Unit 3: Ratios & Proportional Relationships

Content Area: **Mathematics**
Course(s): **Accelerated Math 7**
Time Period: **2nd Marking Period**
Length: **8 Weeks**
Status: **Published**

Unit Overview

In this unit, students will Identify, analyze and represent proportional relationships and use these proportional relationships to solve real-world percent problems. Identify and use unit-rate to solve real-world math problems.

By the end of January, administer the Link IT! Gr 7 MathLinkIt! NJSLS BM Form B.

Transfer

Students will be able to independently use their learning to solve real-world problems involving...

- representing and using rational numbers in solve real-life situation problems.
- representing rational numbers with visuals (including distance models), language, and real-life contexts.
- apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers
- Solve problems involving proportional rate of change.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

- Fractions, decimals, and percents can be used interchangeably.

- Ratios use division to represent relationships between two quantities.
- Proportion represent relationships between parts of a whole.
- The constant of proportionality is also considered to be the unit rate.
- Understand slope as being the proportional rate of change.

Essential Questions

Students will keep considering...

- Chapter 8:
    - How can you identify and represent proportional relationships?
    - How can you use proportional relationships to solve real world percent problems?
    - How are unit rates useful?

- Chapter 9:
    - How can you use percents to solve real world problems involving sales commissions & tax, percent error and simple interest?
    - How do percents relate to scaling figures in geometry?

Application of Knowledge and Skill

Students will know...

Students will know...

- how to compute unit rates associated with fractions, including ratios of lengths, areas, and other quantities measured in like or different units.
- how to recognize and represent proportional relationships between quantities
- how to solve real-world and mathematical problems involving the four operations with rational numbers

Students will be skilled at...

Students will be skilled at...

- Unit Rate and Proportionality
- Comparing Rates
- Identifying Proportional Relationships in Tables
- Identifying Proportional Relationships in Graphs
- Finding Unit Rate and The Constant of Proportionality
- Using Equations to Represent Proportional Relationships
- Interpreting Graphs of Proportional Relationships
- Solving Multi-Step Ratio Problems
- Proportionality in Geometry: Scale Drawings
- Understanding Percent
- Problem-Solving with Percents
- Solving Problems Involving Percent Increase and Decrease
- Finding the Whole Given a Percent
- Solving Markup and Markdown Problems with Percents
- Calculating Percent Error
- Changing Percents
- Calculating Simple Interest
- Solving Problems Involving Taxes, Commissions, and Fees
- Determine Scale Factor of Drawings using Percent

Academic Vocabulary

complex fraction	constant of proportionality	constant of variation	constant rate of change
coordinate plane	cross products	dimensional analysis	direct variation
discount	equivalent ratios	gratuity	markdown
markup	non-proportional	ordered pair	origin
percent equation	percent error	percent of change	percent of decrease
percent of increase	percent proportion	principal	proportion
proportional	quadrants	rate	rate of change
sales tax	selling price	simple interest	slope
tip	unit rate	unit ratio	x-axis
x-coordinate	y-axis	y-coordinate	

Learning Goal 1

Analyze proportional relationships and use them to solve real-world and mathematical problems.

Compute unit rates associated with ratios of fractions measured in like or unlike units.

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.

Use proportional relationships to solve multistep problems.

Target #1.1 -- DOK: 1 Recall and 2 Skill/Concept

SWBAT Calculate and interpret unit rates, as well as, set up equivilent unit rates.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.

Target #1.2 -- DOK: 2 Skill/Concept

SWBAT Covert units to match and then compare two unit rates.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.

Target #1.3 -- DOK: 2 Skill/Concept

SWBAT: Find the unit rate of a table and determine if proportionality exists.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
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.K-12.7	Look for and make use of structure.

Target #1.4 -- DOK: 2 Skill/Concept

SWBAT: Find the unit rate of a graph and determine proportionality.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
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.K-12.7	Look for and make use of structure.

Target #1.5 -- DOK 2 Skill/Concept

SWBAT: Calculate, interpret, and use the constant of proportionalility to solve problems.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
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.K-12.7	Look for and make use of structure.

Target #1.6 -- DOK 3 Strategic Thinking

SWBAT: Use and identify the constant of proportionality within an equation. then relate the equation to a table or graph.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
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.K-12.4	Model with mathematics.
MA.7.RP.A.2b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
MA.7.RP.A.2c	Represent proportional relationships by equations.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.

Target #1.7 -- DOK: 2 Skill/Concept

SWBAT: Identify and interpret the constant of proportionality of a graph.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
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.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.

Target #1.8 -- DOK 2 Skill/Concept

SWBAT: Solve multistep ratio problems.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.

Target #1.9 -- DOK: 3 Strategic Thinking

SWBAT: Solve problems involving scale drwlings related by a ratio.

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.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.K-12.4	Model with mathematics.
MA.7.G.A.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Learning Goal 2

Analyze proportional relationships and use them to solve real-world and mathematical problems.

Use proportional relationships to solve multistep percent problems (for example, simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error)

Target #2. 1 -- DOK: 3 Strategic Thinking

SWBAT: Convert between fration, decimal, and percent.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.
MA.K-12.8	Look for and express regularity in repeated reasoning.

Target #2.2 -- DOK: 2 Skill/Concept

SWBAT: Use the equation Part=percent x whole to solve real world problems.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.

Target #2.3 -- DOK: 3 Strategic Thinking

SWBAT: Solve problems using percent increase or percent decrease.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
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.

Target #2.4 -- DOK: 3 Strategic Thinking

SWBAT: Find the "whole" given the percent and part.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.

Target #2.5 -- DOK: 2 Skill/Concept

SWBAT: Write and interpret equations involving markups and markdowns.

MA.K-12.1	Make sense of problems and persevere in solving them.

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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Target #2.6 -- DOK: 4 Extended Thinking

SWBAT: Students will be able to use absolute value to solve and interpret percent error.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.
MA.7.NS.A.1c	Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

Target #2.7 -- DOK: 3 Strategic Thinking

SWBAT: Solve problems where quantities and percents change.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
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-12.3	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.3	Use proportional relationships to solve multistep ratio and percent problems.
MA.K-12.6	Attend to precision.

Target #2.8 -- DOK: 2 Skill/Concept

SWBAT: Use the distributive property to write equivalent numerical and algebraic expressions.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.

Target #2.9 -- DOK: 3 Strategic Thinking

SWBAT: Solve problems using taxes, commissions, and fees.

MA.K-12.1	Make sense of problems and persevere in solving them.
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-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
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.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Target #2.10 -- DOK: 4 Extended Thinking

SWBAT: Solve problems involving scale drawlings related to percents.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
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-12.3	Construct viable arguments and critique the reasoning of others.

MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.4	Model with mathematics.
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.7.G.A.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Formative Assessment and Performance Opportunities

- Clicker
- Exit/Admit Ticket
- Journal
- Kahoot
- My Favorite No
- Student Persentation
- Student-Teacher Conference
- Think-Pair-Share

Summative Assessment

- LinkIt!
- Portfolio
- Project
- Quiz
- Test

21st Century Life and Careers and Technology (IN PROGRESS)

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP11	Use technology to enhance productivity.
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.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.

TECH.8.1.8.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.8.D.CS2	Demonstrate personal responsibility for lifelong learning.
TECH.8.1.8.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.

Accommodations & Modifications

- 2-color chips
- Adaptive Practice (cK-12 modality)
- Calculator
- Clickers
- Document Cameras
- Graphing Calculators
- Kahoot
- Lesson Extentions
- Manipulatives
- Modification as per IEP/504
- PLIX (cK-12 modality)
- Show students how to simplify ratios prior to multiplying, reducing the chance of making an error
- Small group instruction

Unit Resources

See also *Unit 3: Ratios and Proportional Relationships* Folder in Curriculum Portal

- cK-12.org
- NJCTL - New Jersey Center for Teaching & Learning
- NJSLS

Interdisciplinary Connections

Have students create scale drawings and scale models using proportional relationships (MA.7.G.A.1)

VPA.1.3.8.D.CS1	The creation of art is driven by the principles of balance, harmony, unity, emphasis, proportion, and rhythm/movement.