

NAME _____

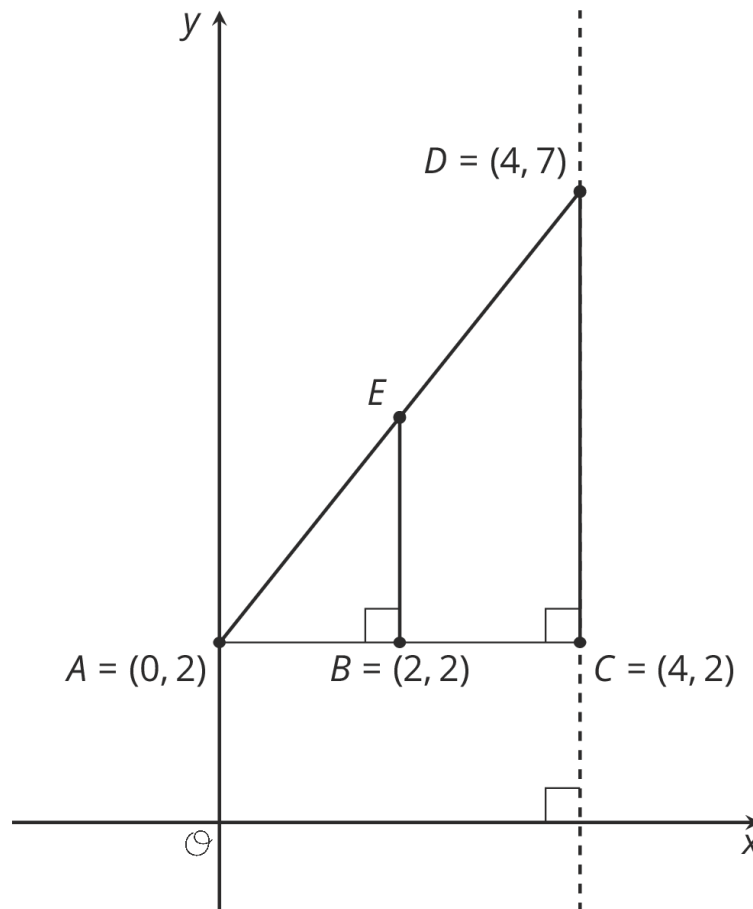
DATE _____

PERIOD _____

Unit 2, Lesson 11: Writing Equations for Lines

Let's explore the relationship between points on a line and the slope of the line.

11.1: Coordinates and Lengths in the Coordinate Plane



Find each of the following and explain your reasoning:

1. The length of segment BE .
2. The coordinates of E .

NAME _____

DATE _____

PERIOD _____

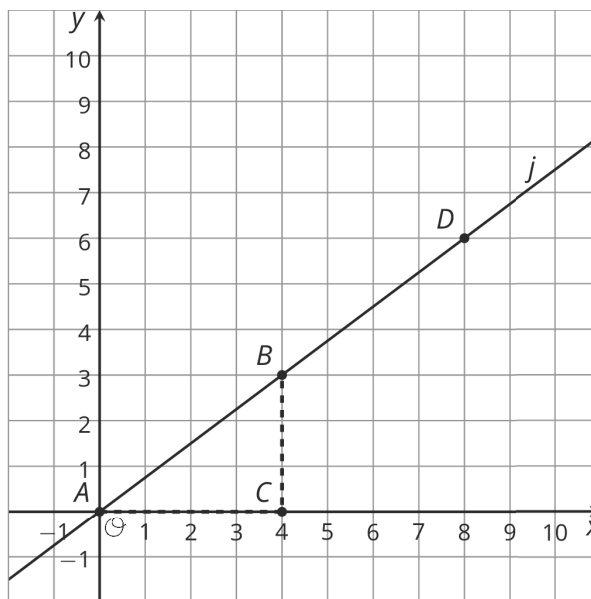
11.2: What We Mean by an Equation of a Line

Line j is shown in the coordinate plane.

1. What are the coordinates of B and D ?

2. Is point $(20, 15)$ on line j ? Explain how you know.

3. Is point $(100, 75)$ on line j ? Explain how you know.



4. Is point $(90, 68)$ on line j ? Explain how you know.

5. Suppose you know the x - and y -coordinates of a point. Write a rule that would allow you to test whether the point is on line j .

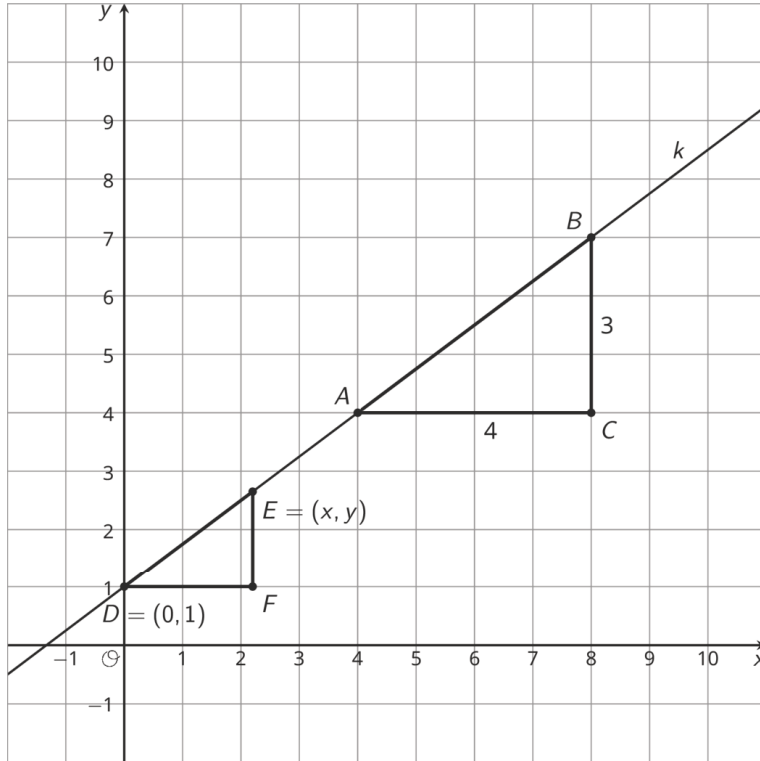
NAME _____

DATE _____

PERIOD _____

11.3: Writing Relationships from Slope Triangles

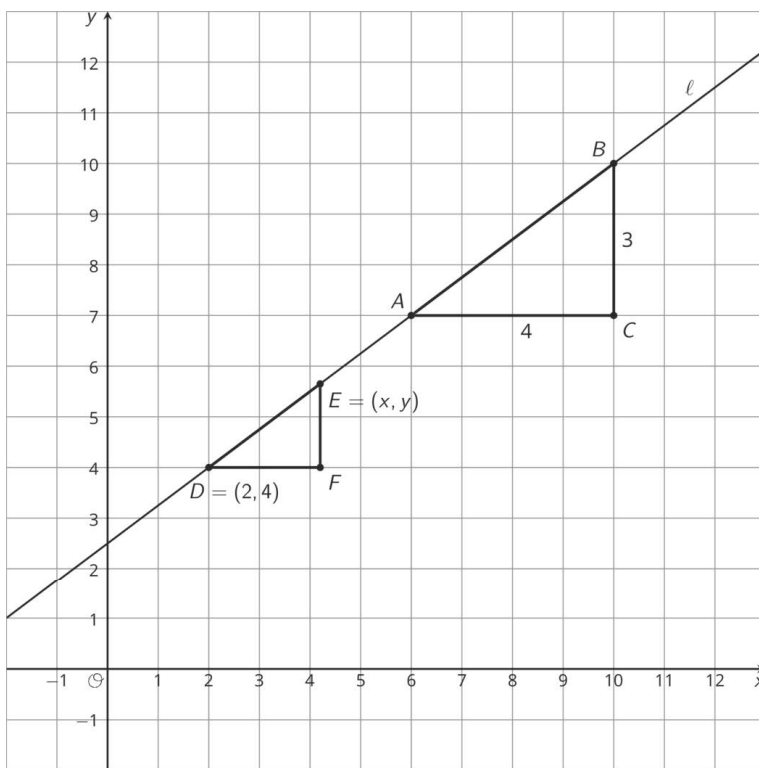
Here are two diagrams:



NAME _____

DATE _____

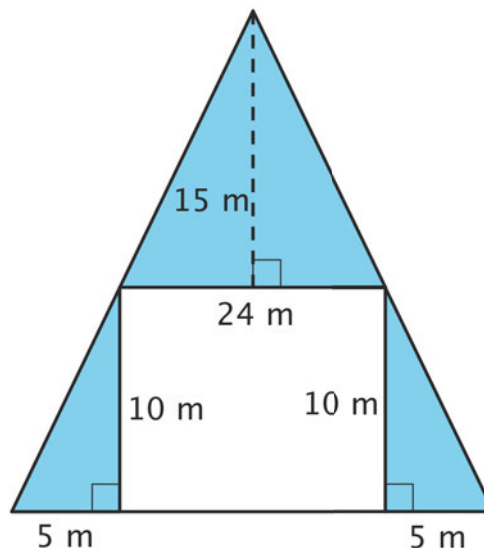
PERIOD _____



1. Complete each diagram so that all vertical and horizontal segments have expressions for their lengths.
2. Use what you know about similar triangles to find an equation for the quotient of the vertical and horizontal side lengths of $\triangle DFE$ in each diagram.

Are you ready for more?

1. Find the area of the shaded region by summing the areas of the shaded triangles.
2. Find the area of the shaded region by subtracting the area of the unshaded region from the large triangle.
3. What is going on here?



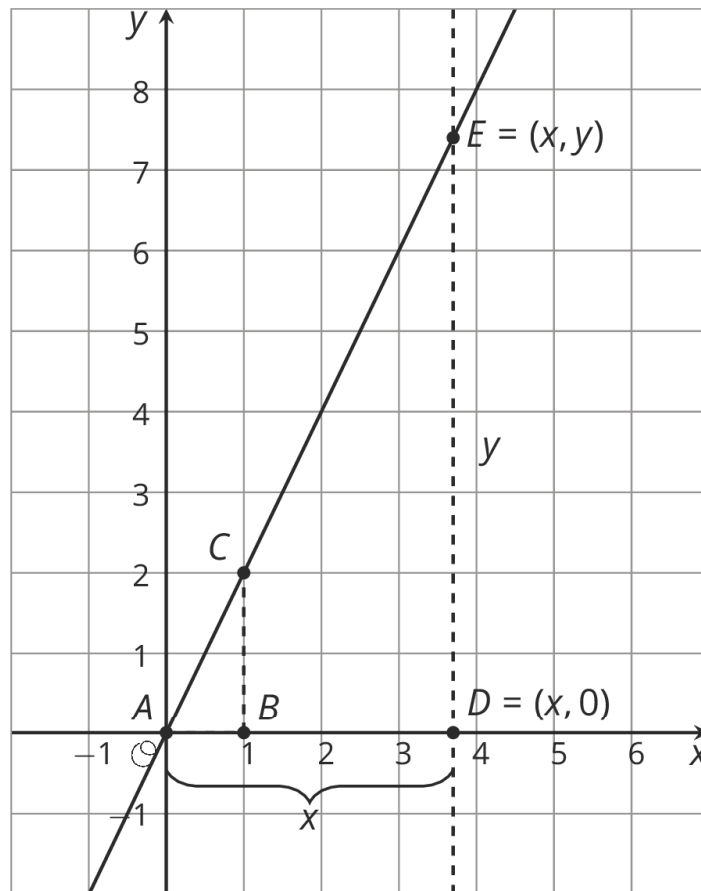
NAME _____

DATE _____

PERIOD _____

Lesson 11 Summary

Here are the points A , C , and E on the same line. Triangles ABC and ADE are slope triangles for the line so we know they are similar triangles. Let's use their similarity to better understand the relationship between x and y , which make up the coordinates of point E .



The slope for triangle ABC is $\frac{2}{1}$ since the vertical side has length 2 and the horizontal side has length 1. The slope we find for triangle ADE is $\frac{y}{x}$ because the vertical side has length y and the horizontal side has length x . These two slopes must be equal since they are from slope triangles for the same line, and so:

$$\frac{2}{1} = \frac{y}{x}$$

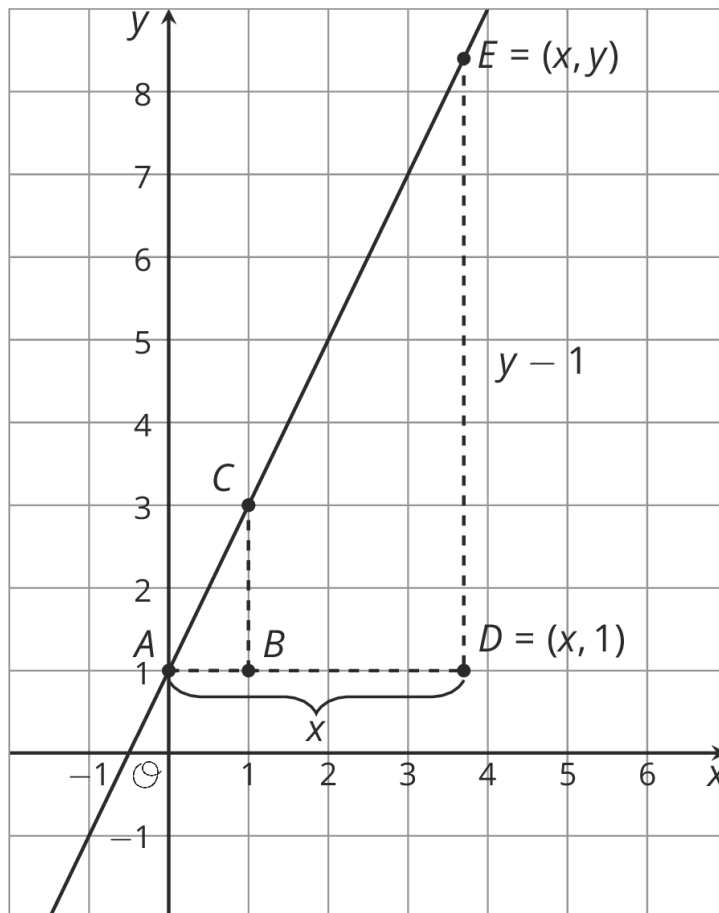
Since $\frac{2}{1} = 2$ this means that the value of y is twice the value of x , or that $y = 2x$. This equation is true for any point (x, y) on the line!

NAME _____

DATE _____

PERIOD _____

Here are two different slope triangles. We can use the same reasoning to describe the relationship between x and y for this point E .



The slope for triangle ABC is $\frac{2}{1}$ since the vertical side has length 2 and the horizontal side has length 1. For triangle ADE , the horizontal side has length x . The vertical side has length $y - 1$ because the distance from (x, y) to the x -axis is y but the vertical side of the triangle stops 1 unit short of the x -axis. So the slope we find for triangle ADE is $\frac{y-1}{x}$. The slopes for the two slope triangles are equal, meaning:

$$\frac{2}{1} = \frac{y-1}{x}$$

Since $y - 1$ is twice x , another way to write this equation is $y - 1 = 2x$. This equation is true for any point (x, y) on the line!

NAME _____

DATE _____

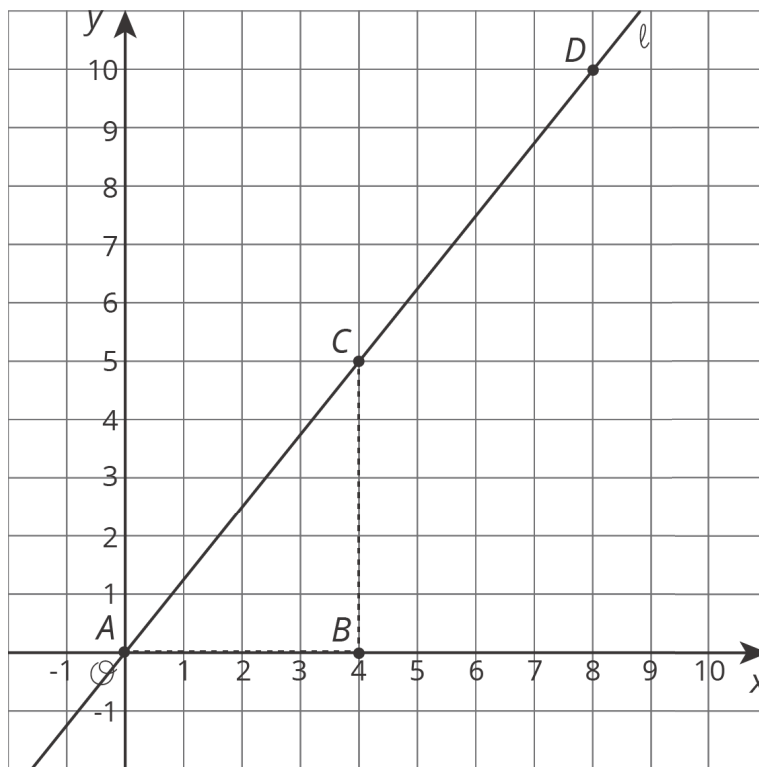
PERIOD _____

Unit 2, Lesson 11: Writing Equations for Lines

1. For each pair of points, find the slope of the line that passes through both points. If you get stuck, try plotting the points on graph paper and drawing the line through them with a ruler.

- a. (1, 1) and (7, 5)
- b. (1, 1) and (5, 7)
- c. (2, 5) and (-1, 2)
- d. (2, 5) and (-7, -4)

2. Line ℓ is shown in the coordinate plane.



- a. What are the coordinates of B and D ?
- b. Is the point $(16, 20)$ on line ℓ ? Explain how you know.
- c. Is the point $(20, 24)$ on line ℓ ? Explain how you know.

NAME _____

DATE _____

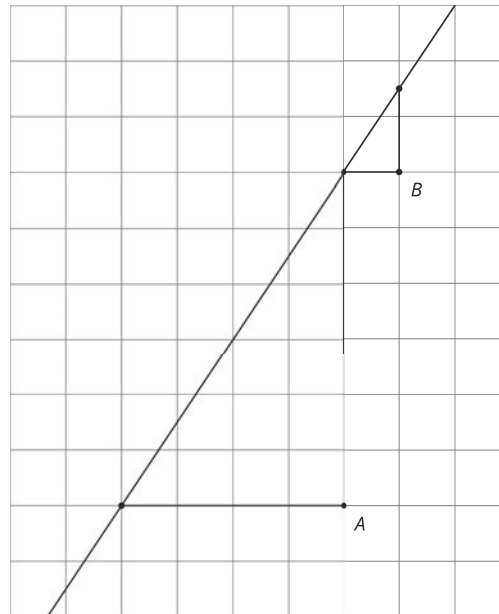
PERIOD _____

d. Is the point $(80, 100)$ on line ℓ ? Explain how you know.

e. Write a rule that would allow you to test whether (x, y) is on line ℓ .

3. Consider the graphed line.

Mai uses Triangle A and says the slope of this line is $\frac{6}{4}$. Elena uses Triangle B and says no, the slope of this line is 1.5. Do you agree with either of them? Explain.



4. A rectangle has length 6 and height 4.

Which of these would tell you that quadrilateral $ABCD$ is definitely *not* similar to this rectangle? Select **all** that apply.

- A. $AB = BC$
- B. $m\angle ABC = 105^\circ$
- C. $AB = 8$
- D. $BC = 8$
- E. $BC = 2 \cdot AB$
- F. $2 \cdot AB = 3 \cdot BC$

(from Unit 2, Lesson 7)