1. Find the point (x, y) that divides the join of A(3, 6) and B(7, 10) in the ratio 3:1

A. (8, 9).
B. (4, 5)
C. (6, 9)
D. None of these

If (x, y) divides the join of A(x₁, y₁) and (x₂, y₂) in the ratio m:n

Then, \[ x = \frac{mx_2 + nx_1}{m+n} \text{ and } y = \frac{my_2 + ny_1}{m+n} \]

Here, \[ x_1 = 3, \quad x_2 = 7, \quad y_1 = 6, \quad y_2 = 10, \quad m = 3 \text{ and } n = 1. \]

\[ x = \frac{3 \times 7 + 1 \times 3}{3+1} = \frac{21 + 3}{4} = \frac{24}{4} = 6 \]

\[ y = \frac{3 \times 10 + 1 \times 6}{3+1} = \frac{30 + 6}{4} = \frac{36}{4} = 9 \]

Therefore the point is (6, 9)

2. C is the mid-point of PQ. If P is (4, x), C is (y, -1) and Q is (-2, 4), then x and y respectively are ____________.

A. - 6 and 1
B. -6 and 2
C. 6 and -1
D. 6 and -2

Given points are P(4, x), Q(-2, 4) and mid-point is C(y - 1)

\[ \text{Mid point (x, y) of the line joining the points (x₁, y₁) and (x₂, y₂) is } x = \left( \frac{x_2 + x_1}{2} \right) \text{ and } y = \left( \frac{y_2 + y_1}{2} \right) \]

\[ 4 - 2 \quad \text{and} \quad \frac{4 + x}{2} = -1 \]

\[ \Rightarrow y = 1 \text{ and } x = -6 \]
3. Find the point that divides A(2, 4) and B(6, 8) in the ratio a : 1.

- A. \( \left( \frac{6a+1}{a+1}, \frac{8a+4}{a+1} \right) \)
- B. \( \left( \frac{6a+2}{a+1}, \frac{8a+4}{a+1} \right) \)
- C. \( \left( \frac{6a-2}{a+1}, \frac{8-4a}{a+1} \right) \)
- D. \( \left( \frac{6a-8}{a+1}, \frac{2a-4}{a+1} \right) \)

The point, say P(x, y), divides the line AB into the ratio a : 1.

The equation for the point that divides a line segment joining the points \((x_1, y_1)\) and \((x_2, y_2)\) in the ratio m : n is:

\[
\left( \frac{m \times x_1 + n \times x_2}{m+n}, \frac{m \times y_1 + n \times y_2}{m+n} \right)
\]

Here, \((x_1, y_1) = (2, 4)\) and \((x_2, y_2) = (6, 8)\)

Applying the formula, we get

\[
\left( \frac{(1 \times 2 - a \times 6)}{a+1}, \frac{(1 \times 4 - a \times 8)}{a+1} \right)
= \left( \frac{6a+2}{a+1}, \frac{8a+4}{a+1} \right)
\]

4. If the distance between the points (4, p) and (1, 0) is 5, then p=___

- A. ±4
- B. ±2
- C. ±2√2
- D. ±4√2

Distance between the points = 5
\[
\sqrt{(4 - 1)^2 + (p - 0)^2} = 5
\]
\[
\Rightarrow 9 + p^2 = 25 \Rightarrow p^2 = 16 \Rightarrow p = \pm 4
\]
5. The distance between the points (5, 5) and (3, 3) is ___.

- A. 2 units
- B. $2\sqrt{2}$ units
- C. $\sqrt{2}$ units
- D. $8\sqrt{2}$ units

The distance between two points $(x_1, y_1)$ and $(x_2, y_2)$ is given by $
\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

Distance between points (5, 5) and (3, 3)

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

Hence, the distance between the given points is $2\sqrt{2}$ units.

6. The distance of the point (–2, –2) from the origin is __________ units.

- A. $\sqrt{9}$
- B. $2\sqrt{2}$
- C. 8
- D. $\sqrt{2}$

Let the origin be O and the point A be (-2, -2)

Using distance formula between two points,

$OA^2 = (2^2 + 2^2)$

$\Rightarrow OA^2 = 8$

$\Rightarrow OA = \sqrt{8} = 2\sqrt{2}$
7. P is the point on the y-axis which is equidistant from A(-5, -2) and B(3, 2), then PA = ___ cm.

A. 2  
B. 6  
C. 3  
D. 5

Given, A(-5, -2), B(3, 2).
Let the coordinates of P be (0, y).
We have,
PA = PB
⇒ PA² = PB²
⇒ (-5 - 0)² + (-2 - y)² = (3 - 0)² + (2 - y)²
⇒ 25 + 4 + y² + 4y = 9 + 4 + y² - 4y
⇒ 8y = -16
⇒ y = -2

Therefore coordinates of P is (0, -2)

PA = \sqrt{(-5 - 0)² + (-2 + 2)²}
  = \sqrt{25}
  = 5 cm
8. The ratio in which the line segment PQ, where P (-5, 2) and Q (2, 3), is divided by the y-axis is

A. 6 : 5
B. 3 : 5
C. 7 : 2
D. 5 : 2

All points on Y-axis can be expressed as (0, y) where y is the y-coordinate of the point.

Therefore, let the point of intersection of Y-axis and line PQ be R(0, y).

Let the ratio in which the line segment PQ is divided by point R be k:1.

Applying section formula, we get

\[
0 = \frac{2k - 1(-5)}{k + 1}
\]

\[
2k - 5 = 0
\]

\[
k = \frac{5}{2}
\]

\[
\therefore \text{ The required ratio is } 5 : 2.
\]
9. Determine the ratio in which the graph of the equation $3x + y = 9$ divides line segment joining the points $A(2,7)$ and $B(1,3)$.

A. $\frac{4}{3}$

B. $\frac{2}{3}$

C. $\frac{1}{3}$

D. $\frac{3}{4}$

Let $P(x, y)$ be the point which lies on line representing $3x + y = 9$ and dividing $AB$ in the ratio $k:1$

So $x = \frac{k \times 1 + 1 \times 2}{k + 1} = \frac{k - 2}{k + 1}$

And $y = \frac{k \times 3 + 1 \times 7}{k - 1} = \frac{3k - 7}{k - 1}$

Thus point $P$ is $\left(\frac{k - 2}{k + 1}, \frac{3k - 7}{k - 1}\right)$

As $P$ lies on $3x + y = 9$,

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

$\Rightarrow 3k + 6 + 3k + 7 = 9k + 9$

$\Rightarrow 3k = 4$

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

Thus the required ratio is $k : 1$, i.e., $4 : 3$
10. If Point P \((-4,6)\) divides the line segment AB with A\((-6,10)\) and B\((x,y)\) in the ratio 3:2, find the co-ordinates of B.

\[ \times \quad \text{A.} \quad \left( \frac{11}{3}, \frac{14}{3} \right) \]
\[ \times \quad \text{B.} \quad \left( \frac{8}{3}, -\frac{10}{3} \right) \]
\[ \checkmark \quad \text{C.} \quad \left( -\frac{8}{3}, \frac{10}{3} \right) \]
\[ \times \quad \text{D.} \quad \left( -\frac{16}{3}, \frac{8}{3} \right) \]

The equation for the point that divides a line segment joining the points \((x_1, y_1)\) and \((x_2, y_2)\) in the ratio \(m : n\) is:

\[
\left( \frac{mx_2 + nx_1}{m+n}, \frac{my_2 - ny_1}{m-n} \right)
\]

Here,

\((x_1, y_1) = (-6, 10),\)
\((x_2, y_2) = (x, y),\)
\(m : n = 3 : 2\)

According to Section Formula:

\[
\left( x, y \right) = \left( \frac{3x + (-12)}{3+2}, \frac{3y + 20}{3+2} \right)
\]
\[
\Rightarrow -4 = \frac{3x - 12}{5} \quad \text{and} \quad 6 = \frac{3y + 20}{5}
\]
\[
\Rightarrow 3x = -20 + 12 \quad \text{and} \quad 3y = 30 - 20
\]
\[
\Rightarrow x = -\frac{8}{3} \quad \text{and} \quad y = \frac{10}{3}
\]

\[
\therefore \text{Co-ordinates of B are} \left( -\frac{8}{3}, \frac{10}{3} \right).
\]
11. The point on the x-axis which is equidistant from (2, -5) and (-2, 9) is

A. (-2, 0)  
B. (2, 0)  
C. (-7, 0)  
D. (7, 0)

We know that a point on the x-axis is of form (x, 0). Let the point on the x-axis be P(x,0) and the given points are A(2, -5) and B(-2, 9)

Now,  
\[PA = \sqrt{(2 - x)^2 + (-5 - 0)^2}\]  
\[PB = \sqrt{(-2 - x)^2 + (9 - 0)^2}\]

Since PA = PB
\[\Rightarrow \sqrt{(2 - x)^2 + (-5 - 0)^2} = \sqrt{(-2 - x)^2 + (9 - 0)^2}\]
\[\Rightarrow (2 - x)^2 + (-5 - 0)^2 = (-2 - x)^2 + (9 - 0)^2\]
\[\Rightarrow 4 - 4x + x^2 + 25 = 4 + 4x + x^2 + 81\]
\[\Rightarrow -8x = 56\]
\[\Rightarrow x = -7\]

Hence, the required point is (-7, 0)
12. If A (−2, −1), B (a, 0), C (4, b) and D (1, 2) are the vertices of a parallelogram, find the values of a and b.

A. a = 1 and b = 3
B. a = 2 and b = 3
C. a = 1 and b = 1
D. a = 1 and b = 4

We know that the diagonals of a parallelogram bisect each other. Therefore, the coordinates of the mid-point of AC are same as the coordinates of the mid-point of BD.

The coordinates of the mid-point of a line formed by joining two points \((x_1, y_1)\) and \((x_2, y_2)\) are \(\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)\)

Midpoint of AC = \(\left(\frac{-2+4}{2}, \frac{-1+b}{2}\right)\)
Midpoint of BD = \(\left(\frac{a-1}{2}, \frac{0-2}{2}\right)\)

\[\Rightarrow \left(\frac{-2+4}{2}, \frac{-1+b}{2}\right) = \left(\frac{a-1}{2}, \frac{0-2}{2}\right)\]
\[\Rightarrow \left(1, \frac{b-1}{2}\right) = \left(\frac{a-1}{2}, 1\right)\]
⇒ \(\frac{a-1}{2} = 1\) and \(\frac{b-1}{2} = 1\)
⇒ a + 1 = 2 and b - 1 = 2
⇒ a = 1 and b = 3
13. If the points A(1, 2), B(4, 3), C(1, 0) and D(p, -1) are the vertices of a parallelogram then, find the value of p.

\[ \begin{align*}
A. & \ 3 \\
B. & \ -2 \\
C. & \ 4 \\
D. & \ 0
\end{align*} \]

In a parallelogram, the diagonals bisect each other.

So the midpoints of both the diagonals will coincide.

Midpoint of AC = Midpoint of BD

\[ \left( \frac{1+1}{2}, \frac{2+0}{2} \right) = \left( \frac{4+p}{2}, \frac{3-1}{2} \right) \]

\[ \Rightarrow (1, 1) = \left( \frac{4+p}{2}, 1 \right) \]

\[ \Rightarrow 1 = \frac{4+p}{2} \]

\[ \Rightarrow p = -2 \]
14. In the given figure, P is the Midpoint of AB. Find the value of m.

Co-ordinates of P \((4, -3)\) by midpoint theorem,

\[ P(x, y) = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \]

Here,
\[ x_1 = 3, x_2 = 5, y_1 = 6 \text{ & } y_2 = m \]

\[ -3 = \frac{6 + m}{2} \]

\[ -6 = 6 + m \]

\[ m = -12 \]

\(\therefore m = -12\).
15. The distance between A (1, 3) and B (x, 7) is 5. The value of x if x > 0 is:

- A. 4
- B. 2
- C. 1
- D. 3

Given points are A = (1,3) and B = (x, 7)

\[ \text{The distance between two points } (x_1, y_1) \text{ and } (x_2, y_2) \text{ is } \]
\[ \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]
\[ \Rightarrow AB^2 = (x - 1)^2 + (7 - 3)^2 \]

Given, distance between A and B is 5 units.
\[ \Rightarrow 5^2 = (x - 1)^2 + 16 \]
\[ \Rightarrow 9 = (x - 1)^2 \]
\[ \Rightarrow x - 1 = \pm 3 \]
\[ \Rightarrow x = 4, -2 \]

Since, x > 0

Therefore, the value of 'x' is 4.
16. In a classroom, 4 friends are seated at the points A, B, C and D as shown in the following figure. The point A(3, 4), B(6, 7), C(9, 4) and D(6, 1) taken in order form the vertices of _________________

A. Square  
B. Rectangle  
C. Rhombus  
D. Rhombus
Distance between two points \((x_1, y_1)\) and \((x_2, y_2)\)

\[= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}\]

\[AB^2 = (6 - 3)^2 + (7 - 4)^2\]
\[= 9 + 9\]
\[= 18\]
\[AB = \sqrt{18}\] units

\[BC^2 = (9 - 6)^2 + (4 - 7)^2\]
\[= 9 + 9\]
\[= 18\]
\[BC = \sqrt{18}\] units

\[CD^2 = (6 - 9)^2 + (1 - 4)^2\]
\[= 9 + 9\]
\[= 18\]
\[CD = \sqrt{18}\] units

\[DA^2 = (3 - 6)^2 + (4 - 1)^2\]
\[= 9 + 9\]
\[= 18\]
\[DA = \sqrt{18}\] units

Since all the sides are equal, from the given options we can say that the figure is a square.
Practice Questions - Term I

17. From the figure, find the ratio in which the line segment joining the points A(3, 4) and C(9, 4) is divided by x = 5.

- A. 1:1
- B. 2:1
- C. 1:2
- D. 3:1

Let O(5, y) divide AB in the ratio k : 1.

By section formula, the coordinates of O are given by: \((\frac{9k-3}{k+1}, \frac{4k-4}{k+1})\)

But \(O(5, y) = (\frac{9k-3}{k+1}, \frac{4k-4}{k+1}) \Rightarrow \frac{9k-3}{k+1} = 5 \Rightarrow 9k + 3 = 5k + 5 \Rightarrow 4k = 2 \Rightarrow k = \frac{1}{2}\)

i.e., the line x = 5 divides AB in the ratio 1 : 2.

18. From the figure, the distance between the points A(3, 4) and C(9, 4) is

- A. 3
- B. 4
- C. 5
- D. 6

Given A(3,4), C(9,4)

\(\therefore\) Distance between points \((x_1, y_1), (x_2, y_2)\) is \(\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}\)

\(\therefore AB = \sqrt{(9 - 3)^2 + (4 - 4)^2} = \sqrt{36 + 0} = 6\)
19. Mid-point of the line-segment joining the points A(3, 4) and C(9, 4) is:

- A. (3, 6)
- B. (4, 3)
- C. (6, 4)
- D. (4, 6)

Midpoint of the line segment joining \((x_1, y_1)\) and \((x_2, y_2)\) is given by
\[
\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)
\]
\[\therefore\] Mid-point of the line-segment joining the points (3, 4) and (9, 4) = 
\[
\left( \frac{3 + 9}{2}, \frac{4 + 4}{2} \right) = (6, 4)
\]

20. From the figure, find the ratio in which the line segment joining the points B(6, 7) and D(6, 1) is divided by \(y = 4\).

- A. 1:1
- B. 1:2
- C. 2:1
- D. 3:2

Let \(P(x, 4)\) divide \(AB\) in the ratio \(k : 1\).

By section formula, the coordinates of \(P\) are given by:
\[
\left( \frac{6k - 6}{k + 1}, \frac{k + 7}{k + 1} \right)
\]
But \(P(x, 4) = \left( \frac{6k - 6}{k + 1}, \frac{k + 7}{k + 1} \right) \Rightarrow \frac{k + 7}{k + 1} = 4\)
\[\Rightarrow k + 7 = 4k + 4\]
\[\Rightarrow 3k = 3\]
\[\Rightarrow k = 1\]

i.e., the line \(y = 4\) divides \(AB\) in the ratio 1 : 1.