Review the main components of the coordinate plane as shown in the figure:

**Examples:** Give the coordinates of each point:

A (____, ____)  B (____, ____)  C (____, ____)
D (____, ____)  E (____, ____)  G (____, ____)

Which quadrant contains the following points:

A: _____  B:_____  C:_____  D:_____  E:_____  G:_____

Graph the following points:

H (7, 10)  J (-5, 12)  K (-1, -8)

To find distance between two points on a coordinate plane:

- If Horizontal or Vertical Line: Use Ruler Postulate (count the spaces between the points)
- Not a Horizontal or Vertical Line: Use Distance Formula or Pythagorean Theorem
EXAMPLE 1: Find the distance between $T(5, 2)$ and $R(4, 1)$ to the nearest tenth.

EXAMPLE 2: Find $PQ$ if $P(-3, -5)$ and $Q(-4, 6)$.

Note: When two segments have the same length, they are said to be congruent. For example, if $AB = BC$, then we write $\overline{AB} \cong \overline{BC}$, which is read “segment $AB$ is congruent to segment $BC$."

Distance Formula

The distance between any two points with coordinates $(x_1, y_1)$ and $(x_2, y_2)$ is given by the formula:

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
**Midpoint: On a Number Line**

The coordinate of the midpoint is the AVERAGE of the coordinates of the endpoints

The midpoint between $a$ and $b$ is: \[
\frac{a + b}{2}
\]

**Example 3:** Find the midpoint between A and D.

**Midpoint: In the Coordinate Plane**

The coordinate of the midpoint between $(x_1, y_1)$ and $(x_2, y_2)$ is the average of the x coordinates and the average of the y coordinates:

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

**Example 4:** \(\overline{QS}\) has endpoints \(Q(3, 5)\) and \(S(7, -9)\).

Find the coordinates of its midpoint.

**Example 5:** \(\overline{CD}\) has endpoints \(C(-2, 12)\) and \(D(10, -4)\).

Find the coordinates of its midpoint.
Use the midpoint formula to find the missing endpoint in the following examples.

**Example 6:** The midpoint of $\overline{AB}$ is $M(3, 4)$. One endpoint is $A(-3, -2)$. Find the coordinates of the other endpoint $B$.

Step 1: Plug in everything given. Let the coordinates of $B$ be $(x_2, y_2)$.

Step 2: Set the x coordinate on the left equal to the x coordinate equation on the right. Do this for the y coordinates also.

Step 3: Solve using algebra.

**Example 7:** The midpoint of $\overline{XY}$ has coordinates $(4, -6)$. $X$ has coordinates $(2, -3)$. Find the coordinates of $Y$. 