Unit 06: Ratio, Proportion, and Probability

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 16**
Length: **3 Weeks**
Status: **Published**

Unit Overview

In this unit, students find and interpret a unit rate. Students solve proportions using their knowledge of algebraic equations and the cross products property. Students identify corresponding side lengths of similar figures and determine unknown side lengths of similar figures. Students find distances using scales and scale drawings. Finally, students determine the probability of an event and use the counting principle to count possibilities.

Standards

MA.6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
MA.6.RP.A.2	Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.
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.6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
MA.6.RP.A.3b	Solve unit rate problems including those involving unit pricing and constant speed.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.
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.

Essential Questions

- How does comparing quantities describe the relationship between them?
- How are ratios and proportions used to compare quantities?
- What makes things similar?
- How is the probability of event determined and described?

Application of Knowledge and Skills...

Students will know that...

- A cross product is the product of the numerator of one ratio and the denominator of the other ratio.
- A proportion is an equation that states that two ratios are equal.
- A rate is a ratio of two quantities measured in different units.
- A ratio uses division to compare two quantities of the same unit.
- A scale gives the relationship between a drawing/model and the actual figure.
- Corresponding parts of figures are sides or angles that have the same relative position.
- Equivalent ratios are two ratios that have the same value.
- If the cross products are equal, the ratios are equal.
- One can use similar figures to find lengths that are difficult to measure directly.
- One can write the ratio of two quantities, a and b, where b is not equal to 0, in three ways: a to b, a:b, and a/b.
- Two figures are congruent if they are the same shape and the same size.
- Two figures are similar if they have the same shape, but not necessarily the same size.

Students will be able to...

- Find a unit rate.
- Find an unknown side length in similar figure using proportions.
- Find the dimensions and scale of a scale model using proportions.
- Find the ratio of lengths of corresponding sides.
- Identify and name geometric concepts (point, lines, rays, segment, angles, planes).
- Identify similar and congruent figures.
- Make a scaled drawing of an object using proportions.
- Name corresponding angles and sides.
- Order ratios from least to greatest.
- Solve a proportion using an algebraic equation.
- Solve a proportion using equivalent fractions.
- Solve proportions involving rational numbers.
- Solve proportions using cross products.
- Use proportions to solve indirect measurement.
- Write equivalent ratios or rates.
- Write ratios in simplest form 3 different ways.

Assessments

Digits Readiness Assessments:

The readiness assessment screens students on their understanding of the prerequisite content of a unit. Students are then assigned invidualized intervention lessons to address specific needs.

- Daily Formative Assessments Formative: Suggested Instructional/Assessment Strategies Formative: Instructional/Assessment Focus Formative assessments, such as: Do Now Assignments, Homework Assignments, Tickets to Leave, and Communicators, will provide daily data for teachers.
- Google Earth Formative: Lab Assignment Google Earth Scale Project: GRADE USING A RUBRIC .
- Proportional Pencil Activity Formative: Personal Project Proportion Activity: have students measure their own height and the height of their pencil. Then have students bring in a doll (GI Joe, Barbie, etc.). Have the students measure the height of the figure and using proportions have them determine an appropriate pencil height for the doll. Provide extension and conclusion questions.
- Ratios and Rates Quiz Formative: Written Test Students will complete a teacher-constructed quiz assessing their knowledge of : -writing ratios -writing ratios in simplest form -writing equivalent ratios -solving proportions (involving multi-step equations) -finding unit rates -solving word problems involving proportions
- Unit Rate Open Ended Formative: Other written assessments Students will complete an open-ended question on Unit Rates. Assessment will be graded using the NJASK rubric.
- Unit Test Summative: Written Test Students will complete a teacher-constructed unit test assessing all objectives in the unit.

Activities

- **Comparing Rates:** Have students work in partners. Have one students count the number of times his/her heart beats in 10 seconds.Have the other students count the number of times his/her heart beats in 15 seconds. Have the 10 sec. person multiply the beats by 66, and have the 15 sec. person multiply the beats by 44. Who has the faster heart rate? How did this help compare the rates? Provide a given set of pulse rates and have the students determine on their own which is the greater pulse rate. Ensure that they have different time intervals so the students have to determine an equivalent base.
- **Proportion Activity:** have students measure their own height and the height of their pencil. Then have students bring in a doll (GI Joe, Barbie, etc.). Have the students measure the height of the figure and using proportions have them determine an appropriate pencil height for the doll. Provide extension and conclusion questions.
- **Congruent Polygons:** have students complete charts showing the corresponding parts between congruent polygons. Link is attached.
- **Scale Drawing Notebook:** print out slides for students to follow along at their seats. Students can use rulers while a volunteer uses the virtual ruler on the Smart notebook to find ratios and to determine the distance between two places. Link is attached.
- **Digits cd grade 7**:

Launch Activities

Planning a Concert r1: In this activity students use examples about concerts to find unit rates, write and simplify fractions and to divide fractions.

Making and Editing a Video r2: In this activity students use examples about video making to find equivalent rations, graph ordered pairs, and solve equations.

congruent and similar polygons

Scale Drawing Notebook

Google Earth

Activities to Differentiate Instruction

- **Investigating Ratios and Rates:** Make a big chart with a column for each month of the year. Collect data on the date of each student's birthday (if your birthday was August 16, you would write a 16 under the month of August). Then have students write ratios based on the information given. Example: write a ratio of the number of students born on even-numbered dates to the number of students born on odd-numbered dates. To challenge students, have them determine which ratios are less than one or greater than one. Have them create their own examples.

- **Unit Rate Open-Ended:**

On level: have students determine unit rates and calculate other values. For example, if 4 apples cost $2.50, how much would 7 apples cost.

Above Level: Give three different rates and have students determine which would be the better buy.

- **Proportion Word Problems:**

On Level/Below Level: Ensure that when setting up the word problems students use the units associated with each problem. In doing so, they can see that each set of units should line up. Ensure that all problems result in whole numbers.

Above Level: 6.3 Real-World Problem Solving. Have students determine how much food and beverage to buy given a table of food and amount of servings needed. This activity combines proportional reasoning with decimals.

- **Disney Map Fun:** Provide students with maps from Disney World (Magic Kingdom, Animal Kingdom, MGM, and Epcot). Have then use a ruler and the maps to answer questions involving scale models. Extension and enrichment questions are provided for advanced students. Link is attached.
- **Google Earth Scale Project:** As a whole class, tour Google Earth and find Green Brook Middle School. Once the image is located, find the basketball court behind the school. Determine the scale that is used and create a proportion to find the "estimated" length and width of the court. Then have the students go outside and measure the actual length and width of the court. Allow the students to work with partners and use various measurement tools (ruler, yard stick, measuring tape). Have the students convert to a more appropriate unit and have them draw conclusions about the accuracy of Google Earth.

A more challenging version of the activity, in which students must create their own scale model drawing using the units provided, is attached.

Digits Supported Materials:

- Math XL Printables
- Leveled Homework G and K

- Help Me Solve This: This function scaffolds math problems by asking prompting question at each individual step.
- View An Example: This function provides a fully worked out step-by-step solution of a similar problem.
- Readiness Assessment: After a student completes the readiness assessment intervention lessons are individually assigned to address prerequisite skills .
- Tools: On line manipulatives

Disney Map Fun

Google Earth - both versions

Integrated/Cross-Disciplinary Instruction

- **Theater/Performing Arts:** In the alternate, more challenging, version of the Google Earth project, the students are asked to arrange props on a stage (stage right and stage left) for a school play.

Resources

Smart Board Links

Power Point Links

Google Earth

Kuta software

Digits teacher materials and support: www.pearsonrealize.com

SMART Exchange

Digits student access and support: www.MyMathUniverse.com

21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.