

## 9.7 Applications of the Midpoint and Distance Formula

You can apply the midpoint formula and the distance formula in real life situations.

**Example 8:** On a map's coordinate grid, Merryville is located at  $(2, 4)$  and Sillytown is located at  $(2, -2)$ . Bluxberg is the midpoint between Merryville and Sillytown. What is the distance from Merryville to Bluxberg? (One map unit equals one mile.)

**Step 1:** First, we would need to find the midpoint from the points of the cities Merryville,  $(2, 4)$  and Sillytown,  $(2, -2)$ . Let  $(2, 4) = (x_1, y_1)$  and  $(2, -2) = (x_2, y_2)$ .

Use the formula for the midpoint:  $M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

$$M = \left( \frac{2 + 2}{2}, \frac{4 + (-2)}{2} \right) = \left( \frac{4}{2}, \frac{2}{2} \right) = (2, 1)$$

We find the midpoint, Bluxberg is  $(2, 1)$ .

**Step 2:** Next, we need to find the distance between Merryville,  $(2, 4)$ , and Bluxberg,  $(2, 1)$ . Let  $(2, 1) = (x_1, y_1)$  and  $(2, 4) = (x_2, y_2)$ .

Use the distance formula:  $d = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$

$$d = \sqrt{(4 - 1)^2 + (2 - 2)^2} = \sqrt{(3)^2 + (0)^2} = \sqrt{9 + 0} = \sqrt{9} = 3$$

The distance between Merryville and Bluxberg is 3 miles.

**Solve the following word problems using the midpoint formula, the distance formula, or both.**

- On a map's coordinate grid, Walt City is located at  $(-1, -3)$  and Koshville is located at  $(4, 9)$ . How long is a train's route as the train travels along a straight line from Walt City to Koshville? (One map unit equals one mile.)
- Find the midpoint of the two cities in problem number one.
- Caliyaah is traveling to Peru for her summer vacation. She looks at a map of the path of her flight. Her plane leaves from Georgia, located at  $(5, 16)$  on the map's coordinate grid, makes a stop at the halfway point, Panama, and then heads to its destination, Peru, located at  $(7, 8)$  on the map's coordinate grid. Find the location of Panama on Caliyaah's map.
- Coach Alvarado drew his football team's next play on a coordinate grid. He placed Kaleem at  $(1, 3)$ . He will be passing the ball to Jeremy at  $(-6, 3)$ . What is the distance, in yards, of the pass from Kaleem to Jeremy?
- In case the ball doesn't reach Jeremy, in the previous problem, Coach Alvarado placed Micah at midpoint. Where is Micah on Coach Alvarado's grid?