RD SHARMA
Solutions
Class 10 Maths
Chapter 14
Ex *14.3*

1. Find the coordinates of the point which divides the line segment joining (— 1, 3) and (4, — 7) internally in the ratio 3 : 4.

Sol:

Let $P(x, y)$ be the required point.

$$x = \frac{mx_2 + nx_1}{m+n}$$

$$y = \frac{my_2 + ny_1}{m+n}$$

Here, $x_1 = -1$

$y_1 = 3$

$x_2 = 4$

$y_2 = -7$

$m : n = 3 : 4$

$$x = \frac{3\times4+4\times(-1)}{3+4}3$$

$$x = \frac{12-4}{7}$$

$$x = \frac{8}{7}$$

$$y = \frac{3\times(-7)+4\times3}{3+4}$$

$$y = \frac{-21+12}{7}$$

$$y = \frac{-9}{7}$$

$$\therefore \text{The coordinates of P are } \left(\frac{8}{7}, \frac{-9}{7}\right)$$

2. Find the points of trisection of the line segment joining the points:
   (i) (5, —6) and (— 7, 5),
   (ii) (3, —2) and (—3, —4)
   (iii) (2, —2) and (—7, 4).

Sol:

(i) Let P and Q be the point of trisection of AB i.e., $AP = PQ = QB$

$(5,-6)$ $(-7,5)$

Therefore, P divides AB internally in the ratio of 1:2, thereby applying section formula, the coordinates of P will be

$$\left(\frac{1(-7)+2(5)}{1+2}\right), \left(\frac{1(5)+2(-6)}{1+2}\right) i.e., \left(1, \frac{-7}{3}\right)$$

Now, Q also divides AB internally in the ratio of 2:1 there its coordinates are

$$\left(\frac{2(-7)+1(5)}{2+1}\right), \frac{2(5)+1(-6)}{2+1} i.e., \left(-3, \frac{4}{3}\right)$$

(ii)

Let P, Q be the point of tri section of AB i.e.,

$AP = PQ = QB$

$(3,-2)$ $\qquad\qquad\qquad$ $(-3,-4)$

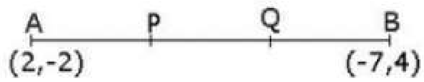
Therefore, P divides AB internally in the ratio of 1:2
Hence by applying section formula, Coordinates of P are

$$\left(\left(\frac{1(-3)+2(3)}{1+2}\right),\frac{1(-4)+1(-2)}{1+2}\right)i.e.,\left(1,\frac{-8}{3}\right)$$

Now, Q also divides as internally in the ratio of 2:1
So, the coordinates of Q are

$$\left(\left(\frac{2(-3)+1(3)}{2+1}\right),\frac{2(-4)+1(-2)}{2+1}\right)i.e.,\left(-1,\frac{-10}{3}\right)$$

Let P and Q be the points of trisection of AB i.e., $AP = PQ = OQ$



Therefore, P divides AB internally in the ratio 1 : 2. Therefore, the coordinates of P, by applying the section formula, are

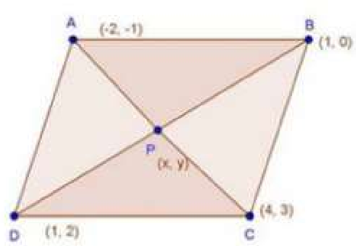
$$\left(\left(\frac{1(-7)+2(2)}{(1+2)}\right),\left(\frac{1(4)+2(-2)}{(1+2)}\right)\right),i.e.,(-1,0)$$

Now, Q also divides AB internally in the ration 2 : 1. So, the coordinates of Q are

$$\left(\frac{2(-7)+1(2)}{2+1},\frac{2(4)+1(2)}{2+1}\right),i.e.,(-4,2)$$

3. Find the coordinates of the point where the diagonals of the parallelogram formed by joining the points (—2, —1), (1, 0), (4, 3) and (1, 2) meet.

Sol:



Let $P(x, y)$ be the given points.

We know that diagonals of a parallelogram bisect each other.

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

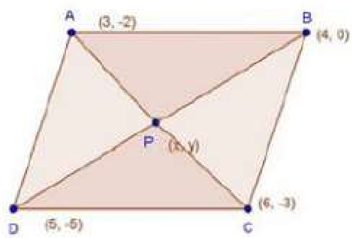
$$\Rightarrow x = \frac{2}{2} = 1$$

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

$\therefore$ Coordinates of P are $(1,1)$

4. Prove that the points (3, —2), (4, 0), (6, —3) and (5, —5) are the vertices of a parallelogram.

Sol:



Let $P(x, y)$ be the point of intersection of diagonals AC and 80 of $ABCD$.

$$x = \frac{3+6}{2} = \frac{9}{2}$$

$$y = \frac{-2-3}{2} = \frac{-5}{2}$$

Mid – point of $AC = \left(\frac{9}{5}, \frac{-5}{2}\right)$

Again,

$$x = \frac{5+4}{2} = \frac{9}{2}$$

$$y = \frac{-5+0}{2} = \frac{-5}{2}$$

Mid – point of $BD = \left(\frac{9}{2}, -\frac{5}{2}\right)$

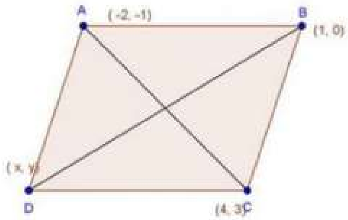
Here mid-point of AC – Mid - point of BD i.e, diagonals AC and BD bisect each other.

We know that diagonals of a parallelogram bisect each other

$\therefore$ $ABCD$ is a parallelogram.

5. Three consecutive vertices of a parallelogram are (—2, —1), (1, 0) and (4, 3). Find the fourth vertex.

Sol:



Let $A(-2,-1), B(1,0), C(4,3)$ and $D(x,y)$ be the vertices of a parallelogram $ABCD$ taken in order.

Since the diagonals of a parallelogram bisect each other.

$\therefore$ Coordinates of the mid - point of AC = Coordinates of the mid-point of BD.

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

$$\Rightarrow \frac{2}{2} = \frac{x+1}{2}$$

$$\Rightarrow 1 = \frac{x+1}{2}$$

$$\Rightarrow x+1=2$$

$$\Rightarrow x=1$$

And, $\dfrac{-1+3}{2} = \dfrac{y+0}{2}$

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

$$\Rightarrow y=2$$

Hence, fourth vertex of the parallelogram is $(1,2)$