Unit 4 - Ratios, Proportions and Percents

Content Area: **Mathematics**
Course(s): **Math 7**
Time Period: **January**
Length: **9 weeks**
Status: **Published**

Unit Summary

In this unit, students will analyze proportional relationships. Students will use their knowledge of equations to set up and solve proportions. Students will determine unit rates and evaluate ratios. Students will use percents to solve real-world problems, including tax/tip/interest and more. Use of these concepts will be applied to word problems. Students will study proportional relationships represented in tables and graphs. Students will translate between equations, graphs, tables, and written explanations. Students will pay precise attention to units, calculations, and rounding.

Standards

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.7.RP.A	Analyze proportional relationships and use them to solve real-world and mathematical problems.
MA.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.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.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.
MA.7.RP.A.2b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
MA.K-12.4	Model with mathematics.
MA.7.RP.A.2c	Represent proportional relationships by equations.
MA.K-12.5	Use appropriate tools strategically.
MA.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.
MA.K-12.6	Attend to precision.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
PFL.9.1.8.A.1	Explain the meaning and purposes of taxes and tax deductions and why fees for various benefits (e.g., medical benefits) are taken out of pay.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.1.8.A.CS1	Understand and use technology systems.

TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.1.8.D.CS2	Demonstrate personal responsibility for lifelong learning.

Student Learning Objectives

- Students will learn to convert between units, both English and metric system, using dimensional analysis.
- Students will learn to define and evaluate ratios and rates.
- Students will learn to determine unit rate.
- Students will learn to determine if a proportion is a true proportion or not.
- Students will learn to solve a proportion and proportion word problems.
- Students will learn to evaluate complex fractions.
- Students will learn to determine constant of proportionality.
- Students will learn to use the percent proportion to solve for percent, part, or whole.
- Students will learn to solve percent proportion problems and word problems.
- Students will learn to use a proportion to find missing side measures and perimeter of similar figures.
- Students will learn to determine missing angles on similar figures.
- Students will learn to determine dimensions based on scale factor.
- Students will learn to calculate discount, tax, tip, interest, commission, and final cost (with discount, tax, tip, interest, commission).
- Students will learn to determine final cost based on more than one percent (tax, tip, discount).
- Students will learn to create a drawing using a different scale.
- Students will learn to calculate percent of change, percent markup/markdown. and percent error.
- Students will learn to determine the final amount using percents when given tax, tip, discount, commission.
- Students will learn to determine original cost/price when given final amount with percents - tax, tip, discount.
- Students will learn to convert between fractions, decimals and percents.

Essential Questions

- When can a percent be greater than 100?
- What does it mean to find the percent of a number?
- Why is it important to understand the difference between a ratio and a rate?
- How can proportions be used to set and solve real world solutions?

Enduring Understandings

- Students will understand that proportionality involves a relationship in which the ratio of two quantities remains constant as the corresponding values of the quantities change.
- Students will understand that proportions and percents is essential to being a knowledgeable participant in the commercial and retail world.

Application

- Students will be able to independently use their learning to compare costs using unit rates.
- Students will be able to independently use their learning to discount, tax, tip, commission, interest, and mark-ups require understanding of

percentages.

- Students will be able to independently use their learning to determine percent proportion, tax/tip/discount, percent of change, simple interest, and percent of error.
- Students will be able to independently use their learning to appropriately use mathematical vocabulary such as ratio, rate, unit rate, proportion, constant of proportionality, percent error, gratuities, commissions, scale factor.

Skills

Students will be skilled at:

- Writing and expressing ratios in simplest form.
- Defining and evaluating ratios and rates.
- Determining unit rates, including complex fractions.
- Determining if two quantities are in a proportional relationship.
- Identifying and calculating the constant of proportionality, including within equations.
- Graphing a proportional relationship as a straight line through the origin.
- Setting up and solving a proportion and proportion word problem.
- Finding unknown lengths in similar figures using a proportion; use to find perimeter.
- Determining missing angles in similar figures.
- Determining measurements on a scale drawing.
- Utilizing percent proportion to solve for percent, part, or whole and word problems.
- Determining percents without using a calculator.
- Calculating discount, tax, tip, interest, commission, mark-up, or final cost.
- Determining the original cost when given final amount after % tax, tip, discount.
- Finding percent of increase, percent of decrease, and percent error.
- Utilizing constant of proportionality to solve word problems.
- Utilizing a proportion to find perimeters of similar figures.
- Setting up and evaluating dimensional analysis problems in order to convert units with the same and different systems of measurements.
- Creating a drawing using a different scale.