Math 7 - Unit C - Proportional Relationships and Percents

Unit Focus

In this unit, students deepen their understanding of ratios, scale factors, unit rates (constants of proportionality), and proportional relationships, using them to solve multi-step problems that are set in a wide variety of contexts that involve fractions, decimals and percentages. Throughout the unit students work together to make sense of problems and create solutions.

The unit begins by revisiting scale factors and proportional relationships, each of which has been the focus of a previous unit. Both of these concepts can be used to solve problems that involve equivalent ratios. However, it is often more efficient to view equivalent ratios as pairs that are in the same proportional relationship rather than seeing one pair as obtained by multiplying both entries of the other by a scale factor. From the proportional relationship perspective, all that is needed is the constant of proportionality—which is the same for every ratio in the proportional relationship.

Next students learn about percent increase and decrease. Students consider situations for which percentages can be used to describe a change relative to an initial amount, e.g., prices before and after a 25% increase. They begin by considering situations with unspecified amounts. They next consider situations with a specified amount and percent change, or with initial and final amounts, using double number line diagrams to find the unknown amount or percent change. Next, they use equations to represent such situations, using the distributive property to show that different expressions for the same amount are equivalent.

Students then use their abilities to find percentages and percent rates to solve problems that involve sales tax, tip, discount, markup, markdown, and commission and percent error. The PBA, In the News, gives students an opportunity to examine current news using new skills involving percents especially those using percent increase/decrease. They will work with a partner to pose and solve questions creating a visual display of their solution as they have throughout the unit.

Stage 1: Desired Results - Key Understandings

Standard(s)

Standards

- Common Core
  - *Mathematics: 7*
    - Analyze proportional relationships and use them to solve real-world and mathematical problems.
    - Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour. *(CCSS.MATH.CONTENT.7.RP.A.1)*
    - Recognize and represent proportional relationships between quantities. *(CCSS.MATH.CONTENT.7.RP.A.2)*
    - 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

Transfer

Students will be able to independently use their learning to...

T1 Construct viable arguments using clear and appropriate mathematical language and critique the reasoning of others. (MP 3)
T2 Apply models to solve problems. (MP4)
T3 Represent situations using mathematical reasoning and symbols (MP 2)

Meaning

Understanding(s)

Students will understand that...

U1 Mathematicians create or use models to generalize, represent, and solve problems.
U2 Mathematicians construct viable arguments to explain problems, solutions, and mathematical representations.

Essential Question(s)

Students will keep considering...

Q1 Have I sufficiently supported my answer and shown my work?
Q2 What model best represents this problem?

Stage 1: Desired Results - Key Understandings

observing whether the graph is a straight line through the origin. *(CCSS.MATH.CONTENT.7.RP.A.2A)*

- Analyze proportional relationships and use them to solve real-world and mathematical problems.
- Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. *(CCSS.MATH.CONTENT.7.RP.A.3)*
  - *Mathematics: 8*
- Mathematical Practices
- Reason abstractly and quantitatively. *(CCSS.MATH.MP.2)*
- Construct viable arguments and critique the reasoning of others. *(CCSS.MATH.MP.3)*
- Model with mathematics. *(CCSS.MATH.MP.4)*

Madison Public Schools Profile of a Graduate

- Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. *(POG.3.1)*
- Product Creation: Effectively use a medium to communicate important information. *(POG.3.2)*

Acquisition of Knowledge and Skill

Knowledge	Skill(s)
Students will know... **K1** Vocabulary: percentage, unit rate, tape diagram, initial/original amount, final/new amount, repeating decimal, percentage increase, percentage decrease, (a fraction) more than, (a fraction) less than, discount, sales tax, tip rate, tip, interest, commission, markup, markdown, measurement error, percent error **K2** using units of measure while working towards a solution and as part of an answer brings clarity.	*Students will be skilled at...* **S1** solving problems involving proportional relationships and rational quantities. **S2** writing equations to model situations in the form y=kx where k is a rational number. **S3** determining amounts a fractions more (or less) than a given amount. **S4** writing equations to model amounts a fractions more (or less) than a given amount. **S5** converting between decimals, percents and fractions. **S6** drawing tape diagrams to solve problems involving a percent more (or less). **S7** solving percent problems involving tax, tips, markups, markdowns, commision, percent error.