**Performance Task: Analyzing and Applying Unit Rate**

Students will develop an understanding of the unit rates associated with a proportional relationship. Students will also develop the ability to determine the appropriate rate to use in solving a problem and to use the corresponding unit rate to solve missing-value problems. The approximate time for this task is 1-2 class periods.

**STANDARD ADDRESSED IN THIS TASK**

MCC7.RP.1 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.

**STANDARDS FOR MATHEMATICAL PRACTICE**

1. Make sense of problems and persevere in solving the.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.

**BACKGROUND KNOWLEDGE**

- In the previous lesson students were introduced to the idea of unit rates.
- In 6th grade, students learning to solve unit rate problems including those involving unit pricing and constant speed.

**COMMON MISCONCEPTIONS**

A common error in setting up proportions is placing numbers in incorrect locations. This is especially easy to do when the order in which quantities are stated in the problem is switched within the problem statement.

**ESSENTIAL QUESTIONS**

- How are unit rates represented?
- How does a unit rate represent a real-world situation?
- How do I interpret a unit rate (using words and mathematically)?

**MATERIALS**

- Student recording sheets
- active-board or transparencies of these sheets for class discussion

**GROUPING**

Individual/Partner
**TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION**

**PART 1**

**Comments**

Students need the opportunity to work with manipulatives on their own or with a partner in order to develop the strategies for finding and interpreting unit rates. From the manipulatives, students will be able to move to pictorial representations of the display, then more abstract representations (such as sketches), and finally to abstract representation of rate equivalents. It is important to remember that this progression begins with concrete representations using manipulatives.

More information along with guidelines for 3-Act Tasks may be found in the Comprehensive Course Guide.

**Anticipated questions:**

If I wanted more red grapefruit than in the bag, how much would I pay for two additional grapefruit?
How much is one box of cereal if I pay $5.98 with the buy one, get one deal?
How much is a half-gallon of milk?

**Task Directions**

**Act I – Whole Group** - Pose the conflict and introduce students to the scenario by showing Act I picture.

1. Students are shown the Sales Ad image.
2. Ask students what they wonder about and what questions they have about what they saw. Students should share with each other first, and then the teacher records these questions (think-pair-share). The teacher may need to guide students so that the questions generated are math-related.

3. Ask students to estimate answers to their questions (think-pair-share). Students will write their best estimate, then write two more estimates – one that is too low and one that is too high so that they establish a range in which the solution should occur. Instruct students to record their estimates on a number line.

When students record their estimates on a number line, it will provide an informal assessment of students understanding of quantities and their value.

Act II – Student Exploration - Provide additional information as students work toward solutions to their questions.

1. Ask students to determine what additional information they will need to solve their questions. The teacher provides that information only when students ask for it:
   - The Tony’s Pizzas are 5 for $10
   - Chicken breast is $1.18 for 1 pound
   - The cost of one box of General Mills cereal is unknown
   - A 5lb bag of red grapefruit is $3.98
   - A 4lb bag of sugar is $.98

   This information is apparent within the image, however, the image will not remain posted and students may need this information to help them answer the question(s) from Act I. Only provide the information to students who inquire about it.

2. Ask students to work to answer the questions they created in Act I. The teacher provides guidance as needed during this phase by asking questions such as:
   - Can you explain what you’ve done so far?
   - What strategies are you using?
   - What assumptions are you making?
   - What tools or models may help you?
   - Why is that true?
   - Does that make sense?

   Doing this time, students will apply their understanding of unit rate to identify unit rates of particular products at the grocery store. Students may also begin to look at how to change a unit rate to a rate through multiplication. Look for the strategies students use for each to share in Act III.

   For students who struggle during this act, have them refer to the strategies used in the Number Talk for the previous lesson. These strategies may be the relationship between multiplication and division, finding an equivalent expression, division or the less efficient skip counting.
Act III – Whole Group - Share student solutions and strategies as well as Act III solution.

1. Ask students to present their solutions and strategies.
2. Share solution in Act III solution.
3. Lead discussion to compare these, asking questions such as:
   - How reasonable was your estimate?
   - Which strategy was most efficient?
   - Can you think of another method that might have worked?
   - What might you do differently next time?

Comments

Act IV is an extension question or situation of the above problem. An Act IV can be implemented with students who demonstrate understanding of the concepts covered in acts II and III. The following questions and/or situations can be used as an Act IV:

- You have $20 to buy only items on sale this week at Publix. Use the link [http://weeklyad.publix.com/publix](http://weeklyad.publix.com/publix) to view the ad and determine what you would purchase if you were purchasing for you and a friend.

PART 2
Applying the Unit Rate Approach

In each problem, record the rate appropriate for the question asked, find the corresponding unit rate, write a short sentence interpreting the unit rate, and use this rate to find the solution to the problem.

1. Anne is painting her house light blue. To make the color she wants, she must add 3 cans of white paint to every 2 cans of blue paint. How many cans of white paint will she need to mix with 6 cans of blue?

   Rate needed (white/ blue) ____3 cans white / 2 cans blue____

   Unit Rate ____1.5 cans white / 1 can blue____

   Interpretation of unit rate ____Anne should mix 1.5 cans of white paint with each can of blue.____

   Solution: \((\text{unit rate}) \times (\text{number of items}) = \text{total}\)

   \((1.5)(6\ \text{blue}) = 9\ \text{white cans of paint}\)
2. Ryan is making a fruit drink. The directions say to mix 5 cups of water with 2 scoops of powdered fruit mix. How many cups of water should he use with 9 scoops of fruit mix?

Rate needed: \( \frac{5 \text{ cups water}}{2 \text{ scoops mix}} \)

Unit Rate: \( \frac{2.5 \text{ cups water}}{1 \text{ scoop mix}} \)

Interpretation of Unit Rate: Ryan should use 2.5 cups of water for each scoop of mix.

Solution: \((\text{unit rate}) \times (\text{number of scoops of mix}) = \text{number of cups of water}\)
\[(2.5)(9) = 22.5 \text{ c. of water}\]

3. Donna is running around a track. It takes her 10 minutes to run 6 laps. If she keeps running at the same speed, how long will it take her to run 5 laps?

Rate needed: \( \frac{10 \text{ minutes}}{6 \text{ laps}} \)

Unit rate: \( \frac{5/3 \text{ minutes}}{1 \text{ lap}} \)

Interpretation of unit rate: Donna runs 1 lap in \( \frac{5}{3} \) minutes

Solution: \((\text{unit rate}) \times (\text{number of laps}) = \text{time}\)
\[(\frac{5}{3} \text{ min./lap}) \times (5 \text{ laps}) = 8 \frac{1}{3} \text{ minutes}\]

4. Mark’s model train can go 12 laps around its track in 4 minutes. If it runs at the same speed, how many laps can the train go in 9 minutes?

Rate needed: \( \frac{12 \text{ laps}}{4 \text{ minutes}} \)

Unit Rate: \( \frac{3 \text{ laps per minute}}{} \)

Interpretation of Unit Rate: Mark’s train travels 3 laps each minute

Solution: \((\text{unit rate}) \times (\text{number of minutes}) = \text{number of laps}\)
\[(3 \text{ laps / minute}) \times (9 \text{ minutes}) = 27 \text{ laps}\]
**SE Analyzing and Applying Unit Rate**

Name: ________________________

Adapted from Andrew Stadel

### PART 1

#### ACT 1

What questions come to your mind?

<table>
<thead>
<tr>
<th>Main Question:</th>
<th>What is your 1st estimate and why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>On an empty number line, record an estimate that is too low and an estimate that is too high.</td>
<td></td>
</tr>
</tbody>
</table>

#### ACT 2

What information would you like to know or need to solve the MAIN question?

| Record the given information (measurements, materials, etc…) |

If possible, give a better estimation with this information: ___________________________
Use this area for your work, tables, calculations, sketches, and final solution.

### ACT 3

<table>
<thead>
<tr>
<th>What was the result?</th>
</tr>
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</table>
Applying the Unit Rate Approach

**PART 2**

In each problem, record the rate appropriate for the question asked, find the corresponding unit rate, write a short sentence interpreting the unit rate, and use this rate to find the solution to the problem.

1. Anne is painting her house light blue. To make the color she wants, she must add 3 cans of white paint to every 2 cans of blue paint. How many cans of white paint will she need to mix with 6 cans of blue?

   Rate needed (white/ blue) _______________________

   Unit Rate ___________________

   Interpretation of unit rate ___________________________________________________

   Solution:

2. Ryan is making a fruit drink. The directions say to mix 5 cups of water with 2 scoops of powdered fruit mix. How many cups of water should he use with 9 scoops of fruit mix?

   Rate needed __________________________________________

   Unit Rate ___________________________________________

   Interpretation of Unit Rate ______________________________________________

   Solution:

3. Donna is running around a track. It takes her 10 minutes to run 6 laps. If she keeps running at the same speed, how long will it take her to run 5 laps?

   Rate needed ____________________________________________

   Unit rate ______________________________________________

   Interpretation of unit rate __________________________________________________

   Solution:

4. Mark’s model train can go 12 laps around its track in 4 minutes. If it runs at the same speed, how many laps can the train go in 9 minutes?
Rate needed __________________________________________

Unit Rate __________________________________________

Interpretation of Unit Rate __________________________________________

Solution: