

Core Content

Cluster Title: Analyze proportional relationships and use them to solve real-world and mathematical problems.
Standard 1: 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 $1/2$ mile in each $1/4$ hour, compute the unit rate as the complex fraction $1/2/1/4$ miles per hour, equivalently 2 miles per hour.</i>
Concepts and Skills to Master
<ul style="list-style-type: none"> Extend the concept of a unit rate to include ratios of fractions. Compute a unit rate, involving quantities measured in like or different units.

Supports for Teachers

Critical Background Knowledge	
<ul style="list-style-type: none"> Understand the concept of a unit rate. (6.RP.2) Solve unit rate problems (If Eliza drives 400 miles in 8 hours, what is her average rate?) (6.RP.3) Simplify a complex fraction. (6.NS.1) 	
Academic Vocabulary	
Complex fractions, equivalent ratios, unit rate	
Suggested Instructional Strategies	Resources
<ul style="list-style-type: none"> Launch with integer problems familiar from Grade 6 and extend to fractional problems. Use grocery store ads to find unit rates for various products. Use ratios of real-life and model figures measured in fractional standard units to determine scale factors. 	<i>Developing Essential Understanding of Ratios, Proportions, and Proportional Reasoning for Teaching Mathematics: Grade 6-8, NCTM</i>
Sample Formative Assessment Tasks	
Skill-based Task <ul style="list-style-type: none"> If the temperature is rising $1/5$ degree each $1/2$ hour, what is the increase in temperature expressed as a unit rate? If Monica reads $7\frac{1}{2}$ pages in 9 minutes, what is her average reading rate in pages per minute, and in pages per hour? 	Problem Task John mows $1/3$ of a lawn in 10 minutes. Marcia mows $1/4$ of a lawn in 6 minutes. A student claims that Marcia is mowing faster because she only worked for 6 minutes, while John worked for 10. Is the student's reasoning correct? Why or why not?

Core Content

Cluster Title: Analyze proportional relationships and use them to solve real-world and mathematical problems.
<p>Standard 2: Recognize and represent proportional relationships between quantities.</p> <p>a) 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.</p> <p>b) Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</p> <p>c) Represent proportional relationships by equations. <i>For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t=pn$.</i></p> <p>d) 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>
Concepts and Skills to Master
<ul style="list-style-type: none"> • Verify that two quantities expressed in a table or in a graph are in a proportional relationship. • Determine a unit rate from a table, graph, equation, diagram or verbal description and relate it to the constant of proportionality. • Write an equation for a proportional relationship in the form $y = kx$. • Explain the meaning of the point (x,y) in the context of a proportional relationship. • Explain the significance of $(0,0)$ and $(1,r)$ in a graph of a proportional relationship, where r is the unit rate.

Supports for Teachers

Critical Background Knowledge	
<ul style="list-style-type: none"> • Understand the concept of a unit rate a/b. (6.RP.1) • Make tables and plot points generated from equivalent ratios. (6.RP.3) 	
Academic Vocabulary	
Proportional relationship, constant of proportionality, linear, equivalent ratios, unit rate	
Suggested Instructional Strategies	Resources
<ul style="list-style-type: none"> • Match verbal descriptions, graphs, tables, and equations of proportional relationships, including real-life proportional relationships. • Use technology to make a table of equivalent ratios and visualize graphs. • Connect the concept of a unit rate to the understanding of directly proportional relationships as a foundation for linear equations in 8th grade. 	<i>Developing Essential Understanding of Ratios, Proportions, and Proportional Reasoning for Teaching Mathematics: Grade 6-8, NCTM</i>
Sample Formative Assessment Tasks	
<p>Skill-based Task Gas is selling at the pump at \$3.75 per gallon. Represent this relationship using a table, graph, and an equation.</p>	<p>Problem Task Measure the circumference and radius of a variety of circles, and plot the radius against the circumference. What is the relationship between radius and circumference? How do you know?</p>

Core Content

Cluster Title: Analyze proportional relationships and use them to solve real-world and mathematical problems.
Standard 3: Use proportional relationships to solve multistep ratio and percent problems. <i>Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.</i>
Concepts and Skills to Master
<ul style="list-style-type: none"> Solve multistep problems involving percent using proportional reasoning. Find the percent of a number and extend the concept to solving real life percent applications. Calculate percent, percent increase, decrease, and error.

Supports for Teachers

Critical Background Knowledge	
<ul style="list-style-type: none"> Find a percent of a quantity as a rate per 100. (6.RP.3) Solve problems involving finding the whole given a part and the percent. (6.RP.3) Work fluently among fractions, decimals, and percent. 	
Academic Vocabulary	
Percent error, gratuity, commission, markup, markdown, simple interest, percent increase, percent decrease	
Suggested Instructional Strategies	Resources
Use authentic information such as sales ads, menus, and tax rates to solve authentic problems involving percent.	National Library of Virtual Manipulatives
Sample Formative Assessment Tasks	
Skill-based Task <ul style="list-style-type: none"> Find the selling price of a \$60 video game with a 28% markup and 6% tax. If you estimate that there are 90 jellybeans in a jar when there are actually 130, what is your percent of error based on the actual number in the jar? 	Problem Task <ul style="list-style-type: none"> An item is discounted 30% and then reduced another 20%. Use an example to demonstrate if the resulting discount is equivalent to a discount of 50%? Write several percent problems in which the solution is 35%. Does taking a 6% discount on an item, and then adding 6% sales tax result in the original price of an item? Support your answer with an example.