

Midpoint Formula

$$\begin{array}{l} x \text{ co-ordinate} = \frac{x_1 + x_2}{2} \\ y \text{ co-ordinate} = \frac{y_1 + y_2}{2} \end{array} \left. \vphantom{\begin{array}{l} x \text{ co-ordinate} \\ y \text{ co-ordinate} \end{array}} \right\} M \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Example: Determine the coordinates of the midpoint of the segment PQ if $P(-4, 7)$ and $Q(9, 13)$.

$$x_m = \frac{-4 + 9}{2} = \frac{5}{2} \text{ or } 2.5$$

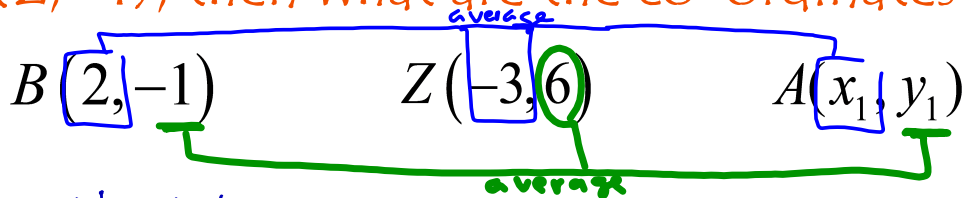
$$y_m = \frac{7 + 13}{2} = \frac{20}{2} = 10$$

$$M\left(\frac{5}{2}, 10\right)$$

Example: What are coordinates of the midpoint of the segment HK if $H(2.6, 12)$ and $K(-3.4, -5)$?

$$M \left(\frac{2.6 + (-3.4)}{2}, \frac{12 + (-5)}{2} \right) = \left(\frac{-0.8}{2}, \frac{7}{2} \right) = (-0.4, 3.5)$$

Example: Point Z lies half way between points A and B. If the co-ordinates of Z are $(-3, 6)$ and B are $(2, -1)$, then what are the co-ordinates of A?



Z is a midpoint.

$$\text{Therefore, } -3 = \frac{2 + x_1}{2} \quad \text{and} \quad 6 = \frac{-1 + y_1}{2}$$

If we solve each equation, we will know the co-ordinates of point A.

A

$$2 \cdot (-3) = \left(\frac{2 + x_1}{2} \right) \cdot 2$$

~~$$\text{or } -3 = \frac{2 + x_1}{2}$$~~

$$-6 = 2 + x_1$$

$$-8 = x_1$$

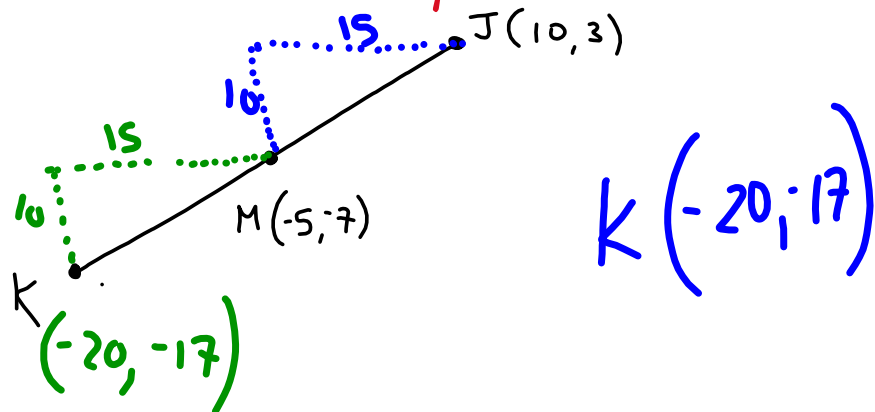
$$6 = \frac{-1 + y_1}{2}$$

$$12 = -1 + y_1$$

$$13 = y_1$$

$$A(-8, 13)$$

Example: The midpoint of line segment JK is $M(-5, -7)$. If the coordinates of one endpoint are $J(10, 3)$, then find the coordinates of point K.



Example: Jim's house is located halfway between his school and hockey rink. If his ^{midpoint} house is located at $(6, 3)$ and the school at $(1, 8)$, then what are the co-ordinates of the hockey rink?

$$6 = \frac{1+x}{2}$$

$$12 = 1+x$$

$$11 = x$$

$$3 = \frac{8+y}{2}$$

$$6 = 8+y$$

$$-2 = y$$

hockey rink
 $(11, -2)$