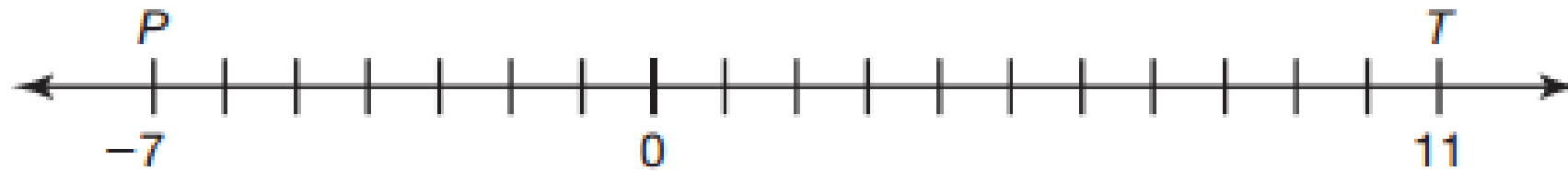


Warm Up

1. What is the value of the point half-way between points P and T ?



2. Bill insists the answer to Question 1 must be a positive number. Is Bill correct?

Explain his reasoning.

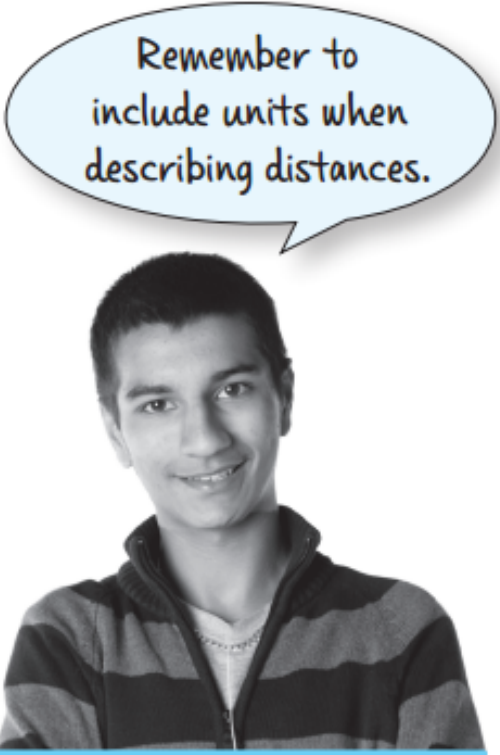
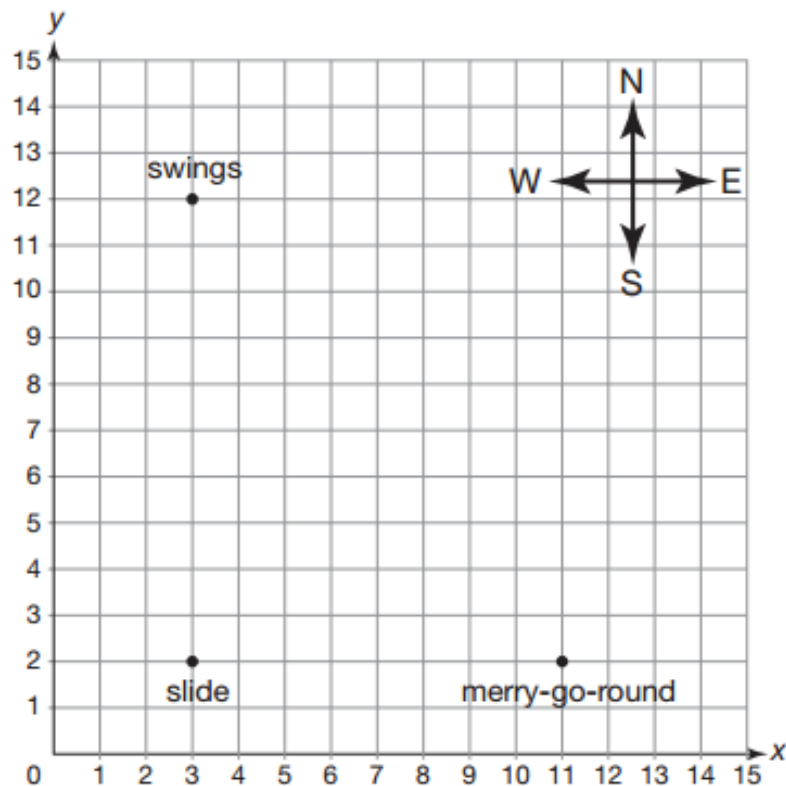
3. What is the value of the point half-way between points R and W ?



4. Describe how you determined the value of the point half-way between two points in Question 3.

5. What determines if the value of the point half-way between two points on a number line is positive number or a negative number?

Ms. Lopez is planning a treasure hunt for her kindergarten students. She drew a model of the playground on a coordinate plane as shown. She used this model to decide where to place items for the treasure hunt, and to determine how to write the treasure hunt instructions. Each grid square represents one square yard on the playground.



- 1. Ms. Lopez wants to place some beads in the grass halfway between the merry-go-round and the slide.
 - a. Determine the distance between the merry-go-round and the slide. Show all your work.

$11 - 3 = 8$
The merry-go-round and the slide are 8 yards apart.

- b.** How far should the beads be placed from the merry-go-round and the slide?

- c.** Write the coordinates for the location exactly halfway between the merry-go-round and the slide. Graph a point representing the location of the beads on the coordinate plane.

- d.** How do the x - and y -coordinates of the point representing the location of the beads compare to the coordinates of the points representing the locations of the slide and the merry-go-round?

2. Ms. Lopez wants to place some kazoos in the grass halfway between the slide and the swings.
 - a. Write the coordinates for the location of the kazoos. Graph the location of the kazoos on the coordinate plane.
 - b. How do the x - and y -coordinates of the point representing the location of the kazoos compare to the coordinates of the points representing the locations of the slide and the swings?

3. Ms. Lopez wants to place some buttons in the grass halfway between the swings and the merry-go-round.

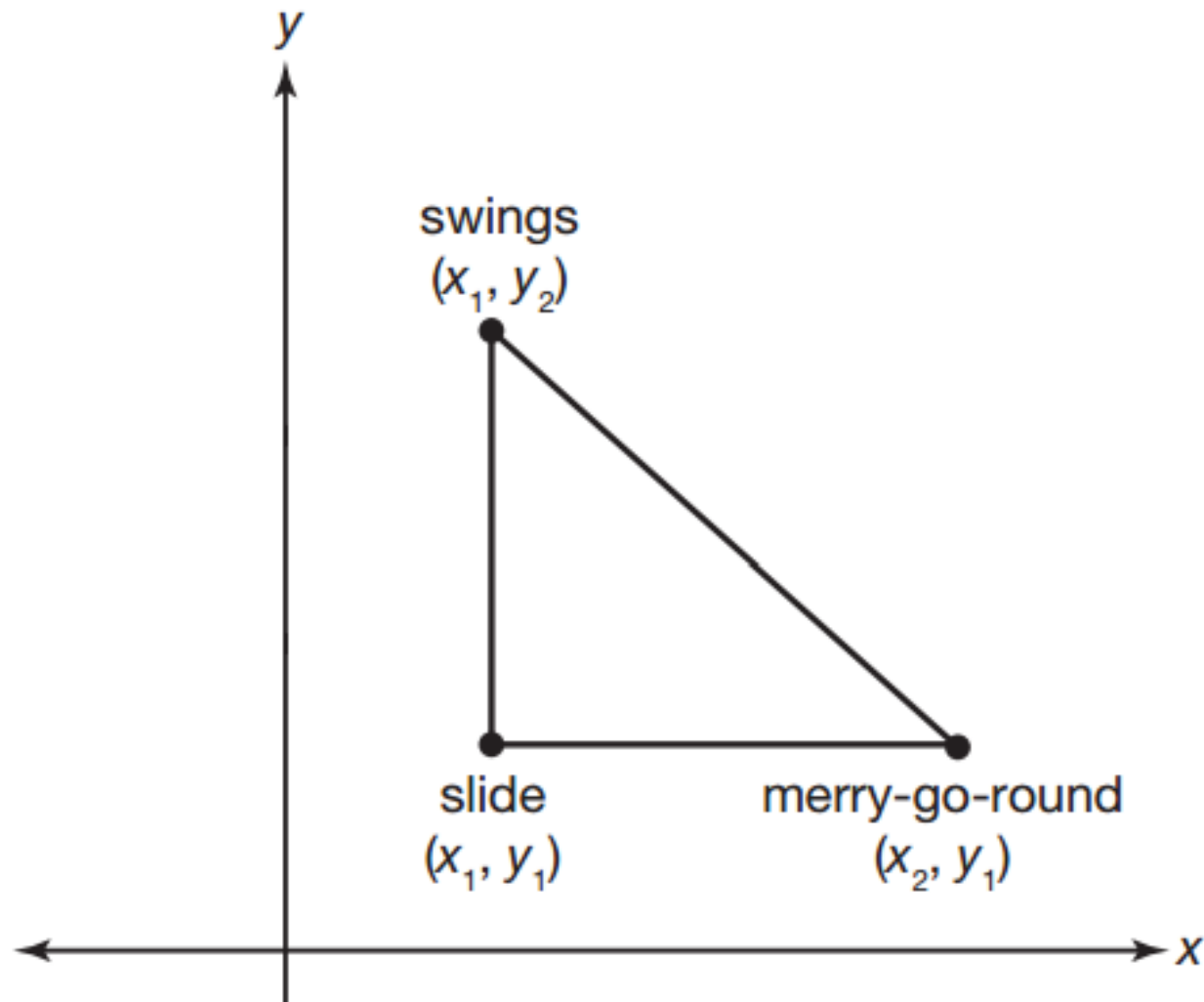
a. Determine the distance between the swings and the merry-go-round.

b. How far should the buttons be placed from the swings and the merry-go-round?

c. How is determining the coordinates for the location of the buttons different than determining the coordinates for the locations of the beads or the kazooos?

d. Write the coordinates for the location of the buttons.
Graph the location of the buttons on the coordinate plane.

Suppose the slide, the swings, and the merry-go-round were at different locations but oriented in a similar manner. You can generalize their locations by using x_1 , x_2 , y_1 , and y_2 , and then solve for the distances between each using variables.



You can draw right triangles on the coordinate plane to figure out the exact location of the buttons. Do you see how?



4. Use the diagram to describe each distance algebraically.
- a. the vertical distance from the x -axis to the slide
 - b. the distance from the slide to the swings
 - c. half the distance from the slide to the swings
 - d. the vertical distance from the x -axis to the slide plus half the distance from the slide to the swings

5. Simplify your expression from Question 4, part (d).
6. Use the diagram to describe each distance algebraically.
- a. the horizontal distance from the y -axis to the slide
 - b. the distance from the slide to the merry-go-round
 - c. half the distance from the slide to the merry-go-round
 - d. the horizontal distance from the y -axis to the slide plus half the distance from the slide to the merry-go-round

7. Simplify your expression from Question 6, part (d).

The coordinates of the points that you determined in Questions 5 and 7 are *midpoints*.

A **midpoint** is a point that is exactly halfway between two given points. The calculations you performed can be summarized by the *Midpoint Formula*.

The **Midpoint Formula** states that if (x_1, y_1) and (x_2, y_2) are two points on the coordinate plane, then the midpoint of the line segment that joins these two points is

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

8. Use the Midpoint Formula to determine the location of the buttons from Question 3.