Midpoint and Distance in the Coordinate Plane

UNIT 1 LESSON 7

Midpoint and Distance in the Coordinate Plane

Students will be able to:

- find the midpoint of a segment
- find the distance between two points in the coordinate plane

Midpoint and Distance in the Coordinate Plane

What do you think we mean
by the word “midpoint”?

Ideas on how to find it on a number line?

Ideas on how to find it on a coordinate plane?

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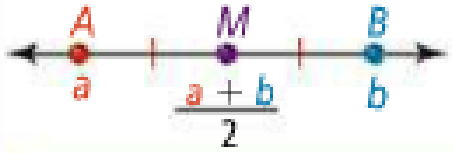
You can use formulas to find the **midpoint** and length of any segment in the coordinate plane.

On a Number Line

The coordinate of the midpoint is the *average* or *mean* of the coordinates of the endpoints.

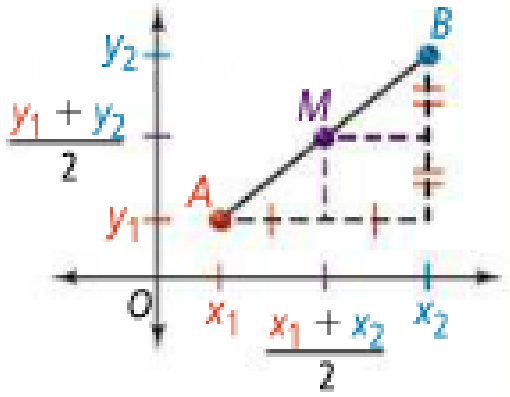
The coordinate of the midpoint M of $\overline{AB}$ is $\frac{a+b}{2}$.



In the Coordinate Plane

The coordinates of the midpoint are the average of the x-coordinates and the average of the y-coordinates of the endpoints.

Given $\overline{AB}$ where $A(x_1, y_1)$ and $B(x_2, y_2)$, the coordinates of the midpoint of $\overline{AB}$ are $M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.



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Problem 1:

Segment AB has endpoints at -4 and 9. What is the coordinate of its midpoint?

Segment JK has endpoints at -12 and 4 on a number line. What is the coordinate of its midpoint?

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Problem 1b:

Segment EF has endpoints E(7, 5) and F(2, -4). What are the coordinates of its midpoint M?

Segment RS has endpoints at R(5, -10) and S(3, 6). What are the coordinates of its midpoint M?

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Problem 2:

The midpoint of Segment CD is M(2, -1). One endpoint is C(-5, 7). What are the coordinates of the other endpoint D?

The midpoint of Segment AB is M(4, -9). One endpoint is A(-3, -5). What are the coordinates of the other endpoint B?

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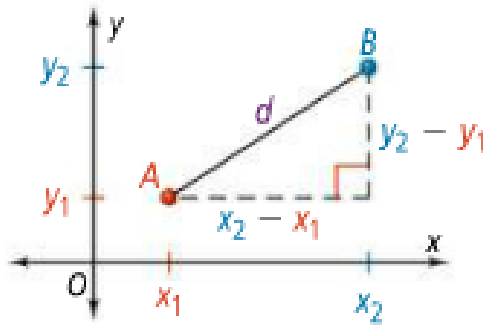
To find the distance between any two points in a coordinate plane, you can use the Distance Formula.

Take note

Key Concept Distance Formula

The distance between two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$



Do you remember any other way to find the distance between to coordinate points in a plane?

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Problem 3:

What is the distance between U(-7, 5) and V(4, -3)? Round to the nearest tenth.

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Problem 3:

Segment SR has endpoints S(-2, 14) and R(3, -1). What is SR to the nearest tenth?

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Lesson Check

Do you know HOW?

1. $\overline{RS}$ has endpoints $R(2, 4)$ and $S(-1, 7)$. What are the coordinates of its midpoint M?

2. The midpoint of $\overline{BC}$ is $(5, -2)$. One endpoint is $B(3, 4)$. What are the coordinates of endpoint C?

3. What is the distance between points $K(-9, 8)$ and $L(-6, 0)$?