

13. Carlos and Mandy just completed Question 12 parts (a) through (c). Now, they need to calculate the distance between the points $(-4, 2)$ and $(-2, 7)$. They notice the similarity between this problem and part (a).

Mandy

$$d = \sqrt{(-4 - -2)^2 + (2 - 7)^2}$$

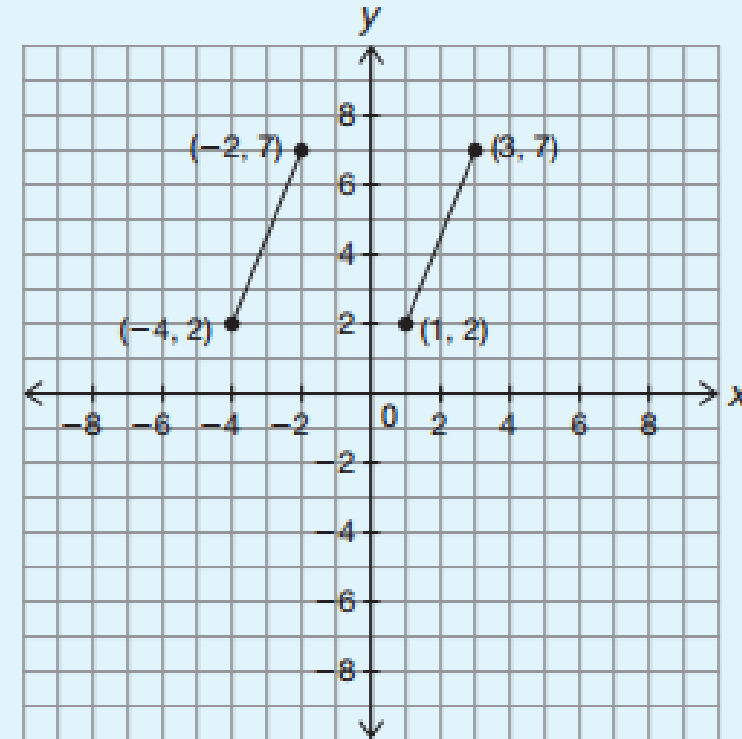
$$d = \sqrt{(-2)^2 + (-5)^2}$$

$$d = \sqrt{4 + 25}$$

$$d = \sqrt{29}$$

$$d \approx 5.4$$

Carlos



$(1, 2) \rightarrow (-4, 2)$ The point moved 5 units to the left

$(3, 7) \rightarrow (-2, 7)$ The point moved 5 units to the left

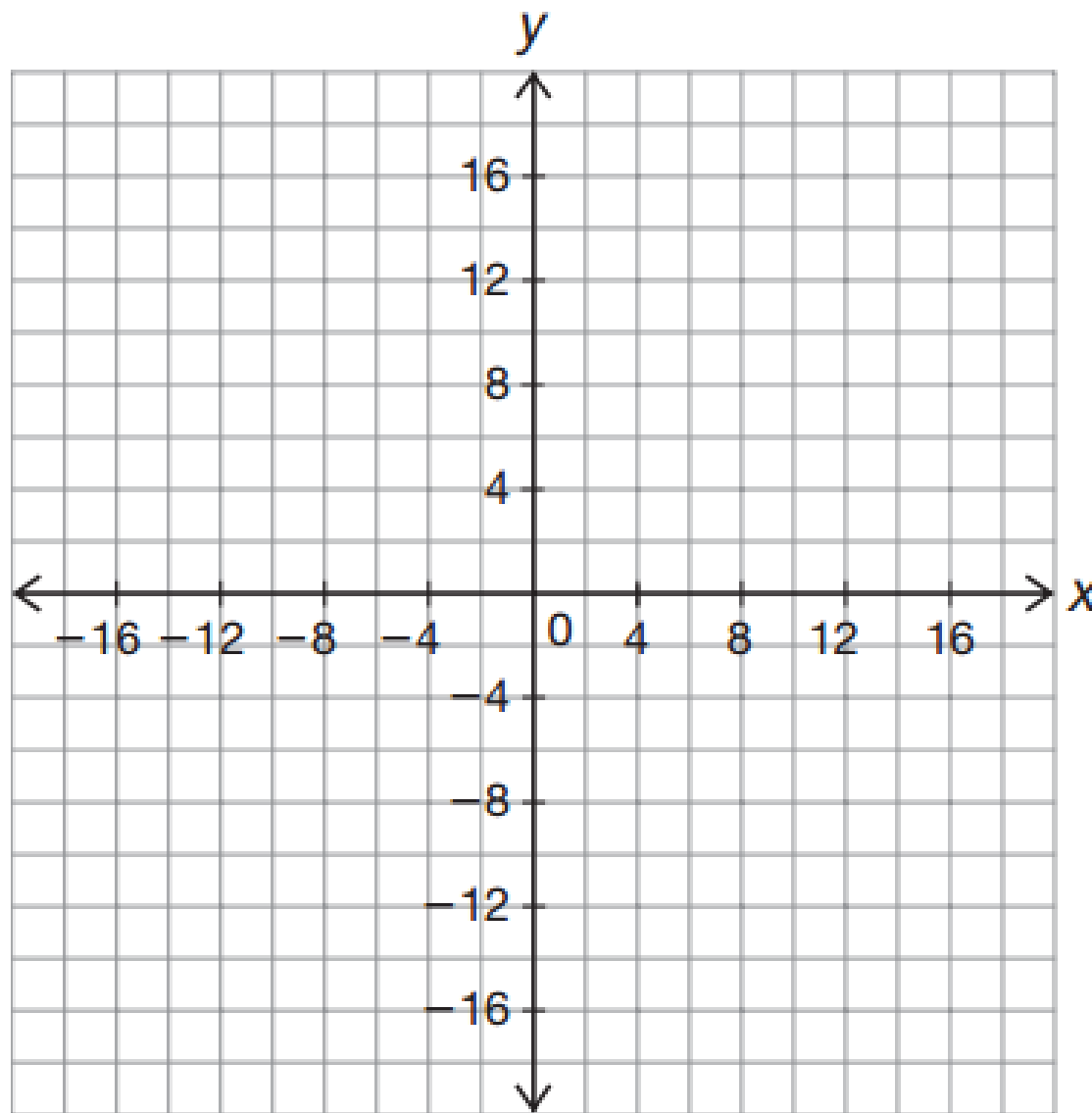
Since both points moved 5 units to the left, this did not alter the distance between the points, so the distance between points $(-4, 2)$ and $(-2, 7)$ is approximately 5.4.

Who used correct reasoning?

14. The distance between $(x, 2)$ and $(0, 6)$ is 5 units. Use the Distance Formula to determine the value of x . Show all your work.

Translating a Line Segment

1. Pedro's house is located at $(6, 10)$. Graph this location on the coordinate plane and label the point P .
2. Jethro's house is located at $(2, 3)$. Graph this location on the coordinate plane and label the point J .
3. Draw a line segment connecting the two houses to create line segment PJ .



4. Determine the length of line segment PJ .

Length is
the same as
distance on the
coordinate plane!



A **transformation** is the mapping, or movement, of all the points of a figure in a plane according to a common operation.

A **rigid motion** is a transformation of points in space.

A **translation** is a rigid motion that “slides” each point of a figure the same distance and direction. Sliding a figure left or right is a horizontal translation, and sliding it up or down is a vertical translation.

The original figure is called the **pre-image**. The new figure created from the translation is called the **image**.

5. Line segment PJ is horizontally translated 10 units to the left.
- Graph the image of pre-image \overline{PJ} . Label the new points P' and J' .
 - Identify the coordinates of P' and J' .
6. Line segment $P'J'$ is vertically translated 14 units down.
- Graph the image of pre-image $\overline{P'J'}$. Label the new points P'' and J'' .

A line,
or even a point,
can be considered a
figure.



b. Identify the coordinates of P'' and J'' .


7. Line segment $P''J''$ is horizontally translated 10 units to the right.

a. Without graphing, predict the coordinates of P''' and J''' .

b. Graph the image of pre-image $\overline{P''J''}$. Label the new points P''' and J''' .

The prime symbol, like on P' or P'' , indicates that this point is related to the original point P . P' is read as "P prime" and P'' is read as "P double prime."



- 
8. Describe the translation necessary on $\overline{P'''J'''}$ so that it returns to the location of \overline{PJ} .

 9. How do the lengths of the images compare to the lengths of the pre-images?
Explain how you could verify your answer.

10. Analyze the coordinates of the endpoints of each line segment.

a. Identify the coordinates of each line segment in the table.

Line Segments	\overline{PJ}	$\overline{P'J'}$	$\overline{P''J''}$	$\overline{P'''J'''}$
Coordinates of Endpoints				

b. Describe how a horizontal translation changes the x - and y -coordinates of the endpoints.

c. Describe how a vertical translation changes the x - and y -coordinates of the endpoints.

11. Describe a sequence of two translations that will result in the image and the pre-image being the same.

12. Describe a sequence of four translations that will result in the image and the pre-image being the same.

1. Use your compass to construct a number of circles of different sizes.

Take your time. It may take a while for you to be able to construct a clean, exact circle without doubled or smudged lines.



2. Point C is the center of a circle and \overline{CD} is a radius.

a. Construct circle C .



Remember a circle is a set of all points in a plane that are the same distance from a given point called the center of the circle. A radius is a segment drawn from the center to a point on the circle.



b. Draw and label points A , B , E , and F anywhere on the circle.

c. Construct \overline{AC} , \overline{BC} , \overline{EC} , and \overline{FC} .

d. Shawna makes the following statement about radii of a circle.



Shawna

All radii are the same length, because all of the points of a circle are equidistant from the circle's center.

Explain how Shawna knows that all radii are the same length? Does this mean the line segments you constructed are also radii?

An **arc** is a part of a circle. You can also think of an arc as the curve between two points on the circle.

3. Point C is the center of a circle and \overline{AC} is the radius.
 - a. Construct an arc of circle C . Make your arc about one-half inch long. Construct the arc so that it does not pass through point A .



- b. Draw and label two points B and E on the arc and construct \overline{CE} and \overline{CB} .
 - c. What conclusion can you make about the constructed line segments?