

ELG 8.3: Understand the connections between proportional relationships, lines, and linear equations.

Vertical Progression:

<p>6th Grade</p>	<p>ELG 6.1 Understand ratio concepts and use ratio reasoning to solve problems.</p> <ul style="list-style-type: none"> ○ 6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. ○ 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. ○ 6.RP.A.3.a Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. ○ 6.RP.A.3.b Solve unit rate problems including those involving unit pricing and constant speed.
<p>7th Grade</p>	<p>ELG 7.1 Analyze proportional relationships and use them to solve real-world and mathematical problems.</p> <ul style="list-style-type: none"> ○ 7.RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units, areas, and other quantities measured in like or different units. ○ 7.RP.A.2 Recognize and represent proportional relationships between quantities. ○ 7.RP.A.2a Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. ○ 7.RP.A.2b Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. ○ 7.RP.A.2c Represent proportional relationships by equations. ○ 7.RP.A.2d Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.
<p>8th Grade</p>	<p>ELG 8.3 Understand the connections between proportional relationships, lines, and linear equations.</p> <ul style="list-style-type: none"> ○ 8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. ○ 8.EE.B.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; 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.
<p>Algebra 1</p>	<p>ELG.MA.HS.A.7: Create equations that describe numbers or relationships.</p> <ul style="list-style-type: none"> ○ A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. <p>ELG.MA.HS.F.6: Construct and compare linear, quadratic, and exponential models and solve problems.</p> <ul style="list-style-type: none"> ○ F-LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. ○ F-LE.A.1b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
<p>Geometry</p>	<p>ELG.MA.HS.G.6: Prove theorems involving similarity.</p> <ul style="list-style-type: none"> ○ G-SRT.B.5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

ELG 8.3: Understand the connections between proportional relationships, lines, and linear equations.

Students will demonstrate command of the ELG by:

- Graphing proportional relationships, interpreting unit rate as the slope of the graph.
- Comparing two different proportional relationships represented in different ways.
- Writing equations in the form $y = mx$ for lines through the origin and equations in the form $y = mx + b$ for lines intercepting the vertical axis at b to model linear situations.
- Finding the slope from any representation of data (i.e. graphs, tables or equations).
- Using similar triangles to explain why choosing any two points on a line will give the same slope.

Vocabulary:

- | | |
|-------------------------------|---------------------|
| • coefficient | • similar triangles |
| • constant of proportionality | • slope |
| • proportional relationship | • unit rate |
| • rate of change | |

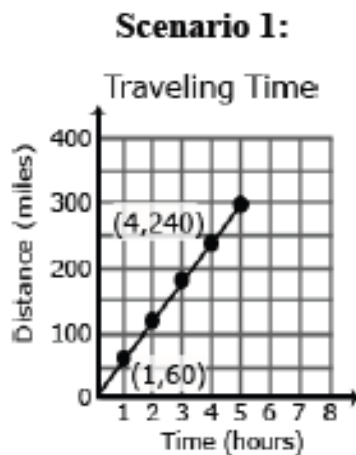
Sample Instructional/Assessment Tasks:

1) Standard(s): 8.EE.B.5

Source: PARCC 8th Grade EOY Practice Test www.parcconline.org

Item Prompt:

Compare the scenarios to determine which represents a greater speed.
Explain your choice including a written description of each scenario.
Be sure to include the unit rates in your explanation.



Scenario 2:

$$y = 55x$$

x is time in hours
 y is distance in miles

Correct Answer:

Scenario 1 has the greater speed since the unit rate is 60 miles per hour. The graph shows this rate since 60 is the distance traveled in one hour. Scenario 2 has a unit rate of 55 miles per hour shown as the coefficient in the equation.

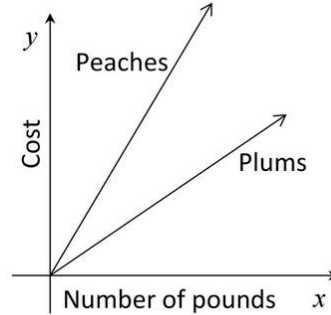
ELG 8.3: Understand the connections between proportional relationships, lines, and linear equations.

2) Standard(s): 8.EE.B.5

Source: PARCC 8th Grade EOY Practice Test www.parcconline.org

Item Prompt:

The graphs show the cost y of buying x pounds of fruit. One graph shows the cost of buying x pounds of peaches, and the other shows the cost of buying x pounds of plums.



- Which kind of fruit costs more per pound? Explain
- Bananas cost less per pound than peaches or plums. Draw a line alongside the other graphs that might represent the cost y of buying x pounds of bananas.

Correct Answer(s)

- Peaches cost more per pound. This can be determined by the steepness of the graph. Since the graph compares number of pounds versus cost, the cost is higher at every point on the graph besides $(0,0)$ for peaches compared to plums.
- Any line drawn below the Plum line and above the x axis will suffice for this solution.