The following lesson plan is adapted from the problem below:
Big Ideas Math Course 3, Section 4.2 *Activity 2: Using Similar Triangles* page 149.

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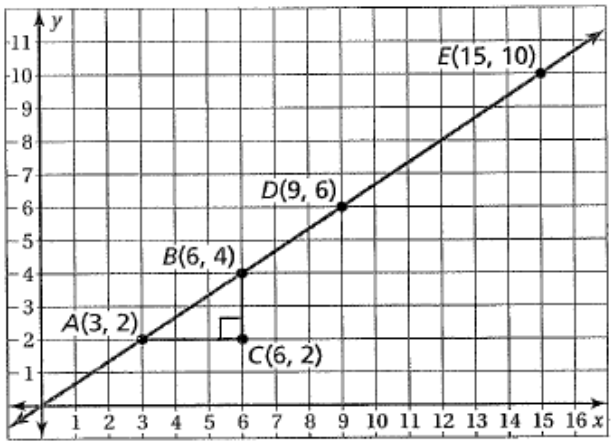
2 ACTIVITY: Using Similar Triangles

Work with a partner. Use the figure shown.



a. $\triangle ABC$ is a right triangle formed by drawing a horizontal line segment from point A and a vertical line segment from point B. Use this method to draw another right triangle, $\triangle DEF$.

b. What can you conclude about $\triangle ABC$ and $\triangle DEF$? Justify your conclusion.

c. For each triangle, find the ratio of the length of the vertical side to the length of the horizontal side. What do these ratios represent?

d. What can you conclude about the slope between any two points on the line?

8th Grade: Exploring Slope Using Similar Triangles

Standard(s)

8.EE.6

Use similar triangles to explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane.

Approx. Time
1 class period

Focus

Learning Objectives:

- Students will build on their understanding of geometry to explore the meaning of slope through the use of similar triangles.
- Students will conclude that the slope is the same between any two points on a given line.

Prior knowledge:

- Understanding of similar shapes and how to find whether shapes are similar or not
- Vocabulary:
  - Right triangle
  - Hypotenuse
  - Ratio
  - Horizontal side length
  - Vertical side length
  - Steepness
  - Points on a line
  - Similar
  - Congruent
- This activity is intended to be taught *before* the slope formula is introduced

Which math concepts will this lesson lead to?

- Deriving and using the slope formula to find the slope between two points on a line
- Graphing linear equations
- Understanding the slope of a line in terms of the context of a real-world problem

Evidence of Math Practices

SMPs addressed:

- SMP 1: Students will make predictions about the ratios of side lengths of the similar triangles
- SMP 3: Students will construct viable arguments regarding why the slope of a line is always the same between any two points on that line
- SMP 5: Students will construct and use triangles, graphs, and points on a line to explore the meaning of slope.
- SMP 6: Students will communicate precisely with each other and with the teacher when answering questions about where to draw the right triangles, what the hypotenuse is, and how to label the sides and points.
- (Leading to) SMP 8: Students will eventually make connections to the slope formula and derive the equation for slope and for linear equations ($y = mx$ and $y = mx + b$).

Essential Question

What can you conclude about the slope of a line between any 2 points?

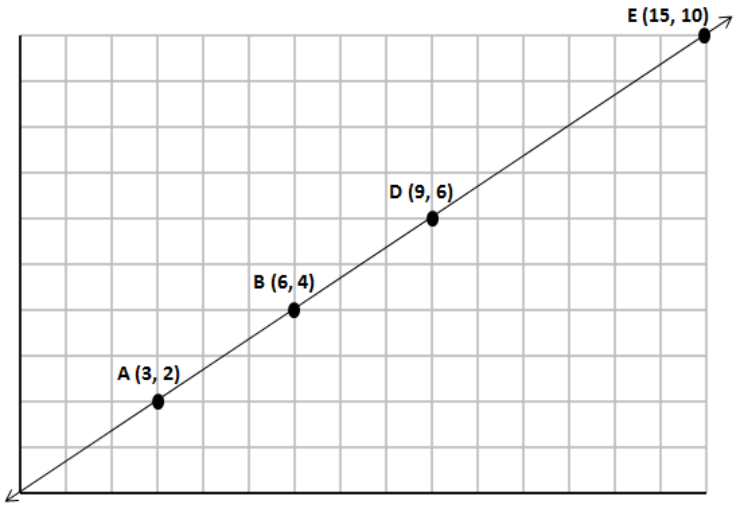
Formative Assessments (check for understanding)

- Small group performance on handout (see attached).
- Student responses to the "closure" writing prompt: *Tell me everything you know about slope.*

Learning Experiences

Adapted from: Lesson Plan: Exploring Slope Using Similar Triangles

Big Ideas Math Course 3, Section 4.2 *Activity 2: Using Similar Triangles* page 149.



Today we're going to be exploring something called "slope." You may have heard of slope of before, and it has to do with the steepness of a line. We're going to explore that concept further to really understand what slope means, and eventually discover a formula that we can use to calculate the slope of a line, no matter how steep it is.

As a whole class, complete the following steps. Have students come up to the board to show their work, where applicable. ***Do not pass out handout yet****.*

1) Pick any 2 of the lettered points on this line (A, B, D, and E).
2) Draw a right triangle so the line between those 2 points is the hypotenuse of the triangle
3) Repeat steps 1 – 2 with a different set of points
4) Redraw those two triangles off of the graph and talk about them:
    a. Are these two triangles congruent? How do you know?
    b. Are these two triangles similar? How do you know?
    c. For both triangles, find the ratio of the vertical side length to the horizontal side length

Pass out Handout (see attached). *In partners or in a small group, students work collaboratively to do the following:*

1) Using points A, B, D, and E, draw two *other* right triangles on this same line
    a. Predict what the ratios of the side lengths will be
    b. Find the ratios of the side lengths of both triangles
2) List all of the vertical:horizontal side-length ratios that you recorded (for 4 triangles)
    a. What do you notice?

Whole-group share out about what students "notice" about their ratios.

(Teacher): We use the word "slope" to represent the ratio of the vertical side length to the horizontal side length. So the ratios you recorded are actually the "slope of this line."

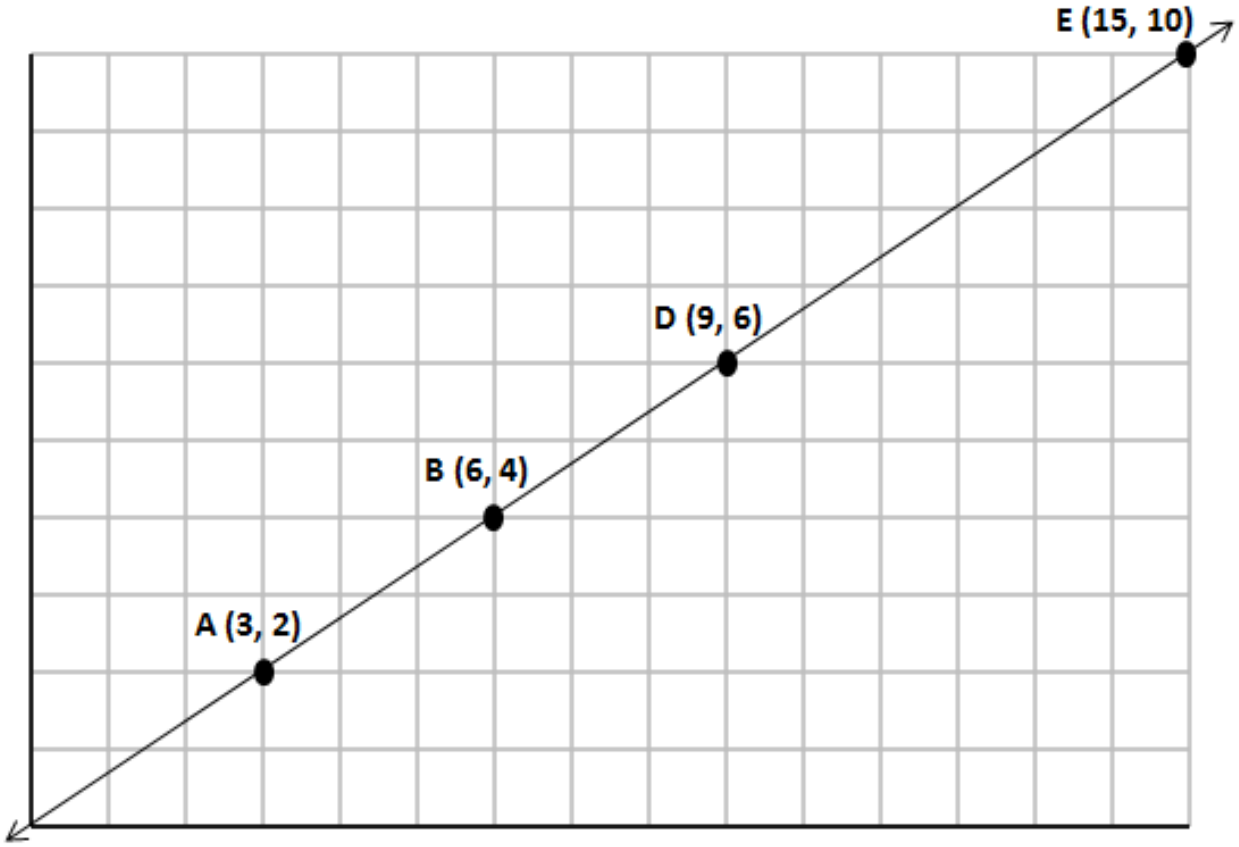
3) What can you conclude about the slope between any 2 points on a line?
    a. *Turn and talk to your shoulder partner.* Construct an argument using evidence from the work you did today. Listen to your partner's argument and prepare to share your discussion with the whole class.

Whole-group share out.

Next steps/follow-up lesson: How can we calculate the slope of a line between any 2 points?

Closure: *Writing prompt:* Tell me everything you know about slope.

Handout: Exploring Slope Using Similar Triangles



1) Using the points A, B, D, and E, draw two right triangles so that their hypotenuses are on the line.
   a. What do you *predict* the ratios of their vertical side lengths to horizontal side lengths will be?

   b. Find the ratios of the vertical side length to horizontal side length of both triangles.

2) What do you notice about all of the ratios you recorded?

3) What can you conclude about the slope between any 2 points on a line?