

# What's Your Rate?

Students learn to write and solve proportions by gathering data and calculating unit rates.

## NGSSS

MA.6.A.2.1 – Multiply and divide to solve ratio and rate problems.

MA.6.A.2.2 – Interpret and compare ratios and rates.

## Learning Objectives

Students will:

- collect data on unit rates by timing themselves doing a variety of activities
- use unit rates to set up proportions
- create and solve proportions

## Instructional Plan

To assess students' prior knowledge, ask students to think about the ways in which they have used ratios, and the type of information they compared with ratios. This allows you to determine their understanding of ratios.

Distribute the [What's Your Rate?](#) activity sheet to each student.

To begin the lesson, arrange students in pairs. Tell them to choose one of the following activities to do for one minute:

- Say the alphabet repeatedly
- Hop on one foot
- Do jumping jacks

Have one student perform the selected activity while her partner counts and records the number of times the activity was completed in one minute. Students can use tally marks or another efficient way of recording the data.

Have the partners switch roles and repeat the process. On the board, record the data that each pair has collected. Use only whole numbers. Disregard any half letters, hops, or jumping jacks.

Ask students: Can you use your data to predict how many times you can complete the activity in one hour? Point out that this is the unit rate (per unit). The students should begin to see that with this data, they can estimate how many times the activity could be done in other time spans, such as one hour.

Next, discuss the concept of proportion. Define proportion as two equal ratios. Explain to students that when they write proportions, they should use a variable in place of the unknown data in the equation.

Example:  $\frac{30 \text{ hops}}{1 \text{ min.}} = \frac{X \text{ hops}}{60 \text{ min.}}$

Use examples from the data students gathered to set up proportions and estimate results for different times. The students should use the data to practice solving proportions (they can use the number of times they completed the activity as their unknown).

Check students' work to make sure they are setting up proportions consistently, placing the time in the denominators of both sides of the proportion.

### **Questions for Students**

Why are rates within the experiments called unit rates?

[They are compared to one unit.]

Name a situation when computing a unit rate might help you.

[At the grocery store, car mileage, etc.]

What does x represent in our proportions?

[The variable, the unknown.]

Why must you be consistent when setting up a proportion?

[For example, putting the time in the denominator position on both sides versus putting the time in the numerator on one side and the denominator on the other.]

Are there any factors that might affect how many jumping jacks or hops you could do in one hour versus one minute?

[Fatigue.]

What other proportional relationships can be used to solve real-life problems if we know a unit rate?

[Cost of items at the store, distances on maps.]

### **Assessment Options**

1. At this stage of the unit, students should be able to do the following:

- Use unit rates
  - See the relevance of using unit rates to solve proportions
  - Recognize proportions as equations, and whether they can solve them
  - Understand the relationship between ratios and proportions
  - Set up proportions using data or by reading scenarios in a word-problem format
2. Have the students identify real-life situations in which they can apply the concepts of this lesson. One way of doing this would be to ask students to write a journal entry in which they give examples of real-life situations and explain how proportions can be used to solve problems in that context. Or, students may create problems and exchange them with a classmate, then solve each other's problems.

### **Teacher Reflection**

1. Do the students demonstrate an understanding of how unit rates are used to make predictions?
2. What problems are the students having setting up their proportions? Are they getting their units backwards?
3. Can students solve proportions? How do they use proportions in their daily lives?

### **NCTM Standards and Expectations**

#### ***Measurement 6-8***

1. Understand relationships among units and convert from one unit to another within the same system.
2. Solve problems involving scale factors, using ratio and proportion.

This lesson was developed by Katie Carbone.