

Co-ordinate Geometry : Merit/Excellence Practice #3

1. $X = (1, 2)$, $Y = (-4, -1)$, $Z = (4, -3)$. Show the triangle XYZ is isosceles.
2. I is the midpoint of points G and H. If $G = (4, 5)$ and $I = (7.25, -2)$, find H.
3. $A = (1, 2)$, $B = (5, 9)$, $C = (3, 5)$ and $D = (9, k)$. Find k so that a line going through the midpoint of AB and the midpoint of CD has a gradient of 2.
4. The bottom left corner of a parallelogram is $A = (1, 0)$. The bottom right corner is $B = (4, 2)$. The top right corner is $C = (k, k)$. Give the top left corner, D, in terms of k .

Answers – Co-ordinate Geometry : Merit/Excellence Practice #3

1. $X = (1, 2)$, $Y = (-4, -1)$, $Z = (4, -3)$. Show the triangle XYZ is isosceles.

$$\Delta x_{XY} = (1 - (-4)) = 5, \quad \Delta y_{XY} = (2 - (-1)) = 3 \text{ so } \text{Length}_{XY} = \sqrt{5^2 + 3^2} = 5.83$$

$$\Delta x_{XZ} = (1 - 4) = -3, \quad \Delta y_{XZ} = (2 - (-3)) = 5 \text{ so } \text{Length}_{XZ} = \sqrt{3^2 + 5^2} = 5.83$$

As the length of XY = length of XZ the triangle is isosceles.

2. I is the midpoint of points G and H. If $G = (4, 5)$ and $I = (7.25, -2)$, find H.

$$\frac{x+4}{2} = 7.25, \text{ so } x = 2 \times 7.25 - 4 = 10.5$$

$$\frac{y+5}{2} = -2, \text{ so } y = 2 \times -2 - 5 = -9$$

$$\mathbf{H = (10.5, -9)}$$

3. $A = (1, 2)$, $B = (5, 9)$, $C = (3, 5)$ and $D = (9, k)$. Find k so that a line going through the midpoint of AB and the midpoint of CD has a gradient of 2.

$$\text{mid}_{AB} = \left(\frac{1+5}{2}, \frac{2+9}{2}\right) = (3, 5.5) \quad \text{mid}_{CD} = \left(\frac{3+9}{2}, \frac{5+k}{2}\right) = \left(6, \frac{5+k}{2}\right)$$

The gradient between $(3, 5.5)$ and $(6, \frac{5+k}{2})$ is 2

$$m = 2 = \frac{\Delta y}{\Delta x} \text{ and } \Delta x \text{ for midpoints} = 6 - 3 = 3, \text{ so } \Delta y \text{ for midpoints} = 2 \times 3 = 6$$

$$\text{So: } 6 = \frac{5+k}{2} - 5.5 \quad \text{Rearranging: } 11.5 = \frac{5+k}{2} \quad \text{Rearranging } 23 = 5 + k$$

$$\mathbf{k = 18}$$

4. The bottom left corner of a parallelogram is $A = (1, 0)$. The bottom right corner is $B = (4, 2)$. The top right corner is $C = (k, k)$. Give the top left corner, D, in terms of k .

To form a parallelogram, CD must be the same length and same slope as AB.

From B to A is 3 left and two down.

The same length and direction must be from C to D.

$$\mathbf{D = (k - 3, k - 2)}$$