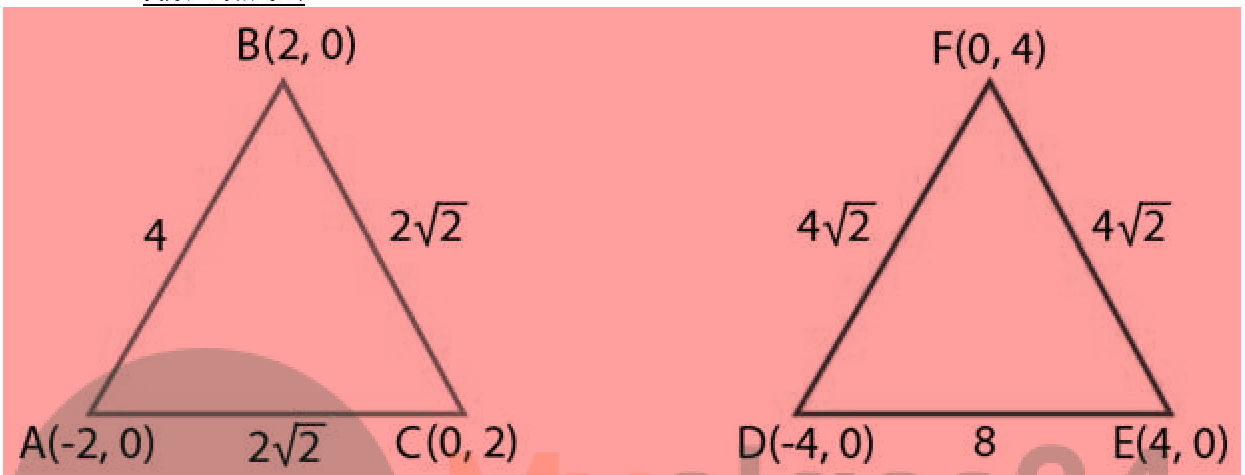
EXERCISE 7.2

State whether the following statements are true or false. Justify your answer.
1. △ABC with vertices A (–2, 0), B (2, 0) and C (0, 2) is similar to △DEF with vertices D (–4, 0) E (4, 0) and F (0, 4).
Solution:

True.

Justification:



Using distance formula, $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
We can find,

$$AB = \sqrt{(2+2)^2 + 0} = \sqrt{16} = 4$$

$$BC = \sqrt{(0-2)^2 + (2-0)^2} = \sqrt{8} = 2\sqrt{2}$$

$$CA = \sqrt{(-2-0)^2 + (0-2)^2} = \sqrt{8} = 2\sqrt{2}$$

$$DE = \sqrt{(4+4)^2 + 0} = \sqrt{64} = 8$$

$$EF = \sqrt{(0-4)^2 + (4-0)^2} = \sqrt{32} = 4\sqrt{2}$$

$$FD = \sqrt{(-4-0)^2 + (0-4)^2} = \sqrt{32} = 4\sqrt{2}$$

$$\therefore \quad \frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} = \frac{1}{2} \quad \Rightarrow \quad \Delta ABC \sim \Delta DEF$$

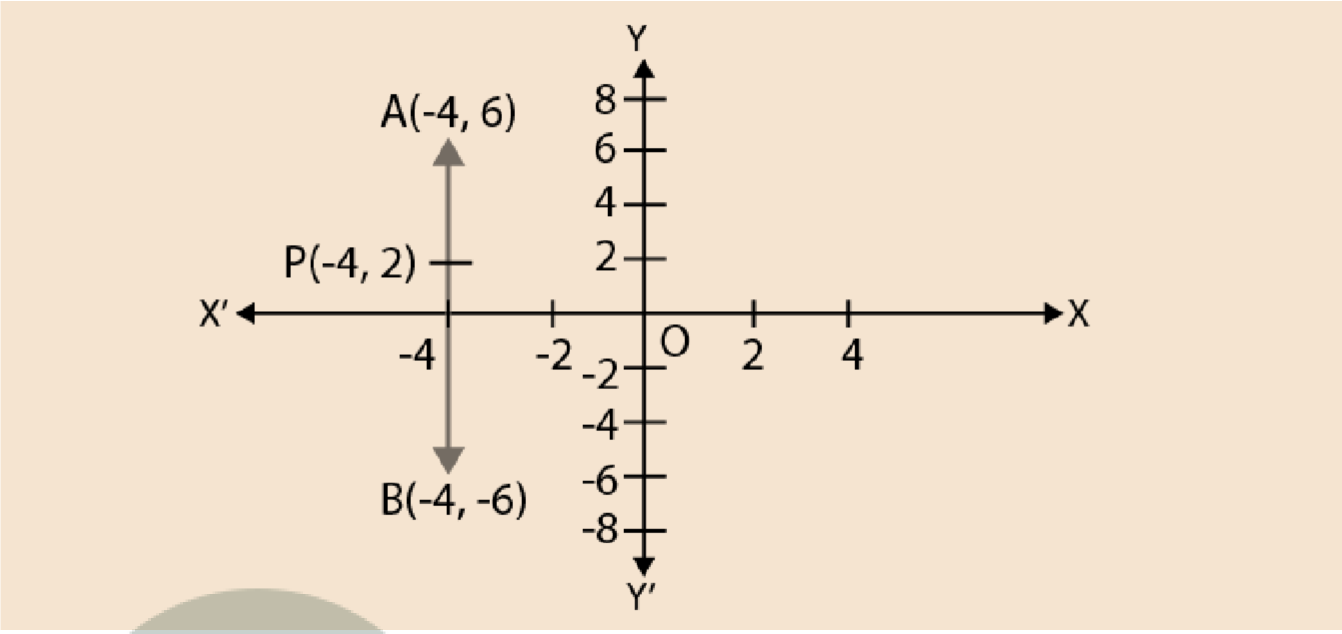
Hence, triangle ABC and DEF are similar.

2. Point P (– 4, 2) lies on the line segment joining the points A (– 4, 6) and B (– 4, – 6).
Solution:

True.

Justification:

Plotting the points P(- 4, 2), A (- 4, 6) and B (- 4, - 6) on a graph paper and connecting the points we get the graph,



Hence, from the graph it is clear that, point P (- 4, 2) lies on the line segment joining the points A (- 4, 6) and B (- 4, - 6),

3. The points (0, 5), (0, –9) and (3, 6) are collinear.
Solution:

False

Justification:

The points are collinear if area of a triangle formed by its points is equals to the zero.
Given,
$x_1 = 0$, $x_2 = 0$, $x_3 = 3$ and
$y_1 = 5$, $y_2 = - 9$, $y_3 = 6$

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

$\Delta = \frac{1}{2}[0(- 9 - 6) + 0(6 - 5) + 4(5 + 9)]$

$\Delta = \frac{1}{2}(0 + 0 + 3 \times 14$

$\Delta = 42/2 = 21 \neq 0$

From the above equation, it is clear that the points are not collinear.

4. 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).
Solution:

False
Justification:

We know that, the points lying on perpendicular bisector of the line segment joining the two points is equidistant from the two points.
i.e., PA should be equals to the PB.

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

$$PA = \sqrt{[-4-(4)]^2 + (6-2)^2}$$

$$PA = \sqrt{(0)^2 + (4)^2} = 4$$

$$PB = \sqrt{[-4-4]^2 + (-6-2)^2}$$

$$PB = \sqrt{0^2 + (-8)^2} = 8$$

$\because PA \neq PB$

5. Points A (3, 1), B (12, –2) and C (0, 2) cannot be the vertices of a triangle.
Solution:

True.
Justification:
Coordinates of A = (x_1, y_1) = (3, 1)
Coordinates of B = (x_2, y_2) = (12, - 2)
Coordinates of C = (x_3, y_3) = (0, 2)
Area of ΔABC = Δ = $1/2 [x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2)]$
Δ = ½ [3 - (2 - 2) + 12(2 - 1) + 0{1 - (- 2)}]
Δ = ½ [3(- 4) + 12(1) + 0]
Δ = ½ (- 12 + 12) =0
Area of ΔABC = 0
Since, the points A (3, 1), B (12, - 2) and C (0, 2) are collinear.
Therefore, the points A (3, 1), B (12, - 2) and C (0, 2) can’t be the vertices of a triangle.

6. Points A (4, 3), B (6, 4), C (5, –6) and D (–3, 5) are the vertices of a parallelogram.
Solution:

False

<u>Justification:</u>

The given points are A (4, 3), B (6, 4), C (5, –6) and D (–3, 5)

Finding the distance between A and B

$$AB = \sqrt{(6-4)^2 + (4-3)^2} = \sqrt{2^2 + 1^2} = \sqrt{5}$$

Finding the distance between B and C

$$BC = \sqrt{(5-6)^2 + (-6-4)^2}$$

$$BC = \sqrt{(-1)^2 + (-10)^2}$$

$$BC = \sqrt{1 + 100} = \sqrt{101}$$

Finding the distance between C and D

$$CD = \sqrt{(-3-5)^2 + (5+6)^2}$$

$$CD = \sqrt{(-8)^2 + (11)^2}$$

$$CD = \sqrt{64 + 121}$$

$$CD = \sqrt{185}$$

Finding the distance between D and A

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

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

$$DA = \sqrt{49 + 4} = \sqrt{53}$$

Since the distances are different, we can conclude that the points are not the vertices of a parallelogram.