

Unit 3: Ratios & Proportional Relationships

Grade 7 Math

14 Class Meetings

Revised April 2024

Essential Questions

- When and why do you use proportional comparisons in the real world?
- How does comparing quantities describe the relationship between them?

Enduring Understandings with Unit Goals

EU 1: The proportional relationship between two quantities is a collection of equivalent ratios, related to each other by a constant of proportionality.

- Compare, analyze, and interpret proportional relationships between quantities in double number lines, tables, graphs and equations.
- Utilize the constant of proportionality (unit rate) to identify proportional relationships.
- Evaluate unit rates in equations in the form of $y=kx$ and in graphs of proportional relationships as the ordered pair (l,r) .
- Evaluate two quantities ratios for their equivalency or straight line passing through the origin.

EU 2: Proportional relationships can be used to create drawing and models at differing scales.

- Compute areas and create geometric figures with scale drawings.
- Analyze scale drawings to find the scale factor and actual measurements.

Standards

Common Core State Standards:

- **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 (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.
- **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.

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ISAAC Vision of the Graduate Competencies

Competency 1: Write effectively for a variety of purposes.

Competency 2: Speak to diverse audiences in an accountable manner.

Competency 3: Develop the behaviors needed to interact and contribute with others on a team.

Competency 4: Analyze and solve problems independently and collaboratively.

Competency 5: Be responsible, creative, and empathetic members of the community.

Unit Content Overview

1. Fractions, Decimals, and Percent

- Convert between fractions, decimals and percents
- **Vocabulary and Key Terms** – Convert, Percent, Fractions, Decimals, Equivalent, Multiply, Divide, Long division

2. Proportional Relations with Fractions

- Solve ratio and rate problems
- Apply part to part ratios
- Apply part to whole ratios
- Compute unit rates associated with ratios of fractions
- Compute ratios of lengths, areas, and other quantities measured in like or different units
- Identify independent and dependent variables
- Use double number lines, tables, and unit rate
- Define the constant of proportionality
- Solve for missing values
- Write equations from proportional relationships from word problems
- **Vocabulary and Key Terms** – Convert, Fractions, Decimals, Equivalent, Multiply, Divide, Rates, Ratios, Unit Rate, Denominator, Numerator, Greatest common factor, Least common Multiple, Part, Whole, Is, Of, Quantities, Variables, Independent, Dependent, Double number lines, tables, constant of proportionality, Unknown Quantity, Proportional relationships, Proportion

3. Proportional Relationship in Graphs

- Evaluate unit rates in equations in the form of $y=kx$
- Evaluate in graphs of proportional relationships as the ordered pair (l,r) .
- Identify the linear relationship does go through the origin
- Write equations from proportional relationships in graphs
- Interpret proportional relationships represented in graphs
- **Vocabulary and Key Terms** – Convert, Fractions, Decimals, Equivalent, Multiply, Divide, Rates, Ratios, Unit Rate, Denominator, Numerator, Greatest common factor, Least Common Multiple, Part, Whole, Is, Of, Quantities, Variables, Independent, Dependent, Double number lines, tables, constant of proportionality, Unknown quantity, Proportional relationships, Proportion, Origin, Graph is proportional

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4. Proportional Relationship in Tables

- Represent proportional relationships in tables
- Determine the constant of proportionality in tables
- Write equations from proportional relationships presented in tables
- **Vocabulary and Key Terms** – Convert, Fractions, Decimals, Equivalent, Multiply, Divide, Rates, Ratios, Unit Rate, Denominator, Numerator, Greatest common factor, Least Common Multiple, Part, Whole, Is, Of, Quantities, Variables, Independent, Dependent, Double number lines, tables, constant of proportionality, Unknown Quantity, Proportional relationships, Proportion

5. Nonproportional Relationships

- Compare proportional and nonproportional relationships
- Identify the linear relationship does not go cross through the origin
- **Vocabulary and Key Terms** – Convert, Fractions, Decimals, Equivalent, Multiply, Divide, Rates, Ratios, Unit Rate, Denominator, Numerator, Greatest common factor, Least Common Multiple, Part, Whole, Is, Of, Quantities, Variables, Independent, Dependent, Double number lines, tables, constant of proportionality, Unknown Quantity, Proportional relationships, Proportion

6. Scale Drawing

- Define and identifying scale drawings
- Determine scale factor between two images
- Use scale factor to draw scale images
- Evaluate a scale to determine actual measurements
- Create and evaluate maps using scales to find actual distance between locations
- Evaluate floor plans using scales to find actual measurements and dimensions
- Compute actual areas from scale drawings
- Draw scale drawing at different scales using proportions.
- **Vocabulary and Key Terms** – Convert, Fractions, Decimals, Equivalent, Multiply, Divide, Rates, Ratios, Unit Rate, Denominator, Numerator, Greatest common factor, Least Common Multiple, Part, Whole, Is, Of, Quantities, Variables, Independent, Dependent, Double number lines, tables, constant of proportionality, Unknown Quantity, Proportional relationships, Proportion, Equivalent, Scale Drawing, Scale Factor, Scale, Scaled Copy, Corresponding, Similar

Interdisciplinary Connection:

- Language Arts - Word Problems
- Science – Word Problems

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Daily Learning Objectives with *TWPS* Activities

Students will be able to...

- Compute the unit rate associated with ratios of fractions
 - *TWPS* – Which one doesn't belong? Explain using mathematical reasoning.
- Calculate the cross product to determine if the two ratios are in proportion (equivalent)
 - *TWPS* – Given two fractions, one with a missing value, how do you think we can solve for x ? Explain using mathematical reasoning.
- Analyze ratios in a table/diagram to determine if the ratios are equivalent by finding constant of proportionality
 - *TWPS* – Find the error in solving the proportion. Explain using mathematical reasoning.
- Construct and analyze graphs of ratios on a coordinate plane to determine if the ratios are proportional
 - *TWPS* – Given a graph, how can you find the constant of proportionality? Explain using mathematical reasoning.
- Compute, evaluate, and explain the rate of change/slope from a graph (rise over run) or equation ($y=mx$)
 - *TWPS* – What are the important criteria to look at when analyzing a graph? Explain using mathematical reasoning.
- Justify the meaning of a point on a graph $y=mx$ of a real-life situation
 - *TWPS* – What do you think a point means on a graph? Explain using mathematical reasoning.
- Produce and solve equations from a proportional relationship
 - *TWPS* – Find the error in describing a point on a graph. Explain using mathematical reasoning.
- Compute the actual length of a figure from a scale drawing
 - *TWPS* – Find the error in computing the scale factor between two figures. Explain using mathematical reasoning.
- Apply a scale from one drawing to create a second scale for that drawing
 - *TWPS* – Describe how to create a second figure given an original figure. Explain using mathematical reasoning.
- Solve problems using scale drawings of geometric figures
 - *TWPS* – Which scale drawing doesn't belong? Explain using mathematical reasoning.

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Instructional Strategies/Differentiated Instruction

- TWPS
- Whole group instruction
- Guided notes
- Student-led instruction
- Small group instruction
- Independent problem-solving
- Collaborative problem-solving
- Cross-curricular problem solving (independent and collaborative)
- Accountable Talk
- Manipulatives
- Homework
- Highlighted words
- Fill in the blanks
- Access to multiplication chart
- Access to calculator
- Color coded notes
- Pre-teaching/Reteaching

EL DIFFERENTIATED INSTRUCTION:

- Word Walls with visuals
- TWPS (Think, Write, Pair, Share)
- Pre-reading strategies
- Culturally responsive teaching
- Explicit Modeling
- Key Vocabulary
- Graphic Organizers
- Strategic Grouping
- Non-verbal Assessments

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Assessments

FORMATIVE ASSESSMENTS:

- Warm-ups (SBAC)
- Whiteboards
- Mid-class check-ins
- Exit Slips
- Accountable Talk Discussions
- Do Now
- Student-led instruction
- Homework
- Performance Task – Camping Trip
 - Problem Solving Rubric

SUMMATIVE ASSESSMENTS:

- Quiz 1 - EU 1 (Edulastic)
- Unit 3 Test (Edulastic)
- Performance Task – IAB PT: Camping Trip

Unit Task

Unit Task Name: Camping Trip

Description: Students will use information learned in this unit about how ratios and rates are used to compare quantities (EU 1) and how to convert rates into different units (EU 2) to solve problems about a campsite and its distance away from other places. Students will use a map and ratios to compare the distances of a campsite from a parking lot. Students will convert a path from a map from inches to miles using proportions. They will then use the distances of two paths to find the error a student made in comparing two distances, their units, and how the student made the error. Using these distances and a given speed, students will also use ratios to find the fastest path. This information will also help students explain which path they would take and why.

Evaluation: Problem Solving Rubric

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Unit Resources

- Match FishTank
- Illustrative Mathematics
- Khan Academy
- SolvemeMobiles.org
- Flipped Google Classroom Videos
- Worksheets
- Calculator
- Laptops
- SBAC Prep Online
- Performance Task – Camping Trip
- Blooket
- Edulastic
- 99math.com
- Legends of Learning