

MATHEMATICS COMMON CORE CURRICULUM UNIT*

North Smithfield Public Schools

TITLE OF UNIT: Unit 3 Ratios and Proportions **COURSE OR GRADE :** Math 7

DATE PRESENTED: _____ **DATE DUE:** _____ **LENGTH OF TIME:** 25 days

OVERVIEW OF UNIT:

Students will recognize proportional relationships and apply them to problems involving percents. They will use proportions when solving problems pertaining to similar figures and recognize slope as representing a constant of proportionality.

**ESSENTIAL QUESTION, PROMPT,
PROBLEM/UNIT**

What types of situations require an understanding of proportional reasoning in order to solve problems?

STANDARDS: Common Core Math Standards – Grade level domains 6-8

Ratios and Proportional Relationships RP	The Number System NS	Expressions and Equations EE	Functions (grade 8) F	Geometry G	Statistics and Probability SP
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Mathematical Practices grades K-12

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

FOCUS MATHEMATICS STANDARDS: see curriculum _____ for specific standards, e.g. **(CUT AND PASTE FROM MAP)**

- Analyze proportional relationships and use them to solve real-world and mathematical problems. **7.RP.1, 2, 3**
- Draw, construct, and describe geometrical figures and describe the relationships between them. **7.G.1, 2**

Applied Learning Standards:

problem solving
communication
critical thinking
research
reflection/ evaluation

ENDURING UNDERSTANDING: (CUT AND PASTE FROM CURRICULUM – ESSENTIAL KNOWLEDGE)

PRIOR KNOWLEDGE:

- Understand ratio concepts and use ratio reasoning to solve problems.
- Solve real-world and mathematical problems involving area, surface area, and volume.

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STUDENT OBJECTIVES, SKILLS and/or NEW KNOWLEDGE: (CUT AND PASTE FROM CURRICULUM – ESSENTIAL KNOWLEDGE)

7.RP.1

- A ratio is a comparison of two quantities (by division) and usually represents a part-to-part comparison.
- A fraction is usually a part to whole comparison or represents a division problem.
- A quotient of a ratio is a unit rate.

7.RP.2

- Proportionality can be determined by equivalent ratios, a constant of proportionality, or a unit rate.
- Proportionality can be determined from a graph, table, or equation by finding a constant of proportionality (unit rate).
- Unit rate is the slope of a proportional relationship that, when graphed, is a linear equation that goes through the origin.
- Linear equations when graphed are straight lines.
- Every point on a graph of a proportional relationship has a meaning in terms of the situation.

7.RP.3

- Ratio can be extended into solving single and multi-step proportionality problems and percent problems.

7.G.1

- Scale drawings are images that are proportional to the original object by a multiplicative relationship.
- Scale drawings can be reproduced using different ratios of side lengths, making them larger or smaller through multiplication.
- Actual side length and areas of figures can be found from scale drawings.

7.G.2

- Given constraints for triangles will determine whether a unique triangle, more than one triangle, or no triangle can be constructed.

ACTIVITIES, PRODUCTS, PERFORMANCE, and ASSESSMENTS: see curriculum introduction

- | | | | |
|---------------------------------------|----------------------------|--|---|
| 1. Application to real world problems | 6. Graphic organizers | 14. Problem/Performance based/common tasks | 18. Technology |
| 2. Creating charts/collecting data | 7. Graphing | 15. Real-life applications involving graphing | 19. Summarizing and note-taking |
| 3. Collaboration - interpersonal | 8. Interviews | 16. Represent numbers | 20. Tests and quizzes |
| 4. Conferencing | 9. Journals | 17. Rubrics/checklists (mathematical practice, modeling) | 21. Writing genres Arguments/ opinion Informative |
| 5. Exhibits | 10. KWL charts | | |
| | 11. Mathematical Practices | | |
| | 12. Modeling ★ | | |
| | 13. Oral presentations | | |

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Lessons	Resources	Timeframe
Rates	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 4 Lesson 1</i>	1
Identifying and Writing Proportions	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 4 Lesson 2</i>	1
Solving Proportions	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 4 Lesson 3</i>	1
Percent of Change	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 6 Lesson 4</i>	1
Application of Percents	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 6 Lesson 5</i>	1
Simple Interest	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 6 Lesson 6</i>	1
Quiz on Solving Proportions and Percent Problems		1
Angles in Polygons	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 8 Lesson</i>	1
Congruent Figures	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 8 Lesson 5</i>	1
Similar Figures and Proportions	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 4 Lesson 4</i>	2
Using Similar Figures	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 4 Lesson 5</i>	1
Scale Drawings and Scale Models	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 4 Lesson 6</i>	1
Quiz on Proportions in Geometric Figures		1
The Coordinate Plane	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 5 Lesson 1</i>	1
Interpreting Graphs	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 5 Lesson 2</i>	1
Slope and Rates of Change	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 5 Lesson 3</i>	1
Direct Variation	Holt McDougall Mathematics <i>Explorations in Core Math Grade 7 Chapter 5 Lesson 4</i>	2
Quiz on Slopes and Rates of Change		1
Additional Practice and Review		3
Unit Assessment		1

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HIGHER ORDER THINKING SKILLS: Web's Depth of Knowledge 2 – 4 or Bloom's Taxonomy

Web's Depth of Knowledge

- skill/conceptual understanding
- strategic reasoning
- extended reasoning

Bloom's Taxonomy

- apply
- analyze
- synthesize/create
- evaluate

ADDITIONAL RESOURCES: see curriculum for specifics

- Holt McDougall Mathematics *Explorations in Core Math Grade 7*
- Jossey-Bass Teaching the Common Core Math Standards with Hands-On Activities
- Holt Course 2
- Holt Course 3
- McDougall Littell Pre-Algebra

VOCABULARY (CUT AND PASTE FROM CURRICULUM)

7.RP

- Dependent
- Equivalent ratios
- Independent
- Linear relationship
- Proportion
- Rate
- Ratio
- Rise
- Run
- Scale/scale factor
- Scale/scale factor
- Steepness
- Unit rate
- X-intercept
- Y-intercept

7.G

- Congruent

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OBJECTIVES:

Lessons	Objective
Rates	Students will find and compare unit rates.
Identifying and Writing Proportions	Students will identify and write proportions.
Solving Proportions	Students will solve proportions.
Percent of Change	Students will find percent of change.
Application of Percents	Students will solve problems involving percents.
Simple Interest	Students will calculate simple interest and solve problems involving simple interest.
Quiz on Solving Proportions and Percent Problems	
Angles in Polygons	Students will draw shapes that satisfy given conditions.
The Coordinate Plane	Students will locate and name points on a coordinate plane.
Congruent Figures	Students will produce congruent figures on the coordinate plane.
Similar Figures and Proportions	Students will model similar figures.
Using Similar Figures	Students will use similar figures and proportions to find unknown lengths.
Scale Drawings and Scale Models	Students will use scale drawings to solve problems.
Quiz on Proportions in Geometric Figures	
Interpreting Graphs	Students will interpret a situation from a graph.
Slope and Rates of Change	Students will find the slope of a line.
Direct Variation	Students will use graphs to represent and analyze proportional relationships and write equations to represent proportional relationships.
Quiz on Slopes and Rates of Change	
Additional Practice and Review	
Unit Assessment	

- **Assessments:** see curriculum introduction
 - **Formative**
 - **Summative**

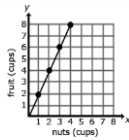
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SUGGESTED PROBLEMS: (CUT AND PASTE FROM CURRICULUM TEACHING PROBLEMS OR ASSESSMENTS)

7.RP.1, 7.RP.2

- A student is making trail mix. Create a graph to determine if the quantities of nuts and fruit are proportional for each serving size listed in the table. If the quantities are proportional, what is the constant of proportionality or unit rate that defines the relationship? Explain how you determined the constant of proportionality and how it relates to both the table and graph.

Serving Size	1	2	3	4
Cups of Nuts (x)	1	2	3	4
Cups of Fruit (y)	2	4	6	8



The relationship is proportional. For each of the other serving sizes there are 2 cups of fruit for every 1 cup of nuts (2:1).

The constant of proportionality is shown in the first column of the table and by the slope of the line on the graph.

- The graph below represents the cost of gum packs as a unit rate of \$2 dollars for every pack of gum. The unit rate is represented as \$2/pack. Represent the relationship using a table and an equation.

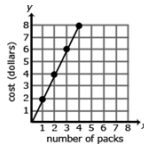


Table:

Number of Packs of Gum (<i>g</i>)	Cost in Dollars (<i>d</i>)
0	0
1	2
2	4
3	6
4	8

Equation: $d = 2g$, where *d* is the cost in dollars and *g* is the packs of gum

- 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 $t = pn$.
- A common error is to reverse the position of the variables when writing equations. Students may find it useful to use variables specifically related to the quantities rather than using *x* and *y*. Constructing verbal models can also be helpful. A student might describe the situation as “the number of packs of gum times the cost for each pack is the total cost in dollars”. They can use this verbal model to construct the equation. Students can check their equation by substituting values and comparing their results to the table. The checking process helps student revise and

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recheck their model as necessary. The number of packs of gum times the cost for each pack is the total cost ($g \times 2 = d$).

7.RP.3

- Gas prices are projected to increase 124% by April 2015. A gallon of gas currently costs \$4.17. What is the projected cost of a gallon of gas for April 2015?
- A student might say: "The original cost of a gallon of gas is \$4.17. An increase of 100% means that the cost will double. I will also need to add another 24% to figure out the final projected cost of a gallon of gas. Since 25% of \$4.17 is about \$1.04, the projected cost of a gallon of gas should be around \$9.40."

$$\$4.17 + \$4.17 + (0.24 \cdot \$4.17) = \$2.24 \times \$4.17$$

100%	100%	24%
\$4.17	\$4.17	?

- A sweater is marked down 33%. Its original price was \$37.50. What is the price of the sweater before

37.50 Original Price of Sweater	
33% of 37.50	67% of 37.50 Sale price of sweater

sales tax?

- The discount is 33% times \$37.50. The sale price of the sweater is the original price minus the discount or 67% of the original price of the sweater, or Sale Price = $0.67 \times$ Original Price.
- A shirt is on sale for 40% off. The sale price is \$12. What was the original price? What was the amount of the

Discount 40% of original price	Sale Price - \$12 60% of original price
Original Price (p)	

discount?

- At a certain store, 48 television sets were sold in April. The manager at the store wants to encourage the sales team to sell more TVs and is going to give all the sales team members a bonus if the number of TVs sold increases by 30% in May. How many TVs must the sales team sell in May to receive the bonus? Justify your solution.
- After eating at a restaurant, your bill before tax is \$52.60. The sales tax rate is 8%. You decide to leave a 20% tip for the waiter based on the pre-tax amount. How much is the tip you leave for the waiter? How much will the total bill be, including tax and tip? Express your solution as a multiple of the bill.
- The amount paid = $0.20 \times \$52.50 + 0.08 \times \$52.50 = 0.28 \times \$52.50$
- Finding the percent error is the process of expressing the size of the error (or deviation) between two measurements. To calculate the percent error, students determine the absolute deviation (positive difference) between an equal measurement and the accepted value and then divide by the accepted value. Multiplying by 100 will give the percent error. (Note the similarity between percent and percent of increase or decrease)

$$\% \text{ error} = \frac{|\text{estimated value} - \text{actual value}|}{\text{actual value}} \times 100\%$$

Example: A student measures the volume of a 2.50 liter container to be 2.38 liters. What is the percent

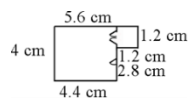
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error in the student's measurement?

- Answer: % error = $\frac{(2.50 \text{ liters} - 2.38 \text{ liters})}{2.50 \text{ liters}} \times 100\%$
 $= \frac{(0.12 \text{ liters})}{2.50 \text{ liters}} \times 100\%$
 $= .048 \times 100\%$

7.G.1

Julie showed you the scale drawing of her room. If each 2 cm on the scale drawing equals 5 ft, what are the actual dimensions of Julie's room?
Reproduce the drawing at 3 times its current size



7.G.2

- Conditions may involve points, line segments, angles, parallelism, congruence, angles, and perpendicularity.