

## *Mathematics: The Language of STEM*

Pay What?!  
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### CONTENT AND TASK DECISIONS

**Grade Level(s):** 6<sup>th</sup>

**Description of the Task:** Students will find the unit rate of price per ounce for various amounts/containers of bottled water.

**Indiana Mathematics Content Standards:** 6.NS.10: Use reasoning involving rates and ratios to model real-world and other mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).

**Indiana Mathematics Process Standards:**

- PS.1: Make sense of problems and persevere in solving them.
- PS.3: Construct viable arguments and critique the reasoning of others.

**Mathematics Content Goals:** Students will explore ways to find the unit rate (price per ounce) for bottles of water and a can of pop from the same vending machine. As a next step, students will find the price per ounce for various packages of water (1 bottle from the vending machine, 12 pack of water, 24 pack of water, 32 pack of water).

**Language Objectives:** Working with other students in either partner groups or groups of 3, students will determine the cost per ounce of different amounts of water (in different sized packages or one at a time from a vending machine). Students will compare the unit rates to determine which is the best deal.

**Materials:**

- Image of vending machine
- Images of different packages of water (12 pack, 24 pack, 32 pack, etc) with costs for packages included.
- Paper to record their work

### THE LESSON

**Before:**

**Note - This task is meant to be inquiry based where students will be trying to discover how to find cost per ounce (unit rate). As students are working, productive struggle is expected, however, they may need some guidance/ideas/examples to help them continue. During all calculations and work throughout this lesson encourage students to round to the nearest cent.**

- **Activate prior knowledge** Discuss vending machines and how you are paying for one item at a time. In our staff lounge, a 12 ounce can of pop is 75¢, but a 16 ounce bottle of water is \$1.00. I usually buy a pop because it is less money to pay, but am I really paying less?
- **Be sure the problem is understood** Students will be exploring ways to find out which is the better deal by finding out how much the bottle of water and can of pop cost per ounce.

- **Establish clear expectations** Explain that students will be working together with a partner to find how much I am paying per ounce for the can of pop and for the bottle of water. I tend to buy a can of pop because it is only 75¢ instead of the bottle of water that is \$1.00. Which is really the better deal?

**During:** This phase of the lesson should be designed for students to explore the focus task. Describe specifically what the students will be doing in this phase. Include a description of how the students will record their mathematical thinking in writing or drawing throughout the investigation. Describe how you will accomplish each of the following in this phase of the lesson:

**Part 1** – Students will find the cost per ounce for bottle of water and can of pop and determine which costs less per ounce.

- **Predict** - Students will make a prediction about which do they think cost less per ounce, the bottle of water or can of pop from the vending machine?
- **Let go** – Students will work in partner groups to discuss ways to find out which costs less per ounce. Once students have strategies, they will calculate the cost per ounce.
- **Listen actively** – Teacher will monitor students while working, checking in with groups, stating what they notice students doing.
- **Provide appropriate support** (Questions to ask students to facilitate learning)
  - What information do you have? What do you need to find out?
  - What strategy are you using to find how much each costs per ounce?
  - Why did you choose that strategy?
  - What struggles are you having while completing this task?
  - Does your answer seem reasonable? Why or why not?
- **Class Discussion after calculations are complete**
  - Discuss with whole group how they found the cost per ounce (unit rate)
  - What strategies were used? Have students share how they find the cost per ounce for both the can of pop and bottle of water.
    - What similarities do we see in strategies?
    - What differences do we see?
    - Do the differences affect the outcome?
  - Once discussion is over, it is okay if the whole class does not have the same exact procedures for finding unit rate. They should have ideas of steps that make sense and use those for the next part.

**Part 2** – Students will decide which package of water (by bottle, 6 pack, 24 pack) cost less per ounce and which is the better deal. Data needs to be presented in an organized manner (students can decide which way is most effective for them).

- **Predict** - Students will make a prediction about which do they think cost less per ounce.
- **Let go** – Students will work in partner groups to determine which costs less per ounce, using the strategies that were shared in previous discussion.
- **Listen actively** – Teacher will monitor students while working, checking in with groups.
- **Provide appropriate support** (Questions to ask students to facilitate learning)
  - What information do you have? What do you need to find out?
  - What strategy are you using to find how much each costs per ounce?
  - Why did you choose that strategy?
  - How will you organize your calculations and results?
  - What struggles are you having while completing this task?
  - Does your answer seem reasonable? Why or why not?
- **Provide worthwhile extensions.**

- After finding the cost per ounce, how should the price be adjusted so that the single bottle, 12 pack, 24 pack and 32 pack of water to make them all cost the same per ounce (have the same unit rate)? What should the new price for each of those packages cost based on the lowest unit rate?
- Find the unit rate cost per ounce for a 12 pack of pop and a 24 case of pop.

**After:** In this portion of the lesson, students should work as a community of learners, discussing, justifying, and challenging various solutions to the problem all have just worked on. Here is where much of the learning will occur. It is critical to plan sufficient time for a discussion and make sure the During portion does not go on for too long. Describe how you will accomplish each of the following:

- **Promote a mathematical community of learners** (Describe how the students will present their solution strategies. How will you organize the discussion to accomplish the mathematical goals? Which solutions will be shared and in what order?)
  - Students will share out their strategies, struggles, and solutions to finding the unit rate of each.
  - Discuss differences in strategies for calculating as well as organizing the data.
- **Listen actively without evaluation** (How will you respond to students' presentations of their solutions?)
  - Teacher will ask clarifying questions to help the other students understand what the students have done to solve the problem.
- **Make connections** (What questions will you ask to help students make sense of the mathematics, make connections, see patterns, and make generalizations?)
  - What works best to find the cost per ounce? Why?
  - Why do you think that they aren't all priced the same currently based on price per ounce?
- **Summarize main ideas** (How will you formalize the main ideas of the lesson? How will you reinforce appropriate terminology, definitions, or symbols?)
  - Teacher and students will work together to establish a working definition, in their own words, for finding the unit rate. (The definition should be something to the effect of rate being a comparison of two measurements or amounts that have different units. Unit rate is a rate in which the second rate is 1 unit.)
  - If needed, work together as a class to establish an efficient algorithm for finding unit rate based on all work that has been completed and shared.

## ASSESSMENT

**Observe:** Describe how you will observe students to gather evidence about what they are learning, and describe the specific evidence of mathematical understanding that you will look for in your observations. Teacher will walk around, observing students work.

**Ask:** List the specific questions you will ask students to assess their learning. (See worksheet below for students to complete after lesson.)



\$2.79 (32 bottles, 16.9 ounces each)



\$2.49 (24 bottles, 16.9 ounces each)



\$1.99 (12 bottles, 16.9 ounces each)

Name \_\_\_\_\_

1.) Using either your own ideas or the definition we composed together in class, describe how to find unit rate?

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2.) At the grocery store, you can buy a bag of Tide pods 20 count for \$4.99 or a 42 count for \$11.99. Which is the better deal? How do you know? Show your work.



20 count - \$4.99



42 count - \$11.99

3.) How much do the BelVita's breakfast biscuits cost for each individual package? Which is the better buy?



12 pack for \$7.49



5 pack for \$2.99

4.) How much should each of the BelVita boxes cost using the lowest unit rate you found from #3? Show your work.

5 Pack - \_\_\_\_\_

12 Pack - \_\_\_\_\_