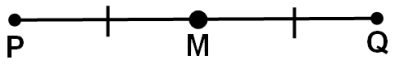
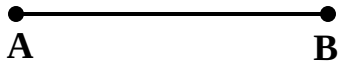
Notes: **SEGMENTS AND MIDPOINTS**

Content Objective: ***I will be able to determine the coordinate(s) of the midpoint of a segment when given the coordinates of its endpoints as represented on one-dimensional (1-D) or two-dimensional (2-D) coordinate systems.***

TERM	DESCRIPTION	EXAMPLE
MIDPOINT	A point on a segment _____ from both endpoints. A point is the midpoint of segment if the distances from this point to each endpoint are _____.	

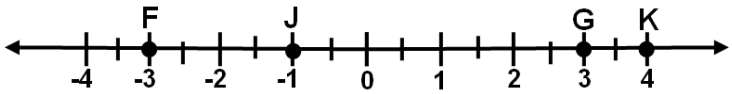
CONSTRUCTION: Construct the midpoint of segment $\overline{AB}$.



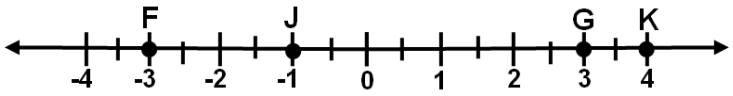
Midpoint Formula for One-Dimensional Coordinate System (number line)

$$M = \frac{a+b}{2}$$

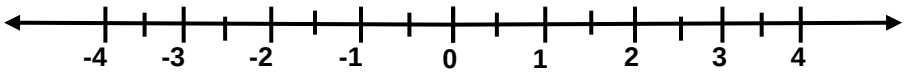
where a and b are the coordinates the of endpoints of the segment



EXAMPLE 1: Find the coordinate of the midpoint of $\overline{FG}$. _____

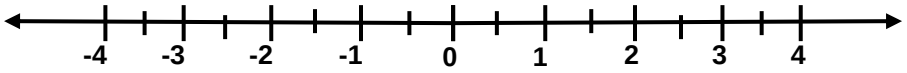


QUICK CHECK: Find the coordinate of the midpoint of $\overline{JK}$. _____



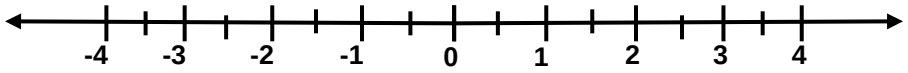
EXAMPLE 2: If the coordinate of the midpoint of $\overline{AB}$ on a number line is 3, and **A** is at –2, find the coordinate of **B**. _____

QUICK CHECK: If the coordinate of the midpoint of $\overline{CD}$ on a number line is 1, and **C** is at –3, find the coordinate of **D**. _____



EXAMPLE 3: If the distance of $\overline{AB}$ is 4 and the coordinate of the midpoint of $\overline{AB}$ on a number line is -1, find the coordinate of **A** and **B**._____

QUICK CHECK: If the distance of $\overline{CD}$ is 7 and the coordinate of the midpoint of $\overline{CD}$ on a number line is 0, find the coordinate of **A** and **B**. _____



EXAMPLE 4: If the distance of $\overline{AB}$ is 6 and the coordinate of **A** on a number line is -4, find the coordinate of the midpoint of $\overline{AB}$. _____

QUICK CHECK: If the distance of $\overline{CD}$ is 5 and the coordinate of **A** on a number line is -2, find the midpoint of $\overline{CD}$. _____

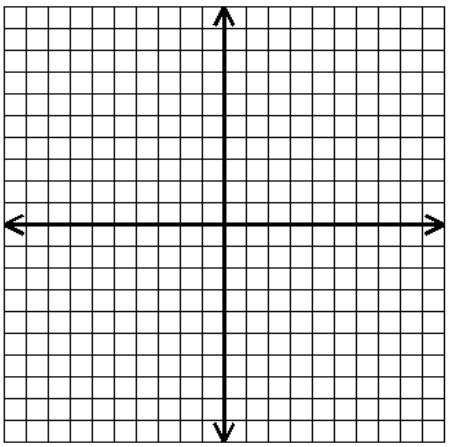
Midpoint Formula for Two-Dimensional Coordinate System (grid)

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

where (x_1, y_1) and (x_2, y_2) are the coordinates the of endpoints of the segment

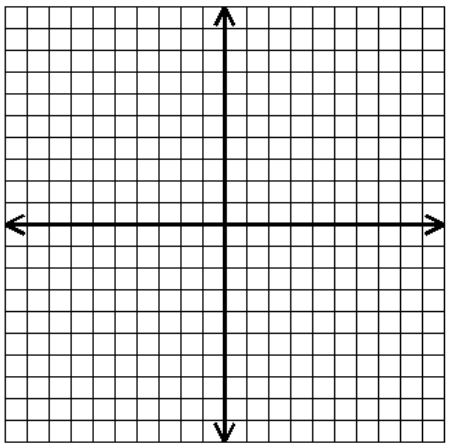
Find the coordinates of the midpoint of each segment formed by the given points.

EXAMPLE 5: (-9, 3) and (8, -7)



Midpoint:_____

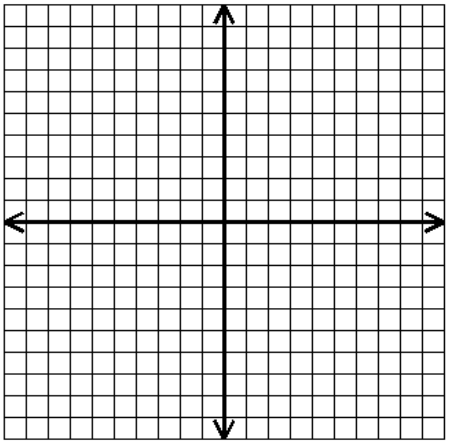
QUICK CHECK: (3, -6) and (7, 2)



Midpoint:_____

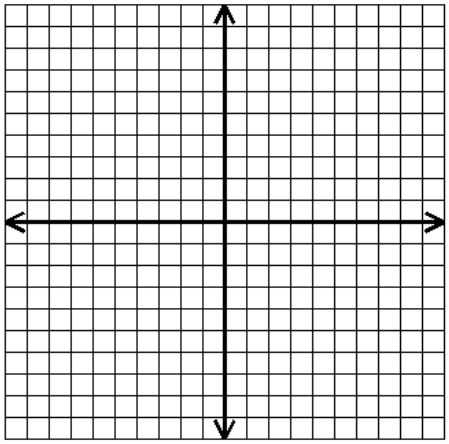
Find the coordinates of the missing endpoint of each segment.

EXAMPLE 6: **M** is the midpoint of $\overline{\mathbf{AB}}$ with **A**(0,1) and **M**(3,5). Find the coordinates of **B**.



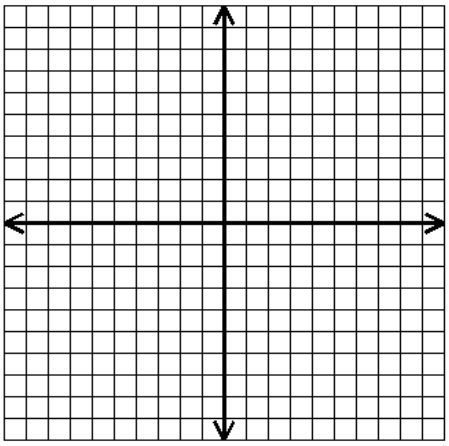
Endpoint B: _____

QUICK CHECK: The midpoint of $\overline{\mathbf{CD}}$ is **M** (-1, 4). What are the coordinates of **C** if **D** is at (3, -2)?



Endpoint C:_____

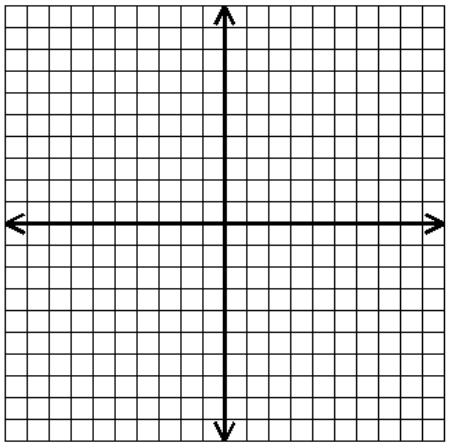
EXAMPLE 7: Given line $\mathbf{y = {}^{3}/_{2}\,x + 4}$, **M** is the midpoint of $\overline{\mathbf{AB}}$, the distance of $\overline{\mathbf{AB}}$ is $\sqrt{\mathbf{13}}$, and **A**(-4,-2). Find the coordinates of **M** and **B**.



Midpoint M:_____

Endpoint B: _____

QUICK CHECK: Given line $\mathbf{y = -{}^{12}/_{5}\,x + 3}$, **M** is the midpoint of $\overline{\mathbf{CD}}$, the distance of $\overline{\mathbf{CD}}$ is 13, and **C**(5, -9). Find the coordinates of **M** and **D.**



Midpoint M:_____

Endpoint D:_____