Unit 5: Proportional Relationships

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 20**
Length: **4 weeks**
Status: **Published**

Unit Overview

In this unit, students will learn about proportional relationships and how they are directly related to unit rates. The unit will begin with students being given a table of values and asked to determine whether or not this would represent a proportional relationship. Students will understand that for a table to represent a proportional relationship, the ratio between y and x must be the same for the entire table. Once students show comprehension of this concept, they will learn what graphs that represent proportional relationships look like. This represents the first time students seeing the idea of "slope" in the context of a problem (represented as the "constant of proportionality"). Once exposed to the idea of "constant of proportionality", students will answer real world problems asking students to apply the constant of proportionality to answer a real life problem. The last type of proportional relationship that students will be asked to understand is how an equation would represent a proportional relationship. The culmination of this unit will involve students applying tables, graphs, and equations of proportional relationships to real world problems. Students will be asked to compare the different rates of change between different representations (tables to graphs, etc).

Standards

CCSS.Math.Content.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.
CCSS.Math.Content.7.RP.A.2	Recognize and represent proportional relationships between quantities.
CCSS.Math.Content.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.
CCSS.Math.Content.7.RP.A.2.b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
CCSS.Math.Content.7.RP.A.2.c	Represent proportional relationships by equations.
CCSS.Math.Content.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.

Essential Questions

- How will our previous knowledge of unit rates assist us in understanding proportional relationships?
- Can we think of any "real world" instances in which proportional relationships are useful?
- How can knowing the "constant of proportionality" help answer multi-step problems about a given topic?

Application of Knowledge: Students will know that...

- A graph represents a proportional relationship when the line is straight and it goes through the origin.
- A proportional relationship can be determined when given a table, graph, or equation.
- A table represents a proportional relationship when the ratio of y to x is the same throughout the entire table.
- An equation represents a proportional relationship when there is a coefficient of x but no constant.
- Proportional relationships can be applied to the idea of map scale and scale drawings.
- Proportional relationships can be compared to one another no matter the way they are being displayed (tables, graphs, or equations).
- The constant of proportionality in a graph is the amount per time of 1 (miles per hour / $ per game).
- The constant of proportionality in a table is the constant ratio of y to x.
- The constant of proportionality in an equation is the coefficient of x.
- Unit rate and constant of proportionality are one in the same.

Application of Skills: Students will be able to...

- Apply the concept of proportional relationships to the idea of map scales and scale drawings.
- Apply the idea of unit rates to the constant of proportionality.
- Calculate the constant of proportionality when given a table, graph, or equation.
- Compare and contrast the rate of change of a real world problem when given a table, graph, or equation.
- Create a table, graph, or equation of a proportional relationship based on a given word problem.
- Identify proportional relationships when given a table, graph, or equation.

Assessments

- Do Now's: Will be used to check for prior knowledge and to determine mastery of particular topics. If needed the teacher will remediate the previous lesson before continuing.
- Tickets to leave: Will be used to measure student understanding of the lesson and assist in determining whether remediation is needed for the topic.
- Communicator Practice: Will be used as a quick whole-class assessment tool to check for complete comprehension.
- Unit Quiz: focusing only on identifying/calculating the constant of proportionality when given tables, graphs, or equations.
- Unit test: focusing on all concepts covered within the "Proportional Relationships" unit specifically multi-step real world problems.
- Road Trip Project: students will be given a blank map of the United States and asked to pick 5 cities to visit. Students will then apply the idea of map scale to calculating the total distance of their trip. Students will then answer other questions based on the logistics of their trip (gas used, total cost, time spent traveling, etc).
- Information from this unit will be included on a locally developed, mid-year or end of year benchmark

assessment that may take the form of a test, performance based project, or other summative assessment. From this unit, students will be asked to solve real world problems involving proportional relationships.

Suggested Activities

- Digits launch activities (Topic 2).
- Review games using communicators.
- Student centered SMART Board lessons: students will manipulate rulers to measure the map distance between two cities followed by calculating the actual distance. Lesson having students compare proportional relationships between tables and graphs.
- Road Trip Project: (see description in assessments).
- Clue "walk-around" activity to review the concept of proportional relationships: focus will be on identifying whether something is a proportional relationship, calculating the constant of proportionality, and apply the constant of proportionality to real world problems. Students will complete review problems that are posted around the room on topics from this unit. The theme of the gallery walk is based off of the board game "Clue". Each problem will rule out possibilities for the suspect, weapon, and location. Once all of the problems are completed correctly, students will be left with the suspect, weapon, and location for the fictional crime.
- Proportional Relationships Poster: Students will work with a partner to come up with a real world word problem that represents a proportional relationship. Students will then represent this word problem with a table, graph, and equation.

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
    - Modifications & accommodations as listed in the student's IEP
    - Assign a peer to help keep student on task
    - Modified or reduced assignments
    - Reduce length of assignment for different mode of delivery
    - Increase one-to-one time
    - Working contract between you and student at risk
    - Position student near helping peer or have quick access to teacher
    - Break tests down in smaller increments
- **Content specific modifications may include:**
    - Personal handout for remembering integer rules (can be taped to desk).
    - Graphic organizer for remembering integer rules.
    - Provide completed examples for practice work and homework.
    - Calculator to assist with calculations.
    - Focus on problems that will result in an integer constant of proportionality

Differentiation for ELL's:

- General modifications may include:
  - Strategy groups
  - Teacher conferences
  - Graphic organizers
  - Modification plan
- **Content specific vocabulary important for ELL students to understand include:**
  - Ratio, rate, unit rate, proportion, origin, coordinates, constant of proportionality, scale

Differentiation to extend learning for gifted students may include:

- On the "Road Trip" project, give students a fractional unit rate to work with.
- When working on the proportional word problem poster, make students represent something that is not proportional and have them explain why it is not proportional from the context of the word problem itself.

Technology Integration

- iPads or Chromebooks as appropriate to the activity.
- Online learning components including use of the Digits digital textbook and resources.
- Teacher integration of the SMART board to facilitate active student engagement throughout the course of the lesson.
- Software or online programs that teachers may use to create students materials or generate problems such as Kuta software.
- Additional practice provided through the use of IXL.

Integrated/Cross-Disciplinary Instruction

ELA: Practice formulating complete and grammatically correct responses to open-ended questions.

Social Studies: Incorporate the ideas of geography and map reading into the Road Trip Project. Can also have students research and explain what types of things they are looking to see and do in the cities they chose to visit.

Resources

Digits teacher materials and support: www.pearsonrealize.com

Digits student access and support: www.mymathuniverse.com

IXL practice: www.ixl.com

Digits video examples

SMART Board lessons

Kuta software generated worksheets

Maps of the United States

21st Century Skills

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.