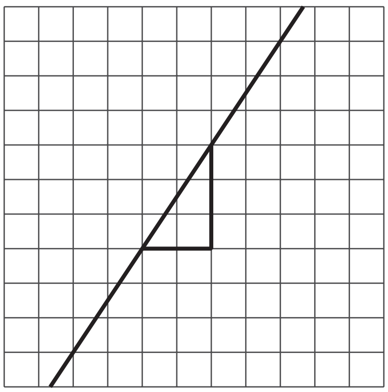
Writing Equations for Lines

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

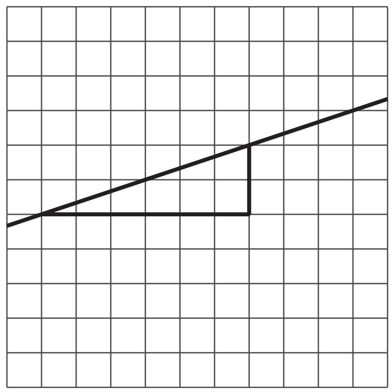
11.1 Different Slopes of Different Lines

Here are several lines.

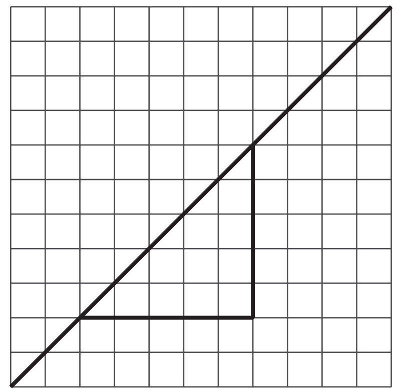
A



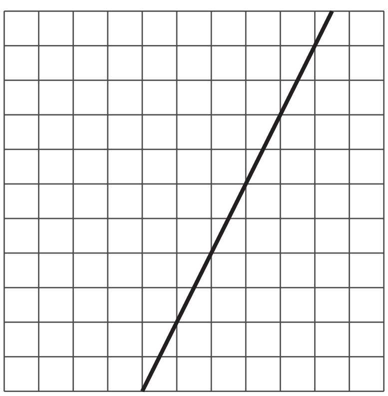
B



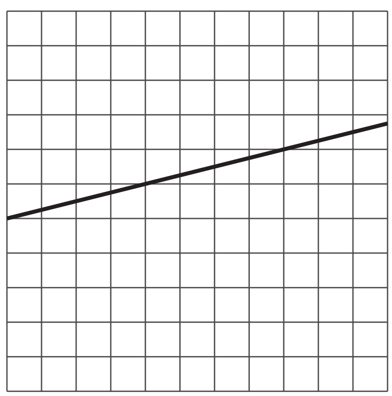
C



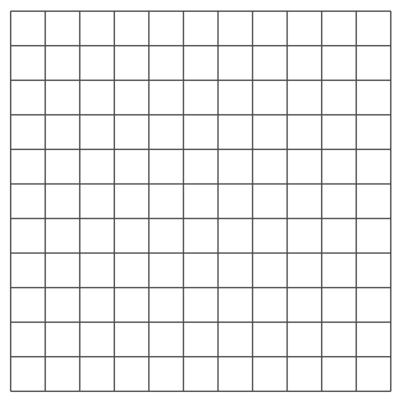
D



E



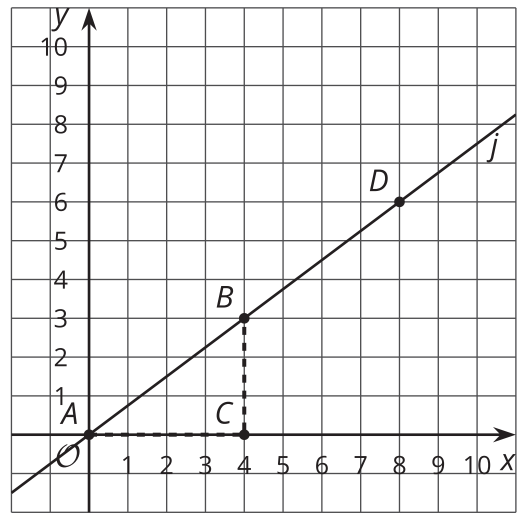
F



1. Match each line shown with a slope from this list: $\frac{1}{3}$, 2, $\frac{3}{5}$, 1, 0.25, $\frac{3}{2}$.
2. One of the given slopes does not have a line to match. Draw a line with this slope on the empty grid (F).

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.

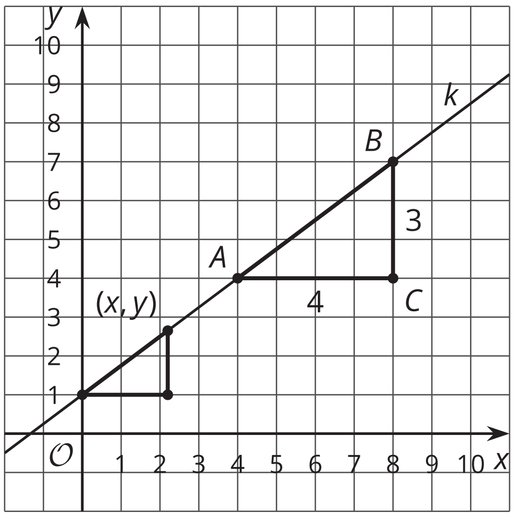
3. Is point $(100, 75)$ on line j? Explain how you know.

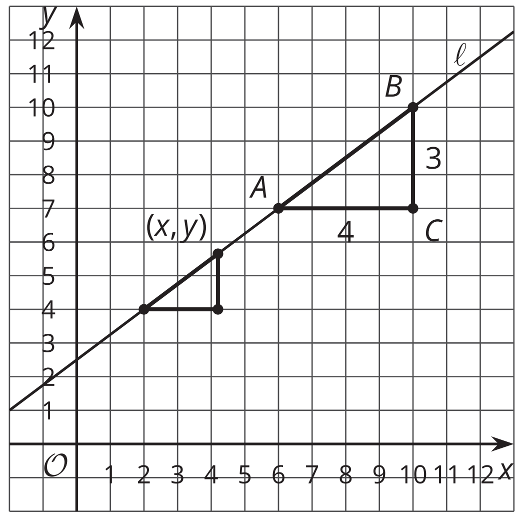
4. Is point $(90, 68)$ on line j? Explain how you know.

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.

11.3 Writing Relationships from Slope Triangles

Here are two diagrams:

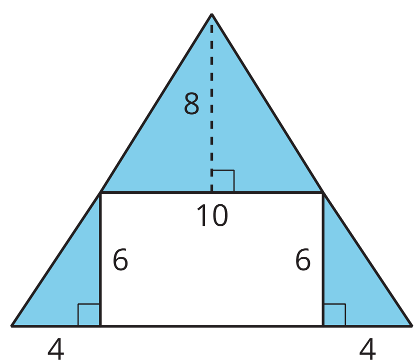




1. Complete each diagram so that all vertical and horizontal sides of the slope triangles have expressions for their lengths.
2. Use what you know about similar triangles to find an equation for the quotient of the vertical and horizontal side lengths of the smaller triangle in each diagram.

Are you ready for more?

1. Find the area of the shaded region by adding the areas of the shaded triangles.

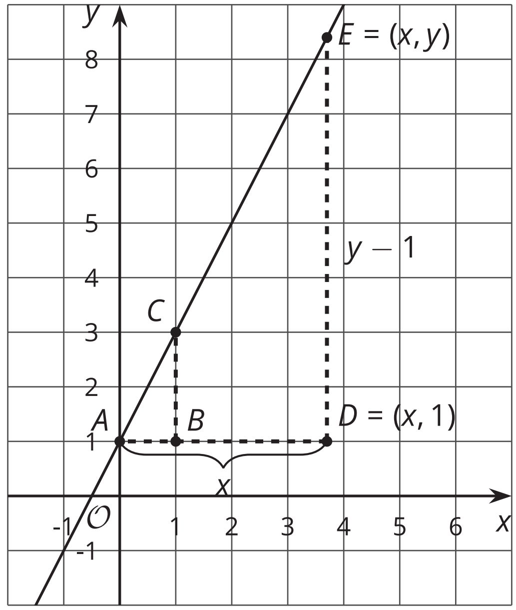


2. Find the area of the shaded region by subtracting the area of the unshaded region from the large triangle.

3. What is going on here?

Lesson 11 Summary

Here is a line on the coordinate plane.



The points A, C, and E are on the same line. Triangles ABC and ADE are slope triangles for the line, so they are similar triangles. We can use their similarity to better understand the relationship between x and y, which are the coordinates of point E.

- The slope for triangle ABC is $\frac{2}{1}$ because the vertical side has length 2 and the horizontal side has length 1.
- For triangle ADE, the vertical side has length $y-1$ because y is the distance from point E to the x-axis, and side DE is 1 unit shorter than the distance. The horizontal side has length x. So, the slope for triangle ADE is $\frac{y-1}{x}$.
- The slopes for the two slope triangles are equal, meaning $\frac{2}{1} = \frac{y-1}{x}$.

The equation $\frac{2}{1} = \frac{y-1}{x}$ is true for all points on the line.