Warm-Up

1. M is the midpoint of AB. AM = 3x +12. MB = 6x – 3. Find the length of AB.

2. If Steven spends $600 for the new Iphone and Drew spends $900, what is the average amount they spent on their new phones.

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Objectives

Develop and apply the formula for midpoint.

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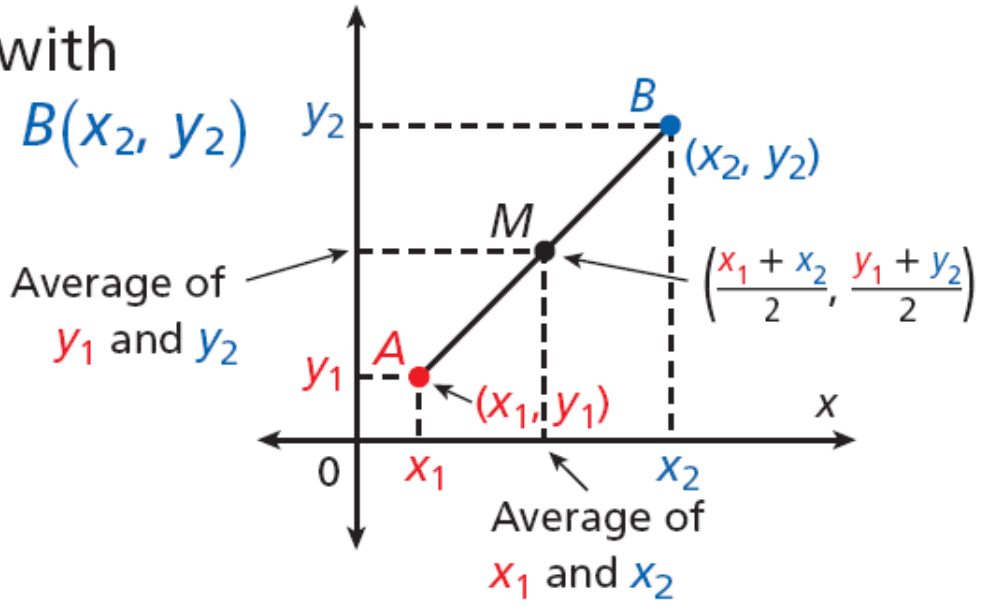
Midpoint Formula

The midpoint M of $\overline{AB}$ with endpoints $A(x_1, y_1)$ and $B(x_2, y_2)$ is found by

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



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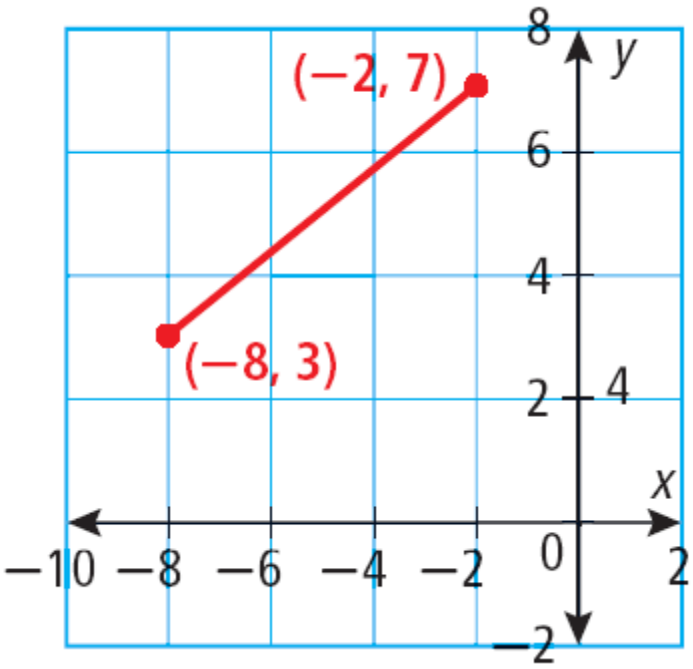
Example 1: Finding the Coordinates of a Midpoint

Find the coordinates of the midpoint of $\overline{PQ}$ with endpoints $P(-8, 3)$ and $Q(-2, 7)$.

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

$$\left(\frac{-8 + (-2)}{2}, \frac{3 + 7}{2}\right) = \left(\frac{-10}{2}, \frac{10}{2}\right)$$

$$= (-5, 5)$$



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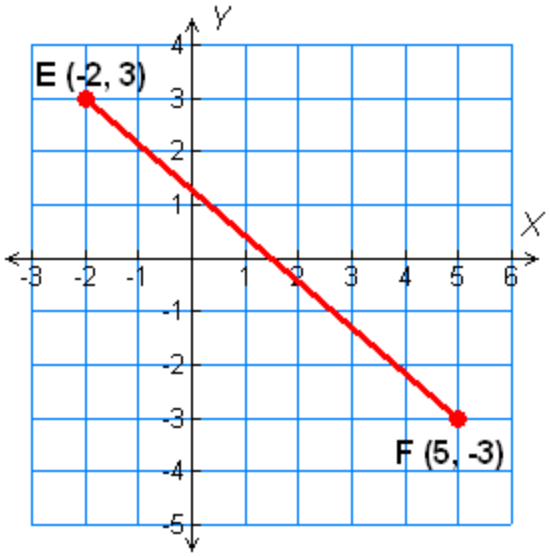
Check It Out! Example 1

Find the coordinates of the midpoint of $\overline{EF}$ with endpoints $E(-2, 3)$ and $F(5, -3)$.

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

$$\left(\frac{-2+5}{2}, \frac{3+(-3)}{2}\right) = \left(\frac{3}{2}, 0\right)$$



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Example 2: Finding the Coordinates of an Endpoint

***M* is the midpoint of $\overline{XY}$. *X* has coordinates (2, 7) and *M* has coordinates (6, 1). Find the coordinates of *Y*.**

Step 1 Let the coordinates of *Y* equal (x, y).

Step 2 Use the Midpoint Formula: $(6,1) = \left(\frac{2+x}{2}, \frac{7+y}{2}\right)$.

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Example 2 Continued

Step 3 Find the *x*-coordinate.

$6 = \frac{2 + x}{2}$ *Set the coordinates equal.* $1 = \frac{7 + y}{2}$

$2(6) = 2\left(\frac{2 + x}{2}\right)$ *Multiply both sides by 2.* $2(1) = 2\left(\frac{7 + y}{2}\right)$

$12 = 2 + x$ *Simplify.* $2 = 7 + y$

$-2 \quad -2$ *Subtract.* $-7 \quad -7$

$10 = x$ *Simplify.* $-5 = y$

The coordinates of *Y* are (10, –5).

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Check It Out! Example 2

S is the midpoint of $\overline{RT}$. R has coordinates $(-6, -1)$, and S has coordinates $(-1, 1)$. Find the coordinates of T.

Step 1 Let the coordinates of T equal (x, y).

Step 2 Use the Midpoint Formula:

$$(-1, 1) = \left(\frac{-6 + x}{2}, \frac{-1 + y}{2} \right).$$

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Check It Out! Example 2 Continued

Step 3 Find the *x*-coordinate.

$-1 = \frac{-6 + x}{2}$ *Set the coordinates equal.* $1 = \frac{-1 + y}{2}$

$2(-1) = 2\left(\frac{-6 + x}{2}\right)$ *Multiply both sides by 2.* $2(1) = 2\left(\frac{-1 + y}{2}\right)$

$-2 = -6 + x$ *Simplify.* $2 = -1 + y$

$+6 \quad +6$ *Add.* $+1 \quad +1$

$4 = x$ *Simplify.* $3 = y$

The coordinates of *T* are (4, 3).

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