Percents and Proportions

Content Area: **Math**
Course(s): **Math Grade 7**
Time Period: **MP3**
Length: **45**
Status: **Published**

Unit Overview

Unit Summary	Unit Rationale
In unit 3 students build on their understanding of equivalent rates and determine whether two quantities are in a proportional relationship. They may test for equivalent ratios in a table or graph the data on a coordinate plane. Students know that the relationship between two quantities is preserved when both quantities are multiplied by the same number. They will learn how to identify such numbers as the unit rate, or the constant of proportionality, in tables, graphs, and verbal descriptions. In this unit students will develop the equation to represent a proportional relationship between the quantities and They identify the ratio of as the constant of proportionality. Students will be able to explain what a point on the graph of a proportional relationship means with special attention to the points and , where is the unit rate. This unit also allows students to build on their understanding that a percent describes a proportional relationship between the part and the whole. They recognize that a percent is a ratio out of 100, which shows the relationship between quantities. Any percent greater than 100% is a number greater than one, and any percent less than 1% is a number less than one-hundredth. Students deepen their conceptual understanding of proportional relationships to develop the percent equation. They use the formula part = percent x whole, to solve percent problems, when given two out of the three terms. Students use a variety of models, such as bar diagram models, fraction representations, and algebraic models. Students will also extend their previous knowledge of absolute value when solving percent error problems. Students also understand that the equations for percent change and percent error are the same. Both of these percentages involve finding the following ratio: the difference between two values to one of those values.	Unit 3 builds upon students prior knowledge of proportional relationships as students procedural skill and fluency related to percent and percent problems. In this unit students also develop conceptual understanding related to this topic. Using percents and proportions has a multitude of real world applications that will help students to make informed decisions. Studying percents and proportional relationships also helps to prepare students to be informed consumers.

NJSLS

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.
7.RP.A.2	Recognize and represent proportional relationships between quantities.
7.RP.A.2.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.
7.RP.A.2.b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
7.RP.A.2.c	Represent proportional relationships by equations.
7.RP.A.2.d	Explain what a point (□, □) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, □) where □ is the unit rate.
7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.

Standards for Mathematical Practice

1	Make sense of problems and persevere in solving them
2	Reason abstractly and quantitatively
3	Construct viable arguments and critique the reasoning of others
4	Model with mathematics
5	Use appropriate tools strategically
6	Attend to precision
7	Look for and make use of structure
8	Look for and express regularity in repeated reasoning

Unit Focus

Enduring Understandings	Essential Questions
• Equivalent ratios and unit rates can be used to compare ratios and solve problems • A unit rate can be easier to use to solve problems than a ratio of fractions. • Quantities in a proportional relationship can be described by equivalent ratios	• How are ratios, rates, and unit rates used to solve problems? • Why is it useful to write a ratio of fractions as a unit rate? • How are proportional quantities described by equivalent ratios?

• Equations in the form where is the constant of proportionality, can be used to represent proportional relationships and solve problems. • The graph of a proportional relationship is a straight line through the origin. • By recognizing proportional quantities, you can use what you know about proportional relationships to solve problems. • Equivalent ratios can be used to find the percent of a number. Percent is a ratio out of 100 that relates the ratio of two quantities. • The part divided by the whole and the percent divided by 100 are equivalent ratios. • Proportional reasoning can be used to develop the percent equation, which in turn, can be used to find the percent, part, or whole. • Both the percent change and percent error involve finding the ratio of a difference of two values to one of those values. • A markup is the same as a percent increase, and a markdown is the same as a percent decrease. The method used to calculate percent change can be used to calculate markups and markdowns.	• How can you represent a proportional relationship with an equation? • What does the graph of a proportional relationship look like? • How can proportional reasoning help to solve a problem? • How do percents show the relationship between quantities? • How does proportional reasoning relate to percent? • How are percent problems related to proportional reasoning? • How is finding percent error similar to finding percent change? • How are the concepts of percent markup and percent markdown related to the percent equation? • How does simple interest show proportional reasoning and relate to the percent equation?

Instructional Focus

Learning Targets
Learners will... • Use ratios and rates to describe the relationship between two quantities • Find equivalent ratios and use unit rates to solve multi-step problems • Find unit rates with ratios of fractions • Use unit rates to solve multi-step problems • Determine whether quantities are proportional by testing for equivalent ratios • Use the constant of proportionality to write equations that represent proportional relationships • Use equations to solve problems involving proportional relationships • Use a graph to recognize proportionality • Identify a constant of proportionality from a graph • Interpret a point on a graph of a proportional relationship • Explain whether a solution represents a proportional relationship • Use representations to find entry points into problems

- Understand that equivalent rates can be used to find percents
- Analyze percents of numbers in a real-world context
- Construct a percent proportion
- Use a percent proportion to find an unknown part, whole, or percent
- Understand the relationship between proportional reasoning and percent
- Interpret the results of a percent equation in a real-life scenario
- Solve real-world problems involving percent change and percent error.
- Understand the percent equation and the different ways it can be used
- Understand and calculate markups and markdowns
- Relate percent change to percent markup and percent markdown
- Identify the parts of interest problems and how the values are related

Prerequisite Skills

- Compute quotients of fractions. Interpret quotients of fractions
- Solve unit rate problems
- Represent and solve rate and ratio real-world and mathematical problems by using equations
- Create tables of equivalent ratios and find missing values with whole number measurements
- Plot pairs of values, in the coordinate plane, form a ratio table to compare ratios
- Interpret coordinate value of points in the context of the real world and mathematical problems
- Find the part, whole and percent of a quantity in real-world problems
- Convert measurement units utilizing ratio

Common Misconceptions

- Conversion of words to symbols
- Percents can only be between 1% and 100% but cannot be smaller or bigger
- Percents with decimals are already in decimal form
- Combining discounts to have one percent instead of working them sequentially
- Confuse how to organize the units in ratios and order
- Writing ratios with fractions
- Scale of a graph
- Interchanging x and y values
- Scale factor must be a whole number

Spiraling For Mastery

Current Unit Content/Skills	Spiral Focus	Activity
• Ratios and Rates • Proportional Relationships • Percent • Connect Percent and	• Ratio Reasoning (Grade 6) • Rates (Grade 6) • Ratios and Rates (Grade 7) • Proportional Relationships	• Math Diagnostic and Intervention System Activities

Proportion	(Grade 7)	

Assessment

Formative Assessment	Summative Assessment
• Homework • Lesson Checks • MathXL • Quizzes • Exit Tickets • Lesson Reflections • Performance Tasks	• Topic Tests (Common Assessments) • Unit 3 Benchmark (Link-It)

Resources

Key Resources	Supplemental Resources
• Savvas EnVision Math 7 • Pacing Guide	• IXL • Delta Math • Desmos • Khan Academy • Manuevering the Middle

Career Readiness, Life Literacies, and Key Skills

9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
9.4.8.CT	Critical Thinking and Problem-solving
9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
9.4.8.GCA.1	Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful

visualizations.

Interdisciplinary Connections

L.KL.7.2.A	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases.
SL.PE.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
SL.PE.7.1.C	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
SL.PE.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.
6-8.MS-ETS1-3.4	Analyzing and Interpreting Data
6-8.MS-ETS1-3.ETS1.B.1	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
6-8.MS-ETS1-3.ETS1.B.2	Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.