

### ELG 7.1: Analyze proportional relationships and use them to solve real-world and mathematical problems.

#### Vertical Progression:

<p><b>5<sup>th</sup> Grade</b></p>	<p><b>5.NF.B Apply and extend previous understandings of multiplication and division to multiply and divide fractions.</b></p> <ul style="list-style-type: none"> <li>○ <b>5.NF.B.3</b> Interpret a fraction as division of the numerator by the denominator (<math>a/b = a \div b</math>). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.</li> </ul>
<p><b>6<sup>th</sup> Grade</b></p>	<p><b>ELG 6.1 Understand ratio concepts and use ratio reasoning to solve problems.</b></p> <ul style="list-style-type: none"> <li>○ <b>6.RP.A.1</b> Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, “The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.” “For every vote candidate A received, candidate C received nearly three votes.”</li> <li>○ <b>6.RP.A.2</b> Understand the concept of a unit rate <math>a/b</math> associated with a ratio <math>a:b</math> with <math>b \neq 0</math>, and use rate language in the context of a ratio relationship.</li> <li>○ <b>6.RP.A.3</b> 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.</li> <li>○ <b>6.RP.A.3a</b> 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.</li> <li>○ <b>6.RP.A.3b</b> Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?</li> <li>○ <b>6.RP.A.3c</b> Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.</li> <li>○ <b>6.RP.A.3d</b> Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.</li> </ul>
<p><b>7<sup>th</sup> Grade</b></p>	<p><b>ELG 7.1 Analyze proportional relationships and use them to solve real-world and mathematical problems.</b></p> <ul style="list-style-type: none"> <li>○ <b>7.RP.A.1</b> Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. <i>For example, if a person walks <math>1/2</math> mile in each <math>1/4</math> hour, compute the unit rate as the complex fraction <math>^{1/2}/_{1/4}</math> miles per hour, equivalently 2 miles per hour.</i></li> <li>○ <b>7.RP.A.2</b> Recognize and represent proportional relationships between quantities.</li> <li>○ <b>7.RP.A.2a</b> 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.</li> <li>○ <b>7.RP.A.2b</b> Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</li> <li>○ <b>7.NS.A.2c</b> Represent proportional relationships by equations.</li> <li>○ <b>7.RP.A.2d</b> Explain what a point <math>(x, y)</math> on the graph of a proportional relationship means in terms of the situation, with special attention to the points <math>(0, 0)</math> and <math>(1, r)</math> where <math>r</math> is the unit rate.</li> <li>○ <b>7.RP.A.3</b> Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.</li> </ul>

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<b>8<sup>th</sup> Grade</b>	<b>ELG 8.3 Understand the connections between proportional relationships, lines, and linear equations.</b> <ul style="list-style-type: none"><li>○ <b>8.EE.B.5</b> Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.</li></ul>
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**Students will demonstrate command of the ELG by:**

- Using division to compute unit rate, always labeling units.
- Explaining how the two units are related in a unit rate.
- Computing unit rates using fractions in real life situations.
- Converting different unit measures relating to length, time and other quantities.
- Deciding whether two quantities are in a proportional relationship using tables, equations, and graphs.
- Identifying a constant of proportionality from a table, graph, equation, or situation.
- Writing equations to represent a proportional relationship.
- Solving real-world ratio and percent problems and evaluating the reasonableness of their solution.

**Vocabulary:**

- complex fraction
- constant of proportionality
- equivalent fractions
- percent
- proportion
- proportional relationship
- ratio
- reciprocal
- unit conversion
- unit rate

**Sample Instructional/Assessment Tasks:**

**1) Standard(s): 7.RP.A.3**

**Source:** PARCC 7<sup>th</sup> Grade EOY Practice Test [www.parcconline.org](http://www.parcconline.org)

**Item Prompt:**

**Task 1:**

The directions on a bottle of vinegar say, “mix 1 cup of vinegar with 1 gallon of water to make a cleaning solution.” The ratio of vinegar to water is 1 to 16.

Part A

How many **cups** of water should be mixed with  $\frac{1}{4}$  cup of vinegar to make the cleaning solution?

Enter your answer in the box.

cups

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Part B

How many **fluid ounces** of vinegar should be mixed with 80-fluid ounces of water to make the cleaning solution? Enter your answer in the box.

 ounces

Part C

The bottle contains 1 quart of vinegar. What is the **total number of quarts of cleaning solution** that can be made using the entire bottle of vinegar? Enter your answer in the box.

 quarts of cleaning solution

Part D

A spray bottle holds up to 1 cup of cleaning solution. When the spray bottle is full, what fraction of the cleaning solution is vinegar? Enter your answer in the space provided. Enter **only** your fraction.

**Solution:**

Part A: 4, Part B: 5, Part C: 17, Part D:  $\frac{1}{17}$

**2) Standard(s): 7.RP.A.2c**

Source: PARCC 7<sup>th</sup> grade PBA Practice Test [www.parcconline.org](http://www.parcconline.org)

**Item Prompt:**

A worker has to drive her car as part of her job. She receives money from her company to pay for the gas she uses. The table shows a proportional relationship between  $y$ , the amount of money that the worker receives, and  $x$ , the number of work-related miles driven.

**Mileage Rates**

Distance Driven, $x$ (miles)	Amount of Money Received, $y$ (dollars)
25	12.75
35	17.85
40	20.40
50	25.50

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**Part A:** Explain how to compute the amount of money the worker receives for any number of work-related miles. Based on your explanation, write an equation that can be used to determine the total of money,  $y$ , the worker receives for driving  $x$  work-related miles.

Explain your explanation and your equation in the graph.

**Part B:** On Monday, the worker drove a total of 134 work-related and personal miles. She receives \$32.13 for the work-related miles she drove on Monday. What percent of her total miles driven were work-related on Monday? Show how or explain your work.

**Correct Answer(s)**

**Part A:** Since the table shows a proportional relationship, I can divide the amount of money received by the distance driven for any of the rows in the table. The worker receives \$0.51 for each work-related mile driven. The equation that represents this is  $y = 0.51x$  (or equivalent).

**Part B:** The percent of total miles is found by dividing the work-related miles driven by the total number of miles driven. So, I must first determine the total number of miles that were work-related. I can use my equation from Part A to find the answer.

$$32.13 = 0.51x$$

$$x = \frac{32.13}{0.51} = 63$$

$$\frac{63}{134} \times 100 \approx 47\%$$