Midpoint of a Line Segment

If M is the coordinate of the midpoint of a line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$, then the coordinates of M are given by:

$$M = \left(\frac{x_2 + x_1}{2} , \frac{y_2 + y_1}{2} \right)$$

Example

Find the midpoint between S(3, -4) and T(-15, 2).

Solution

$(x_1,y_1) = (3, -4)$ $\quad$ $(x_2,y_2) = (-15, 2)$

$$M_{ST} = \left(\frac{x_2+x_1}{2}, \frac{y_2+y_1}{2} \right)$$

$$= \left(\frac{-15+3}{2}, \frac{2+-4}{2} \right)$$

$$= \left(\frac{-12}{2}, \frac{-2}{2} \right)$$

$$= (-6, -1)$$

The midpoint is therefore (-6, -1).

Example 2

The midpoint of AB is given by M(-1, 3) for the points A(-4, 2) and B(x,y). Find x and y.

Solution

$$-1 = \frac{(x + -4)}{2} \qquad 3 = \frac{(y + 2)}{2}$$

$$(-1)(2) = x - 4 \qquad (3)(2) = y + 2$$

$$-2 = x - 4 \qquad 6 = y + 2$$

$$-2 + 4 = x \qquad 6 - 2 = y$$

$$2 = x \qquad 4 = y$$

Therefore, point B is (2, 4).