


1. Plot points $A(-6, -2)$ and $B(-6, -8)$.

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2. Is the distance between points A and B considered a horizontal distance, a vertical distance, or a diagonal distance? Explain your reasoning.

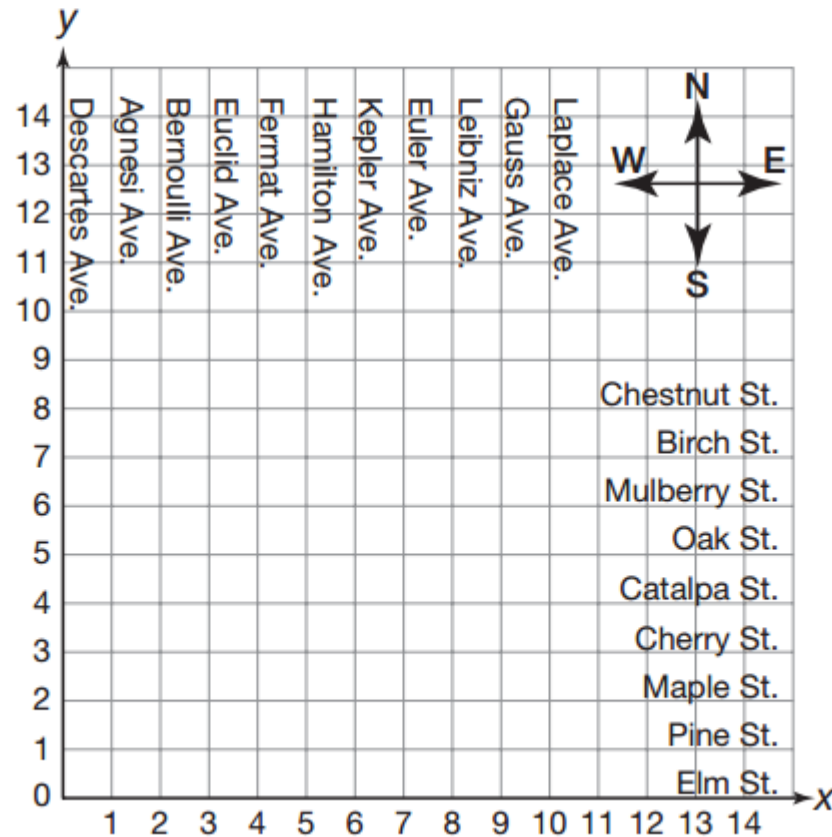
3. How do you calculate the distance between points A and B ?

4. What is the distance between points A and B ?

5. How do the negative coordinates affect the distance between points A and B ?

Don, Freda, and Bert live in a town where the streets are laid out in a grid system.

1. Don lives 3 blocks east of Descartes Avenue and 5 blocks north of Elm Street. Freda lives 7 blocks east of Descartes Avenue and 2 blocks north of Elm Street. Plot points to show the locations of Don's house and Freda's house on the coordinate plane. Label each location with the student's name and the coordinates of the point.



- a. Name the intersection of streets that Don lives on.
 - b. Name the intersection of streets that Freda lives on.
2. Bert lives at the intersection of the avenue that Don lives on, and the street that Freda lives on. Plot and label the location of Bert's house on the coordinate plane. Describe the location of Bert's house with respect to Descartes Avenue and Elm Street.
3. How do the x - and y -coordinates of Bert's house compare to the x - and y -coordinates of Don's house and Freda's house?

4. Use Don's and Bert's house coordinates to write and simplify an expression that represents the distance between their houses. Explain what this means in terms of the problem situation.

5. Use Bert's and Freda's house coordinates to write and simplify an expression that represents the distance between their houses. Explain what this means in terms of the problem situation.

6. All three friends are planning to meet at Don's house to hang out. Freda walks to Bert's house, and then Freda and Bert walk together to Don's house.

a. Use the coordinates to write and simplify an expression that represents the total distance from Freda's house to Bert's house to Don's house.

b. How far, in blocks, does Freda walk altogether?

7. Draw the direct path from Don's house to Freda's house on the coordinate plane. If Freda walks to Don's house on this path, how far, in blocks, does she walk? Explain how you determined your answer.

What shape do you see? How can that help you determine the distance of the direct path?



8. Complete the summary of the steps that you took to determine the direct distance between Freda's house and Don's house. Let d be the direct distance between Don's house and Freda's house.

Distance between
Bert's house and
Freda's house

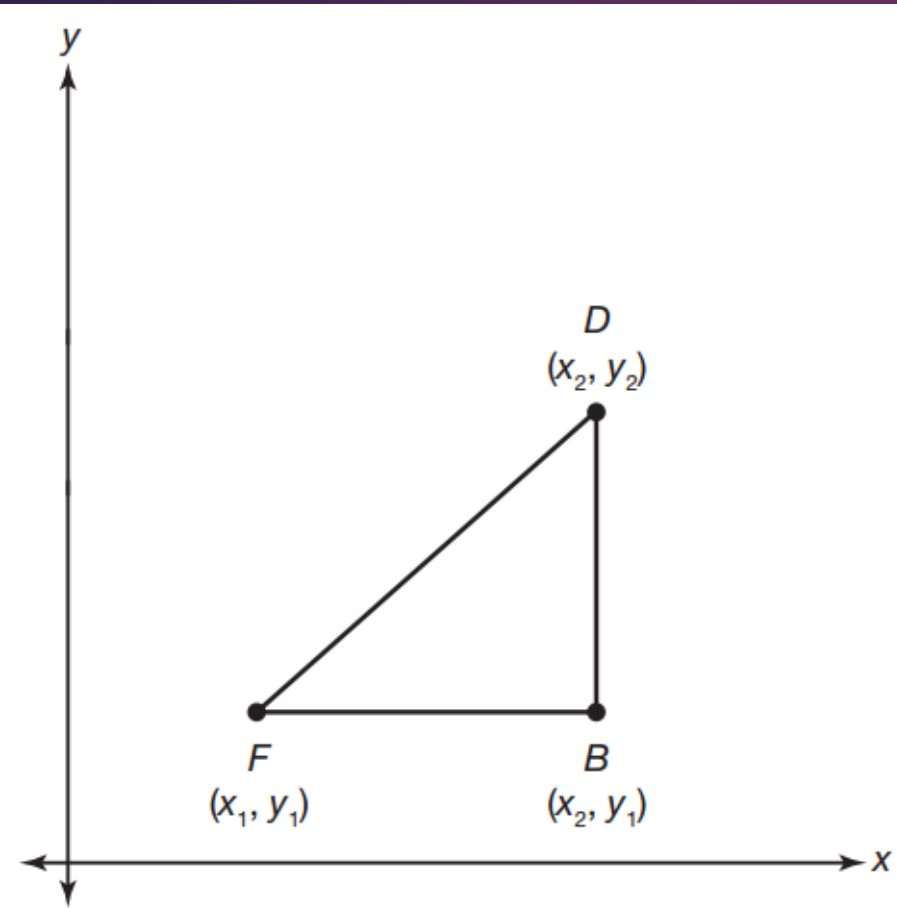
Distance between
Don's house and
Bert's house

Direct distance between
Don's house and
Freda's house

$$\begin{array}{ccc} \left(\boxed{} - \boxed{} \right)^2 & + & \left(\boxed{} - \boxed{} \right)^2 \\ \boxed{}^2 & + & \boxed{}^2 \\ \boxed{} & + & \boxed{} \end{array}$$

$$\begin{array}{ccc} & = & \boxed{} \\ & = & \boxed{} \\ & = & \boxed{} \\ \boxed{} & = & \boxed{} \\ \boxed{} & = & \boxed{} \end{array}$$

Suppose Freda's, Bert's, and Don's houses 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 still solve for the distances between their houses using variables. Let point F represent Freda's house, point B represent Bert's house, and point D represent Don's house.



Sure, they
can live in
different locations, but
the points must still form a
right triangle in order for
us to generalize this,
right?



9. Use the graph to write an expression for each distance.

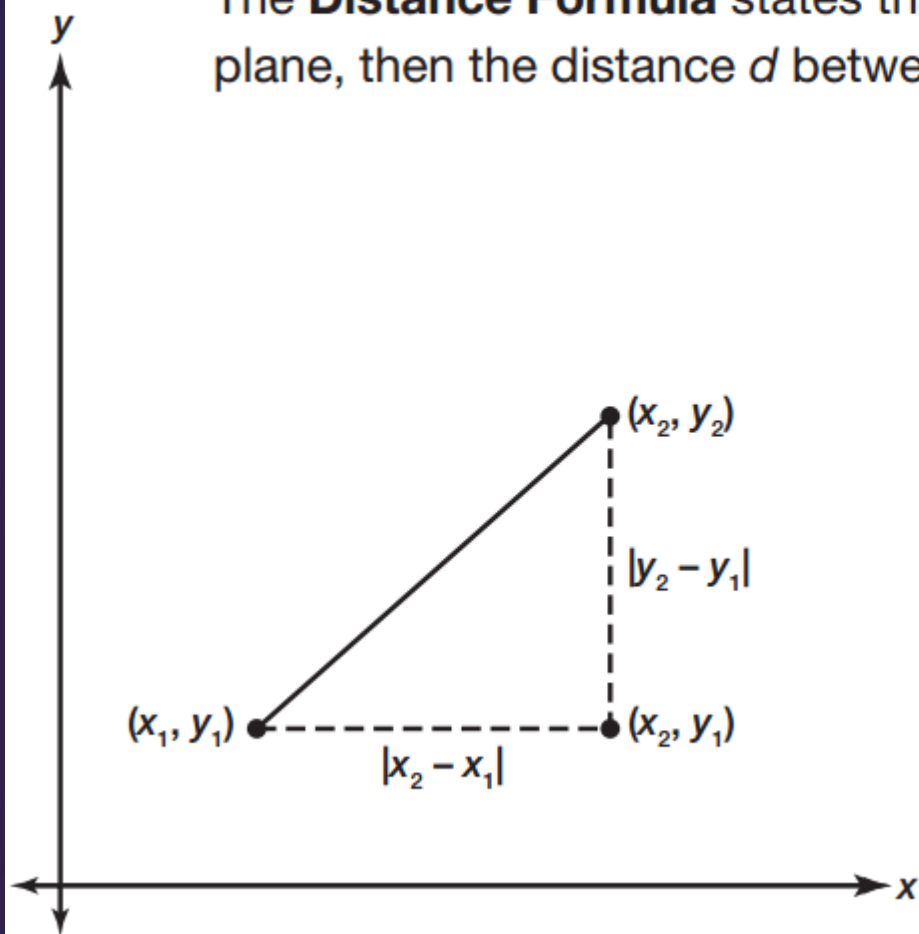
a. Don's house to Bert's house (DB)

b. Bert's house to Freda's house (BF)

10. Use the Pythagorean Theorem to determine the distance from Don's house to Freda's house (DF).

You used the Pythagorean Theorem to calculate the distance between two points on the coordinate plane. Your method can be written as the *Distance Formula*.

The **Distance Formula** states that if (x_1, y_1) and (x_2, y_2) are two points on the coordinate plane, then the distance d between (x_1, y_1) and (x_2, y_2) is $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.



The absolute value symbols are used to indicate that the distance is always positive.



11. Do you think that it matters which point you identify as (x_1, y_1) and which point you identify as (x_2, y_2) when you use the Distance Formula? Use an example to justify your answer.