow 8 + k = 0$

$\Rightarrow k = -8$

Section - D(Each 5 Marks)

Q.16 : Show that the points (a, a), (–a, –a) and $\left(-\sqrt{3}a, \sqrt{3}a\right)$ are the vertices of an equilateral triangle, Also find its area.

Ans : Let A(a, a), B(–a, –a) and C$\left(-\sqrt{3}a, \sqrt{3}a\right)$

be the given points, Then, we have

By distance formule

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

$$= \sqrt{4a^2 + 4a^2} = 2\sqrt{2}a$$

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

$$= \sqrt{3a^2 + a^2 - 2\sqrt{3}a^2 + 3a^2 + a^2 + 2\sqrt{3}a^2}$$

$$= \sqrt{8a^2} = 2\sqrt{2}a$$

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

$$= \sqrt{3a^2 + a^2 + 2\sqrt{3}a^2 + 3a^2 + a^2 - 2\sqrt{3}a^2}$$

$$= \sqrt{8a^2} = 2\sqrt{2}a$$

Clearly AB = BC = AC

Hence the triangle ABC is an equilateral triangle.

Now, Area of $\Delta ABC = \frac{\sqrt{3}}{4}(\text{side})^2$

$$= \frac{\sqrt{3}}{4}(2\sqrt{2}a)^2$$

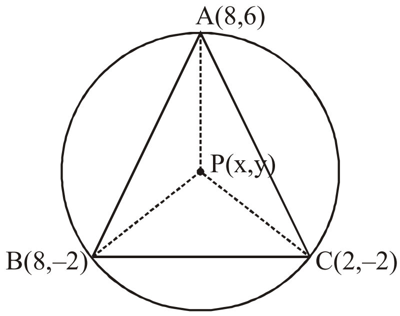
$$= \frac{\sqrt{3}}{4} \times 4 \times 2a^2$$

$$= 2\sqrt{3}a^2 \text{ sq. units}$$

OR

Find the Co-ordinates of the circumcentre of triangle whose vertices are (8, 6), (8,–2) and (2, –2). Also, find its circum-radius.

Ans : As we know that the circumcentre of a triangle is equidistant from the vertices of a triangle.



Let A(8, 6), B(8, –2) and C(2, –2) be the vertices of the given triangle and let P(x,y) be the circumcentre of this triangle.

Then PA = PB = PC

$PA^2 = PB^2 = PC^2$

Now $PA^2 = PB^2$

$\Rightarrow (x-8)^2 + (y-6)^2 = (x-8)^2 + (y+2)^2$

$\Rightarrow y^2 + 36 - 12y = y^2 + 4 + 4y$

$\Rightarrow 16y = 32$

$\Rightarrow y = 2$ and $PB^2 = PC^2$

$\Rightarrow (x-8)^2 + (y+2)^2 = (x-2)^2 + (y+2)^2$

$\Rightarrow x^2 + 64 - 16x + y^2 + 4 + 4y$

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

$\Rightarrow 12x = 60$

$\Rightarrow x = 5$

So, the co-ordinates of the circumcentre P are (5, 2)

Also, circumradius = PA = PC = PB

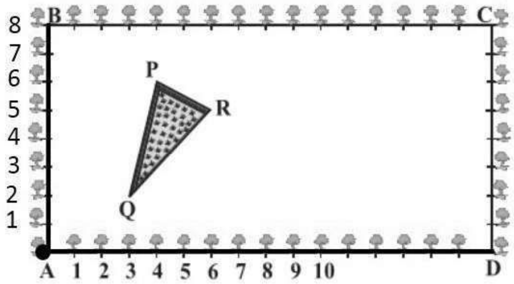
$$= \sqrt{(5-8)^2 + (2-6)^2}$$

$$= \sqrt{(-3^2) + (-4^2)} = \sqrt{25} = 5 \text{ units.}$$

Section : E

Q.17 : **Case study :**

The Class X students of a secondary school in Krishinagar have been allotted a rectangular plot of land for their gardening activity. Sapling of Gulmohar are planted on the boundary at a distance of 1m from each other. There is a triangular grassy lawn in the plot as shown in the below figure. The students are to sow seeds of flowering plants on the remaining area of the plot.



i) Taking A as origin, find the coordinates of the vertices of the triangle $\triangle PQR$. 1

Ans : The co-ordinates of the vertices of triangle ΔPQR are

P(4, 6) Q(3, 2) R(6, 5).

ii) What is the midpoint of side PQ, when A is the origin? 1

Ans : The mid point of side PQ where P(4, 6) and (3, 2) is

$$=\left(\frac{4+3}{2},\frac{6+2}{2}\right)$$

$$=\left(\frac{7}{2},4\right)$$

[∵ Mid point formula

$$\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right).$$

iii) What will be the coordinates of the vertices of a $\triangle PQR$ if C is the origin? 2

Ans : The co-ordinates of the vertices of triangle ΔPQR if C is the origin

P(12, 2) Q(13, 6) R(10, 3)

OR

What is the mid point of side QR, when C is the origin?

Ans : The mid point of side QR when C is the origin

$$\left(\frac{13+10}{2},\frac{6+3}{2}\right)$$ [∵ Q(13, 6) R(10, 3)

$$=\left(\frac{23}{2},\frac{9}{2}\right).$$

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