MATHEMATICS

Important Questions

Multiple Choice questions-

1. The ratio in which (4,5) divides the line segment joining the points (2,3) and (7,8) is

(a) 2:3

(b) -3:2

(c) 3:2

(d) -2:3

2. The values of x and y, if the distance of the point (x, y) from (-3,0) as well as from (3,0) is 4 are

(a) $x = 1, y = 7$

(b) $x = 2, y = 7$

(c) $x = 0, y = -\sqrt{7}$

(d) $x = 0, y = \pm\sqrt{7}$

3.The distance between the points (3,4) and (8,-6) is

(a) $2\sqrt{5}$ units

(b) $3\sqrt{5}$ units

(c) $\sqrt{5}$ units

(d) $5\sqrt{5}$ units

4. The ratio in which the x-axis divides the segment joining A(3,6) and B(12,-3) is

(a) 1:2

(b) -2:1

(c) 2:1

(d) -1:-1

5. The horizontal and vertical lines drawn to determine the position of a point in a Cartesian plane are called

(a) Intersecting lines

(b) Transversals

(c) Perpendicular lines

(d) X-axis and Y-axis

6. The mid point of the line segment joining A(2a,4) and B(-2,3b) is M (1,2a + 1). The values of a and b are

(a) 2,3

(b) 1,1

(c) -2,-2

(d) 2,2

7. The points (1,1), (-2, 7) and (3, -3) are

(a) vertices of an equilateral triangle

(b) collinear

(c) vertices of an isosceles triangle

(d) none of these

8. The line $3x + y – 9 = 0$ divides the line joining the points (1, 3) and (2, 7) internally in the ratio

(a) 3 : 4

(b) 3 : 2

(c) 2 : 3

(d) 4 : 3

9. The ordinate of a point is twice its abscissa. If its distance from the point (4,3) is $\sqrt{10}$, then the coordinates of the point are

(a) (1,2) or (3,6)

(b) (1,2) or (3,5)

(c) (2,1) or (3,6)

(d) (2,1) or (6,3)

10. The mid-point of the line segment joining the points A (-2, 8) and B (-6, -4) is

(a) (-4, -6)

(b) (2, 6)

(c) (-4, 2)

(d) (4, 2)

Very Short Questions:

1. What is the area of the triangle formed by the points 0 (0, 0), A (-3, 0) and B (5, 0)?
2. If the centroid of triangle formed by points P (a, b), Q (b, c) and R (c, a) is at the origin, what is the value of a + b + c?
3. AOBC is a rectangle whose three vertices are A (0, 3), 0 (0, 0) and B (5, 0). Find the length of its diagonal.
4. Find the value of a, so that the point (3, a) lie on the line 2x – 3y = 5.
5. Find distance between the points (0, 5) and (-5, 0).
6. Find the distance of the point (-6,8) from the origin.
7. If the distance between the points (4, k) and (1, 0) is 5, then what can be the possible values of k?
8. If the points A (1, 2), B (0, 0) and C (a, b) are collinear, then what is the relation between a and b?
9. Find the ratio in which the line segment joining the points (-3, 10) and (6, – 8) is divided by (-1, 6).
10. The coordinates of the points P and Q are respectively (4, -3) and (-1, 7). Find the abscissa of a point R on the line segment PQ such that $\frac{PR}{PQ} = \frac{3}{5}$.

Short Questions :

1. Write the coordinates of a point on x-axis which is equidistant from the points (-3, 4) and (2, 5).
2. Find the values of x for which the distance between the points P (2, -3) and Q (x, 5) is 10.

3. What is the distance between the points (10 cos 30°, 0) and (0, 10 cos 60°)?

4. In Fig. 6.8, if A(-1, 3), B(1, -1) and C (5, 1) are the vertices of a triangle ABC, what is the length of the median through vertex A?

5. Find the ratio in which the line segment joining the points P (3, -6) and Q (5,3) is divided by the x-axis.

6. Point P (5, -3) is one of the two points of trisection of the line segment joining the points A (7, -2) and B (1, -5). State true or false and justify your answer.

7. Show that ΔABC, where A(-2, 0), B(2, 0), C(0, 2) and APQR where P(-4, 0), Q(4, 0), R(0,4) are similar triangles.

OR

Show that ΔABC with vertices A(-2, 0), B(0, 2) and C(2, 0) is similar to ΔDEF with vertices D(-4, 0), F(4,0) and E(0, 4).

[ΔPQR is replaced by ΔDEF]

8. Point P (0, 2) is the point of intersection of y-axis and perpendicular bisector of line segment joining the points, A (-1, 1) and B (3, 3). State true or false and justify your answer.

9. Determine, if the points (1, 5), (2, 3) and (-2, -11) are collinear.

10. Find the distance between the following pairs of points:

(i) (-5, 7), (-1, 3)

(ii) (a, b), (-a, -b)

Long Questions :

1. Find the value of 'k", for which the points are collinear: (7, -2), (5, 1), (3, k).

2. Find the area of the triangle formed by joining the mid-points of the sides of the triangle whose vertices are (0, -1), (2, 1) and (0, 3). Find the ratio of this area to the area of the given triangle.

3. Find the area of the quadrilateral whose vertices, taken in order, are (-4, -2), (-3, -5), (3, -2) and (2, 3).

4. A median of a triangle divides it into two triangles of equal areas. Verify this result for ΔABC whose vertices are A (4,-6), B (3, -2) and C (5, 2).

5. Find the ratio in which the point P (x, 2), divides the line segment joining the points A (12, 5) and B (4, -3). Also find the value of x.

6. If A (4, 2), B (7, 6) and C (1, 4) are the vertices of a ΔABC and AD is its median, prove that the median AD divides into two triangles of equal areas.

7. If the point A (2, -4) is equidistant from P (3, 8) and Q (-10, y), find the values of y. Also find distance PQ.

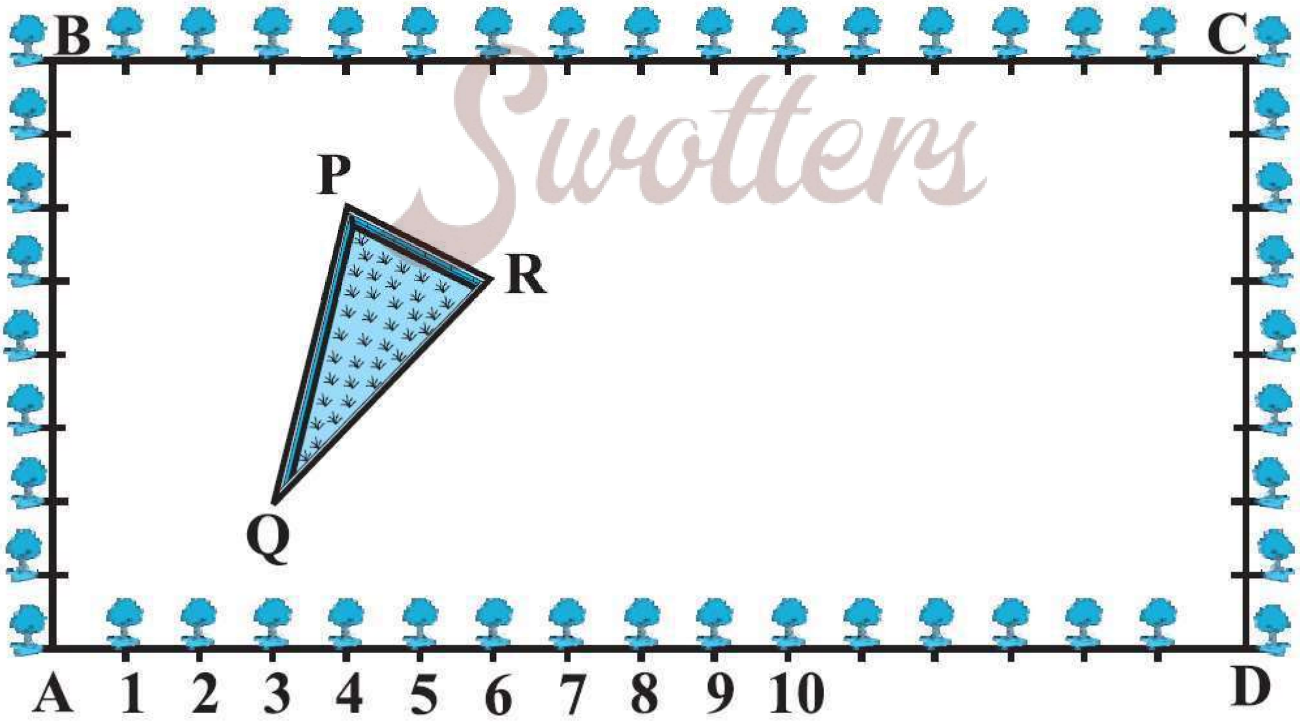
8. The base BC of an equilateral triangle ABC lies on y-axis. The coordinates of point Care (0, -3). The origin is the mid-point of the base. Find the coordinates of the points A and B. Also find the coordinates of another point D such that BACD is a rhombus.

9. Prove that the area of a triangle with vertices (t, t-2), (t + 2, t + 2) and (t + 3, t) is independent of t.

10. The area of a triangle is 5 sq units. Two of its vertices are (2, 1) and (3, -2). If the third vertex is $\left(\frac{7}{2}, y\right)$, find the value of y.

Case Study Qurstions:

1. 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 is planted on the boundary of the plot at a distance of 1m from each other. There is a triangular grassy lawn inside the plot as shown in Fig. Th students have to sow seeds of flowering plants on the remaining area of the plot.



i. Considering A as the origin, what are the coordinates of A?

a. (0, 1)
b. (1, 0)
c. (0, 0)
d. (-1, -1)

ii. What are the coordinates of P?

a. (4, 6)
b. (6, 4)
c. (4, 5)
d. (5, 4)

iii. What are the coordinates of R?

a. (6, 5)
b. (5, 6)
c. (6, 0)
d. (7, 4)

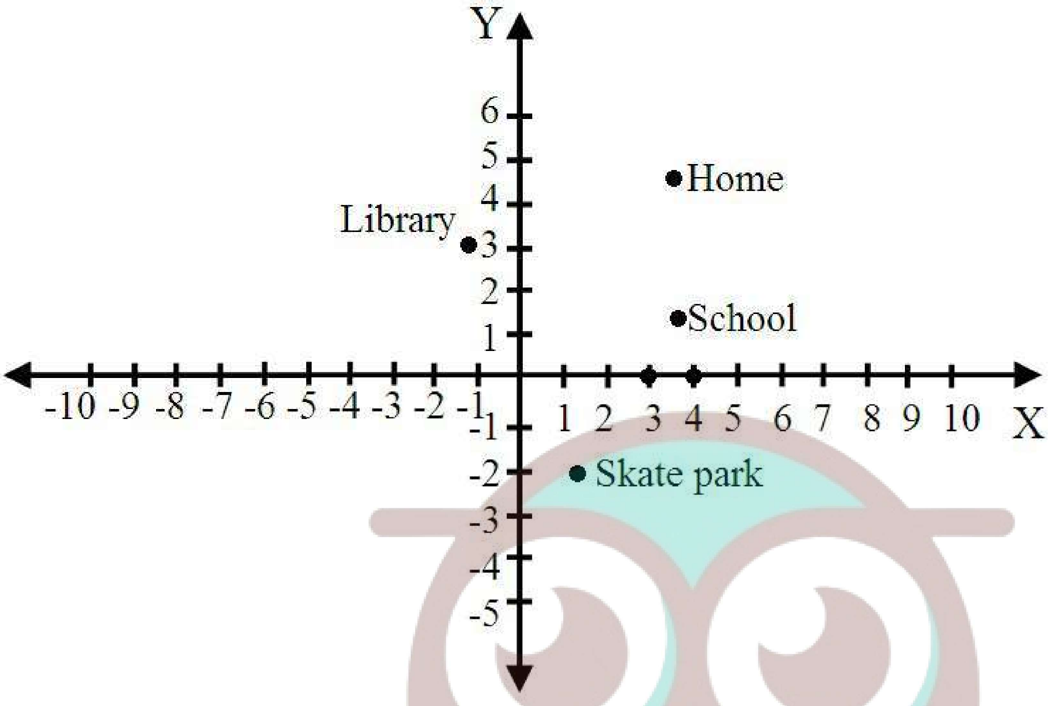
iv. What are the coordinates of D?

a. (16, 0)
b. (0, 0)
c. (0, 16)
d. (16, 1)

v. What are the coordinates of P if D is taken as the origin?

a. (12, 2)
b. (-12, 6)
c. (12, 3)
d. (6, 10)

2. Two brothers Ramesh and Pulkit were at home and have to reach School. Ramesh went to Library first to return a book and then reaches School directly whereas Pulkit went to Skate Park first to meet his friend and then reaches School directly.



i. How far is School from their Home?

a. 5m
b. 3m
c. 2m
d. 4m

ii. What is the extra distance travelled by Ramesh in reaching his School?

a. 4.48 metres
b. 6.48 metres
c. 7.48 metres
d. 8.48 metres

iii. What is the extra distance travelled by Pulkit in reaching his School? (All distances are measured in metres as straight lines).

a. 6.33 metres
b. 7.33 metres
c. 5.33 metres
d. 4.33 metres

iv. The location of the library is:

a. (-1, 3)

b. (1, 3)
c. (3, 1)
d. (3, -1)

v. The location of the Home is:

a. (4, 2)
b. (1, 3)
c. (4, 5)
d. (5, 4)

Assertion Reason Questions-

1. **Directions:** Each of these questions contains two statements: Assertion [A] and Reason [R]. Eac of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes [a], [b], [c] and [d] given below.

   a. A is true, R is true; R is a correct explanation for A.

   b. A is true, R is true; R is not a correct explanation for A.

   c. A is true; R is False.

   d. A is false; R is true.

2. **Directions:** Each of these questions contains two statements: Assertion [A] and Reason [R]. Eac of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes [a], [b], [c] and [d] given below.

   a. A is true, R is true; R is a correct explanation for A.

   b. A is true, R is true; R is not a correct explanation for A.

   c. A is true; R is False.

   d. A is false; R is true.

Answer Key-

Multiple Choice questions-

1. (a) 2:3
2. (d) x = 0, y = ± √7
3. (d) 5√5 units
4. (c) 2:1
5. (d) X-axis and Y-axis
6. (d) 2,2
7. (b) collinear
8. (a) 3 : 4
9. (a) (1,2) or (3,6)
10. (c) (-4, 2)

Very Short Answer :

1. Area of ΔOAB = $\frac{1}{2}$ [0(0 – 1) – 3(0 – 0) + 5(0 – 0)] = 0

⇒ Given points are collinear

2.

$$\text{Centroid of } \Delta PQR = \left(\frac{a+b+c}{3}, \frac{b+c+a}{3}\right)$$

$$\text{Given } \left(\frac{a+b+c}{3}, \frac{b+c+a}{3}\right) = (0, 0)$$

$$\Rightarrow a + b + c = 0$$

3.

$$\text{Length of diagonal} = AB = \sqrt{(5-0)^2 + (0-3)^2} = \sqrt{25+9} = \sqrt{34}$$

4. Since (3, a) lies on the line 2x – 3y = 5

Then 2(3) – 3(a) = 5

– 3a = 5 – 6

– 3a = -1

$\Rightarrow$ a = $\frac{1}{3}$

5. Here $x_1 = 0$, $y_1 = 5$, $x_2 = -5$ and $y_2 = 0$)

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

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

$$= \sqrt{25+25} = \sqrt{50} = 5\sqrt{2} \text{ units}$$

6. Here $x_1 = -6$, $y_1 = 8$

$x_2 = 0$, $y_2 = 0$

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

$$= \sqrt{[0-(-6)^2] + (0-8)^2} = \sqrt{(6)^2 + (-8)^2} = \sqrt{36+64}$$

$$= \sqrt{100} = 10 \text{ units}$$

7. Using distance formula

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

$$\sqrt{(4-1)^2 + (k-0)^2} = 5$$

$$9 + k^2 = 25 \quad \Rightarrow \quad k^2 = 16$$

$$\Rightarrow \quad k = \pm 4$$

8. Points A, B and C are collinear

$\Rightarrow$ 1(0 – b) + 0 (b – 2) + a(2 – 0) = 0

$\Rightarrow$ -b + 2a = 0 or 2a = b

9. In Fig. 6.6, let the point P(-1, 6) divides the line joining A(-3, 10) and B (6, -8) in the ratio k : 1

then, the coordinates of P are $\left(\dfrac{6k-3}{k+1}, \dfrac{-8k+10}{k+1}\right)$

But, the coordinates of P are $(-1, 6)$

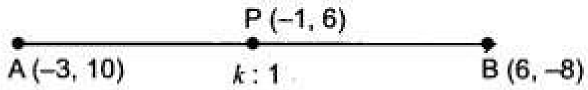


Fig. 6.6

$$\therefore \quad \frac{6k-3}{k+1} = -1 \quad \Rightarrow \quad 6k-3 = -k-1$$

$$\Rightarrow \quad 6k + k = 3 - 1 \quad \Rightarrow \quad 7k = 2$$

$$\Rightarrow \quad k = \frac{2}{7}$$

Hence, the point P divides AB in the ratio 2 : 7.

10.

Fig. 6.7

$$\frac{PQ}{PR} = \frac{5}{3} \quad \Rightarrow \quad \frac{PQ - PR}{PR} = \frac{5-3}{3}$$

$$\Rightarrow \quad \frac{RQ}{PR} = \frac{2}{3}$$

i.e., R divides PQ in the ratio 3 : 2

Abscissa of $R = \dfrac{3\times(-1)+2\times 4}{3+2} = \dfrac{-3+8}{5} = 1$

Short Answer :

1. Let the required point be (x, 0).

Since, (x, 0) is equidistant from the points (-3, 4) and (2, 5).

$\therefore \quad \sqrt{(-3-x)^2+(4-0)^2} = \sqrt{(2-x)^2+(5-0)^2}$

$\Rightarrow \quad \sqrt{9+x^2+6x+16} = \sqrt{4+x^2-4x+25}$

$\Rightarrow \quad x^2+6x+25 = x^2-4x+29 \quad \Rightarrow \quad 10x = 4 \quad \text{or} \quad x = \frac{4}{10} = \frac{2}{5}$

$\therefore$ Required point is $\left(\frac{2}{5}, 0\right)$.

2.

Distance between the given points $= \sqrt{(x-2)^2+(5+3)^2}$

$\Rightarrow \quad 10 = \sqrt{x^2+4-4x+64}$

$\Rightarrow \quad 100 = x^2-4x+68$

$\Rightarrow \quad x^2-4x-32 = 0$

$\Rightarrow \quad x^2-8x+4x-32 = 0$

$\Rightarrow \quad (x-8)(x+4) = 0 \quad \Rightarrow x = 8, -4$

3.

Distance between the given points $= \sqrt{(0-10\cos 30°)^2+(10\cos 60° - 0)^2}$

$= \sqrt{100\cos^2 30° + 100\cos^2 60°}$

$= \sqrt{100\left[\left(\frac{\sqrt{3}}{2}\right)^2+\left(\frac{1}{2}\right)^2\right]} = \sqrt{100\left(\frac{3}{4}+\frac{1}{4}\right)} = \sqrt{100} = 10$ units

4.

Coordinates of the mid-point of $BC = \left(\frac{1+5}{2}, \frac{-1+1}{2}\right) = (3, 0)$

$\therefore$ Length of the median through $A = \sqrt{(3+1)^2+(0-3)^2}$

$= \sqrt{16+9} = \sqrt{25} = 5$ units.

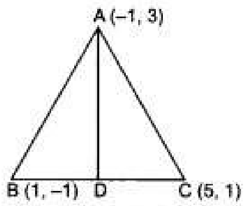


Fig. 6.8

5. Let the required ratio be λ : 1

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

Given that this point lies on the x-axis

$$\therefore \quad \frac{3\lambda - 6}{\lambda + 1} = 0 \quad \text{or} \quad 3\lambda = 6 \quad \text{or} \quad \lambda = 2$$

Thus, the required ratio is 2 : 1.

6. Points of trisection of line segment AB are given by

$$= \left(\frac{2\times1+1\times7}{3}, \frac{2\times(-5)+1\times(-2)}{3}\right) \text{ and } \left(\frac{1\times1+2\times7}{3}, \frac{1\times(-5)+2\times(-2)}{3}\right)$$

$$= \left(\frac{9}{3}, \frac{-12}{3}\right) \text{and} \left(\frac{15}{3}, \frac{-9}{3}\right) \text{ or } (3, -4) \text{ and } (5, -3)$$

∴ Given statement is true.

7.

$$AB = \sqrt{(2+2)^2+0} = \sqrt{16} = 4$$
$$BC = \sqrt{(0-2)^2+(2-0)^2} = \sqrt{8} = 2\sqrt{2}$$
$$CA = \sqrt{(-2-0)^2+(0-2)^2} = \sqrt{8} = 2\sqrt{2}$$
$$PQ = \sqrt{(4+4)^2+0} = \sqrt{64} = 8$$
$$QR = \sqrt{(0-4)^2+(4-0)^2} = \sqrt{32} = 4\sqrt{2}$$
$$RP = \sqrt{(-4-0)^2+(0-4)^2} = \sqrt{32} = 4\sqrt{2}$$

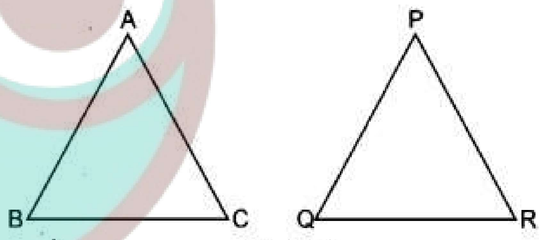


Fig. 6.9

$$\therefore \quad \frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP} = \frac{1}{2} \quad \Rightarrow \quad \Delta ABC \sim \Delta PQR$$

8. The point P (0, 2) lies on y-axis

$$\text{Also,} \quad AP = \sqrt{(0+1)^2+(2-1)^2} = \sqrt{2}$$
$$BP = \sqrt{(0-3)^2+(2-3)^2} = \sqrt{9+1} = \sqrt{10}$$

AP ≠ BP

∴ P(0, 2) does not lie on the perpendicular bisector of AB. So, given statement is false.

9. Let A (1, 5), B (2, 3) and C (-2, -11) be the given points. Then we have

$$AB = \sqrt{(2-1)^2+(3-5)^2} = \sqrt{1+4} = \sqrt{5}$$
$$BC = \sqrt{(-2-2)^2+(-11-3)^2} = \sqrt{16+196} = \sqrt{4\times53} = 2\sqrt{53}$$
$$AC = \sqrt{(-2-1)^2+(-11-5)^2} = \sqrt{9+256} = \sqrt{265}$$

Clearly, AB + BC ≠ AC

∴ A, B, C are not collinear.

10. (i) Let two given points be A (-5, 7) and B (-1, 3).

Thus, we have x_1 = -5 and x_2 = -1

y_1 = 7 and y_2 = 3

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

$$\Rightarrow \quad AB = \sqrt{(-1+5)^2 + (3-7)^2} = \sqrt{(4)^2 + (-4)^2} = \sqrt{16+16} = \sqrt{32} = 4\sqrt{2} \text{ units.}$$

Long Answer :

1. Let the given points be

A (x_1, y_1) = (7, -2), B (x_2, Y_2) = (5, 1) and C (x_3, y_3) = (3, k)

Since these points are collinear therefore area (ΔABC) = 0

⇒ 12 [$x_1(y_2 – y_3) + x_2(y_3 – y_1) + x_3(y_1 – y_2)$] = 0

⇒ x1($y_2 – y_3$) + $x_2(y_3 – y_1) + x_3(y_1 – y_2)$ = 0

⇒ 7(1 – k) + 5(k + 2) + 3(-2 -1) = 0

⇒ 7 – 7k + 5k + 10 – 9 = 0

⇒ -2k + 8 = 0

⇒ 2k = 8

⇒ k = 4

Hence, given points are collinear for k = 4.

2. Let A (x_1, y_1) = (0, -1), B (x_2, y_2) = (2, 1), C (x_3, y_3) = (0, 3) be the vertices of ΔABC.

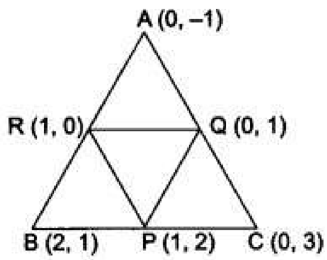
Now, let P, Q, R be the mid-points of BC, CA and AB, respectively.

So, coordinates of P, Q, R are

$$P = \left(\frac{2+0}{2}, \frac{1+3}{2}\right) = (1, 2)$$

$$Q = \left(\frac{0+0}{2}, \frac{3-1}{2}\right) = (0, 1)$$

$$R = \left(\frac{2+0}{2}, \frac{1-1}{2}\right) = (1, 0)$$



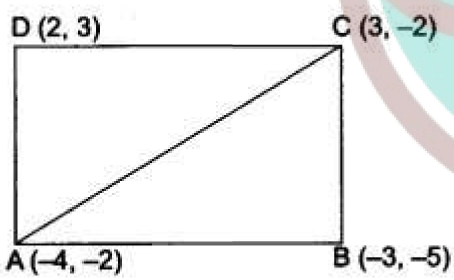
Therefore, $ar(\Delta PQR) = \frac{1}{2}[1(1-0) + 0(0-2) + 1(2-1)] = \frac{1}{2}(1+1) = 1$ sq. unit

Now, $ar(\Delta ABC) = \frac{1}{2}[0(1-3) + 2(3+1) + 0(-1-1)]$

$= \frac{1}{2}[0 + 8 + 0] = \frac{8}{2} = 4$ sq. units

Ratio of ar (ΔPQR) to the ar (ΔABC) = 1 : 4.

3.



Let A(4, -2), B(-3, -5), C(3, -2) and D(2, 3) be the vertices of the quadrilateral ABCD.

Now, area of quadrilateral ABCD

= area of ΔABC + area of ΔADC

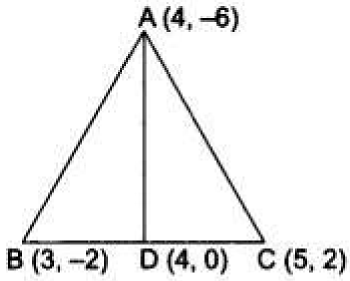
$= \frac{1}{2}[-4(-5+2) - 3(-2+2) + 3(-2+5)] + \frac{1}{2}[-4(-2-3) + 3(3+2) + 2(-2+2)$

$= \frac{1}{2}[12 - 0 + 9] + \frac{1}{2}[20 + 15 + 0]$

$\frac{1}{2}[21 + 35] = \frac{1}{2} \times 56 = 28$ sq. units.

4. Since AD is the median of ΔABC, therefore, D is the mid-point of BC.

Coordinates of D are $\left(\frac{3+5}{2}, \frac{-2+2}{2}\right)$ *i.e.*, $(4, 0)$



Now, area of ΔABD

$$= \frac{1}{2}[4(-2-0) + 3(0+6) + 4(-6+2)]$$

$$= \frac{1}{2}(-8 + 18 - 16) = \frac{1}{2} \times (-6) = -3$$

Since area is a measure, it cannot be negative.

Therefore, $ar(\Delta ABD) = 3$ sq. units

and area of $\Delta ADC = \frac{1}{2}[4(0-2) + 4(2+6) + 5(-6-0)]$

$$= \frac{1}{2}(-8 + 32 - 30)$$

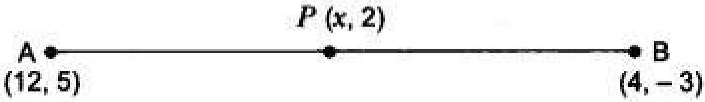
$$= \frac{1}{2}(-6) = -3, \text{ which cannot be negative.}$$

$\therefore$ $ar(\Delta ADC) = 3$ sq. units

Here, $ar(\Delta ABD) = ar(\Delta ADC)$

Hence, the median divides it into two triangles of equal areas.

5.



Let the ratio in which point P divides the line segment be $k:1$.

Then, coordinates of P : $\left(\dfrac{4k+12}{k+1}, \dfrac{-3k+5}{k+1}\right)$

Given, the coordinates of P as $(x, 2)$

$$\therefore \quad \frac{4k+12}{k+1} = x \qquad ...(i)$$

$$\text{and} \quad \frac{-3k+5}{k+1} = 2 \qquad ...(ii)$$

$$-3k + 5 = 2k + 2$$

$$5k = 3 \quad \Rightarrow \quad k = \frac{3}{5}$$

Putting the value of k in (i), we have

$$\frac{4 \times \frac{3}{5} + 12}{\frac{3}{5} + 1} = x \quad \Rightarrow \quad \frac{12+60}{3+5} = x$$

$$x = \frac{72}{8} \quad \Rightarrow \quad x = 9$$

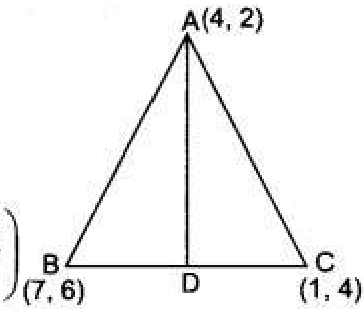
The ratio in which p divides the line segment is $\frac{3}{5}$, i.e., 3 : 5.

6. Given: AD is the median on BC.

⇒ BD = DC

The coordinates of midpoint D are given by.

$$\left(\frac{x_2+x_1}{2}, \frac{y_2+y_1}{2}\right) \qquad i.e., \left(\frac{1+7}{2}, \frac{4+6}{2}\right)$$



Coordinates of D are (4, 5).

Now, Area of triangle $ABD = \frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$

$$= \frac{1}{2}|4(6-5) + 7(5-2) + 4(2-6)| = \frac{1}{2}|4 + 21 - 16| = \frac{9}{2} \text{ sq. units}$$

$$\text{Area of } \Delta ACD = \frac{1}{2}|4(4-5) + 1(5-2) + 4(2-4)|$$

$$= \frac{1}{2}\ |-4+3-8|\ = \frac{1}{2}\ |-9| = \frac{9}{2} \text{ sq. units}$$

Hence, AD divides ΔABC into two equal areas.

7. Given points are A(2, 4), P(3, 8) and Q(-10, y)

According to the question,

PA = QA

$$\sqrt{(2-3)^2 + (-4-8)^2} = \sqrt{(2+10)^2 + (-4-y)^2}$$

$$\sqrt{(-1)^2 + (-12)^2} = \sqrt{(12)^2 + (4+y)^2}$$

$$\sqrt{1+144} = \sqrt{144+16+y^2+8y}$$

$$\sqrt{145} = \sqrt{160+y^2+8y}$$

On squaring both sides, we get

$$145 = 160 + y^2 + 8y$$

$$y^2 + 8y + 160 - 145 = 0$$

$$y^2 + 8y + 15 = 0$$

$$y^2 + 5y + 3y + 15 = 0$$

$$y(y+5) + 3(y+5) = 0$$

$$\Rightarrow \quad (y+5)(y+3) = 0$$

$$\Rightarrow \quad y + 5 = 0 \quad \Rightarrow \quad y = -5$$

$$\text{and} \quad y + 3 = 0 \quad \Rightarrow \quad y = -3$$

$$\therefore \quad y = -3, -5$$

Now, $\quad PQ = \sqrt{(-10-3)^2 + (y-8)^2}$

For $\quad y = -3 \quad PQ = \sqrt{(-13)^2 + (-3-8)^2} = \sqrt{169+121} = \sqrt{290}$ units

and for $y = -5 \quad PQ = \sqrt{(-13)^2 + (-5-8)^2} = \sqrt{169+169} = \sqrt{338}$ units

Hence, values of y are -3 and -5, $PQ = \sqrt{290}$ and $\sqrt{338}$ units.

8. ∵ O is the mid-point of the base BC.

∴ Coordinates of point B are (0, 3). So, BC = 6 units Let the coordinates of point A be (x, 0).

Using distance formula,

$$AB = \sqrt{(0-x)^2+(3-0)^2} = \sqrt{x^2+9}$$

$$BC = \sqrt{(0-0)^2+(-3-3)^2} = \sqrt{36}$$

Also, $AB = BC$ ($\because \Delta ABC$ is an equilateral triangle)

$$\sqrt{x^2+9} = \sqrt{36}$$

$$x^2 + 9 = 36$$

$$x^2 = 27 \Rightarrow x^2 - 27 = 0$$

$$x^2 - (3\sqrt{3})^2 = 0 \Rightarrow (x + 3\sqrt{3})(x - 3\sqrt{3}) = 0$$

$$x = -3\sqrt{3} \text{ or } x = 3\sqrt{3}$$

$$\Rightarrow \quad x = \pm 3\sqrt{3}$$

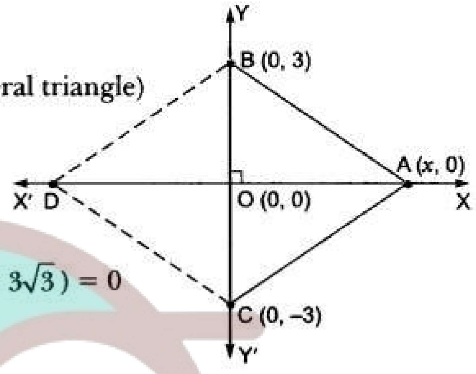


Fig. 6.30

∴ Coordinates of point A = (x, 0) = (3√3, 0)

Since BACD is a rhombus.

∴ AB = AC = CD = DB

∴ Coordinates of point D = (-3√3, 0).

9. Area of a triangle = $\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$

Area of the triangle = $\frac{1}{2}[t + 2 - t) + (t + 2)(t - t + 2) + (t + 3)(t - 2 - t - 2)]$

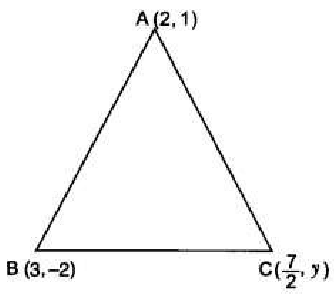
$= \frac{1}{2}[2t + 2t + 4 - 4t - 12]$

= 4 sq. units

which is independent of t.

Hence proved.

10.



Given: ar(ΔABC) = 5 sq. units

$$\frac{1}{2}\left|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right| = 5$$

$$\Rightarrow \frac{1}{2}\left|2(-2-y) + 3(y-1) + \frac{7}{2}(1+2)\right| = 5$$

$$\Rightarrow -4 - 2y + 3y - 3 + \frac{7}{2} + 7 = 10$$

$$\Rightarrow y + \frac{7}{2} = 10 \quad \Rightarrow y = 10 - \frac{7}{2}$$

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

Case Study Answer-

1. **Answer :**

It can be observed that the coordinates of point P, Q and R are (4, 6), (3, 2), and (6, 5) respectively.

i	c	(0, 0)
ii	a	(4, 6)
iii	a	(6, 5)
iv	a	(16, 0)
v	b	(-12, 6)

2. **Answer :**

i. (b) Distance between home and school, $HS = \sqrt{(4-4)^2 + (3-5)^2} = 3m$

ii. (c) Now, $HL = \sqrt{(-1-4^2) + (3-5)^2} = \sqrt{25+4} = \sqrt{29}$

$LS = \sqrt{[4-(-1)]^2 + (2-3)^2} = \sqrt{25+1} = \sqrt{26}$

Thus, $HL + LS = \sqrt{29} + \sqrt{26} = 10.48m$

So, extra distance covered by ramesh is $= HL + LS - HS = 10.48 - 3 = 7.48m$

iii. (d) Now, $HP = \sqrt{(3-4)^2 + (0-5)^2} = \sqrt{1+25} = \sqrt{26}$

$PS = \sqrt{[4-3]^2 + (2-0)^2} = \sqrt{1+4} = \sqrt{5}$

Thus, $HP + PS = \sqrt{26} + \sqrt{5} = 7.33m$

So, extra distance covered by pulkit is $= HP + PS - HS = 7.33 - 3 = 4.33m$

iv. (a) (-1, 3)
v. (c) (4, 5)

Assertion Reason Answer-

1. (a) A is true, R is true; R is a correct explanation for A.
2. (d) A is false; R is true.