**Midpoint**

It is the middle point between two endpoints.

![Line segment with endpoints and midpoint]

The midpoint of a line segment is an ORDERED PAIR!!!

**2 Types of Questions with Midpoint**

1. Given two endpoints, find the midpoint.
2. Given one endpoint and one midpoint, find the other endpoint.
Midpoint Formula

\[ m = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \]

\[ x_{\text{midpoint}} = \frac{x_1 + x_2}{2} \]

\[ y_{\text{midpoint}} = \frac{y_1 + y_2}{2} \]

Find the midpoint of the line segment, given the endpoints of (2, 4) and (8, 8).

\[ x_{\text{mid}} = \frac{2 + 8}{2} = \frac{10}{2} = 5 \]

\[ y_{\text{mid}} = \frac{4 + 8}{2} = \frac{12}{2} = 6 \]

\[ m = (5, 6) \]
Find the midpoint of the line segment, given the endpoints of \((-2, 5)\) and \((6, -3)\).

\[
X_{\text{mid}} = \frac{-2 + 6}{2} = \frac{4}{2} = 2
\]

\[
y_{\text{mid}} = \frac{5 + (-3)}{2} = \frac{2}{2} = 1
\]

\((2, 1)\)

Find the midpoint of the line segment, given the endpoints of \((-5, -1)\) and \((9, -3)\).

\[
X_{\text{mid}} = \frac{-5 + 9}{2} = \frac{4}{2} = 2
\]

\[
y_{\text{mid}} = \frac{-1 + (-3)}{2} = \frac{-4}{2} = -2
\]

\((2, -2)\)
Find the midpoint of the line segment, given the endpoints of (3, -4) and (-2, 1).

\[ x_{\text{mid}} = \frac{3 + (-2)}{2} = \frac{1}{2} \]

\[ y_{\text{mid}} = \frac{-4 + 1}{2} = \frac{-3}{2} \]

\[ \left( \frac{1}{2}, \frac{-3}{2} \right) \quad \text{or} \quad \left( 0.5, -1.5 \right) \]

If the endpoint of a line segment is (2, 5) and the midpoint is (4, 8), find the other endpoint.

\[ 2 + 4 = \frac{2 + x}{2} \cdot 2 \]

\[ 8 = 2 + x \]

\[ 6 = x \]

\[ 2 + 8 = \frac{5 + x}{2} \cdot 2 \]

\[ 16 = 5 + x \]

\[ 11 = x \]

\[ \left( 6, 11 \right) \]
The midpoint of a line segment is (3, 10). One endpoint is at (-6, 5). Find the other endpoint.

If the endpoint of a line segment is (-1, 2) and the other endpoint isn’t known, find the missing endpoint if the midpoint is (-5, -4).
Find the missing endpoint if the midpoint is (10, -7) and the other endpoint is (4, -2).

\[
\begin{align*}
2 \cdot 10 &= \frac{4 + x}{2} \\
2 \cdot -7 &= \frac{-2 + x}{2}
\end{align*}
\]

\[
\begin{align*}
20 &= 4 + x \\
-14 &= -2 + x
\end{align*}
\]

\[
\begin{align*}
20 &= 4 + x \\
-14 &= -2 + x
\end{align*}
\]

\[
\begin{align*}
16 &= x \\
-12 &= x
\end{align*}
\]

If the endpoint of a line segment is (3, 6) and the midpoint is (-2, -1), find the other endpoint.

\[
\begin{align*}
2 \cdot -2 &= \frac{3 + x}{2} \\
2 \cdot -1 &= \frac{6 + x}{2}
\end{align*}
\]

\[
\begin{align*}
-4 &= 3 + x \\
-2 &= 6 + x
\end{align*}
\]

\[
\begin{align*}
-4 &= 3 + x \\
-2 &= 6 + x
\end{align*}
\]

\[
\begin{align*}
-7 &= x \\
-8 &= x
\end{align*}
\]