

### Core Content

**Cluster Title: Understand the connections between proportional relationships, lines, and linear equations.**

**Standard:** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

**Concepts and Skills to Master**

- Graph a proportional relationship given a table, equation or contextual situation.
- Recognize unit rate as slope and interpret the meaning of the slope in context.
- Recognize that proportional relationships include the point (0,0).
- Compare different representations of two proportional relationships represented as contextual situations, graphs, or equations.

### Supports for Teachers

**Critical Background Knowledge**

- Use an equation to create a table and plot values on the coordinate axes.
- Understand and calculate unit rates.

**Academic Vocabulary**

slope, unit rate, rate of change,  $m$  (slope)

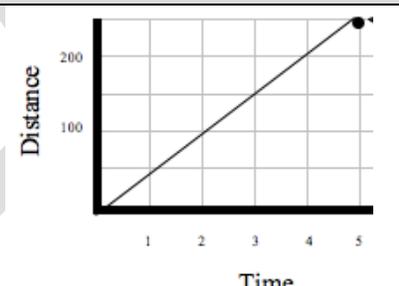
<b>Suggested Instructional Strategies</b>	<b>Resources</b>
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- Categorize linear relationships represented in multiple ways as either proportional or not proportional.
- Plot relationships generated from real-life proportional examples (e.g., shopping) and interpret the slope in the context of the situation.

*illuminations.nctm.org/ActivityDetail.aspx?ID=124.*  
NCTM. (9-12 Activity: Two Terrains)

**Sample Formative Assessment Tasks**

**Skill-Based Task**  
This is a graph of Susie’s trip to John’s cabin. John made the same trip in 4 hours. Compare their rates. Who travelled at a faster rate? How do you know?



**Problem Task**  
Give examples of relationships that are proportional and relationships that are linear, but not proportional.

### Core Content

**Cluster Title: Understand the connections between proportional relationships, lines, and linear equations.**

**Standard:** 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; derive the equation  $y = mx$  for a line through the origin and the equation  $y = mx + b$  for a line intercepting the vertical axis at  $b$ .

**Concepts and Skills to Master**

- Determine the slope of a line as the ratio of the leg lengths of similar right triangles.
- Explain why the slope is the same between any two distinct points on a line using similar right triangles.
- Write an equation in the form  $y = mx + b$  from a graph of a line on the coordinate plane.

### Supports for Teachers

**Critical Background Knowledge**

- Recognize similar triangles and know that they have proportional sides.

**Academic Vocabulary**

similar triangles,  $m$  (slope),  $b$  (y-intercept), linear, right triangle, origin, rise, run

**Suggested Instructional Strategies**

- Have students draw many right triangles with the hypotenuse on the line and compare the ratio of the leg lengths.
- Discuss the value of choosing easy-to-read points when determining slope.
- Relate negative slopes to the change in  $y$  as  $x$  increases.

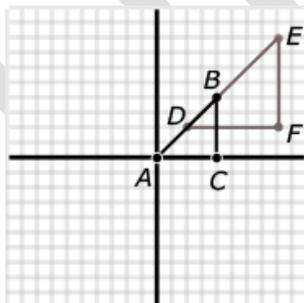
**Resources**

[illuminations.nctm.org/ActivityDetail.aspx?ID=144](http://illuminations.nctm.org/ActivityDetail.aspx?ID=144).  
NCTM. (3-8 Activity: Chairs)

**Sample Formative Assessment Tasks**

**Skill-Based Task**

Points A, D, B, and E are collinear. Show that  $\overline{AB}$  and  $\overline{DE}$  have the same slope.



**Problem Task**

How is it possible to have similar triangles that do not yield the same slope?