

# Describing Functions

## Lesson Overview

### Course/Instructional Information:

- Algebra 1
- Unit – What is a Function?
- Lesson 1 – Introduction to Functions

### Prerequisite Skills:

- Understand a function as a relationship of inputs and outputs.
- Translate expressions between verbal and algebraic forms.

### Learning Goals:

- Describe a function rule using words.
- Compare the verbal description of a function to its algebraic form.
- Write function rules in algebraic form.

### Common Core Standards:

CCSS.Math.Content.8.F.A.2 Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.

CCSS.Math.Content.HSF.BF.A.1 Write a function that describes a relationship between two quantities.

CCSS.Math.Content.HSF.BF.A.1.a Determine an explicit expression, a recursive process, or steps for calculation from a context.

### Mathematical Practices:

4. Model with mathematics.
5. Use appropriate tools strategically.
7. Look for and make use of structure.

### Materials:

- PhET *Function Builder* simulation: [https://phet.colorado.edu/sims/html/function-builder/latest/function-builder\\_en.html](https://phet.colorado.edu/sims/html/function-builder/latest/function-builder_en.html)
- Whiteboard and dry-erase markers
- Computers/tablets for each student.
- Describing Functions Activity Sheet (1 per student)

### Estimated Time:

Approximately 55 minutes

<b>Describing Functions</b>	
<b>Warm Up</b>	<b>5 minutes</b>
<p>Activate prior knowledge by asking students to tell you everything that they know about functions. Record student responses on the whiteboard.</p> <p>(Leave these responses up while students explore the sim and refer to them when asking students questions about the sim.)</p>	
<b>Simulation Introduction</b>	<b>7-10 minutes</b>
Teacher will...	Students will...
<ul style="list-style-type: none"> <li>• Distribute Describing Functions Activity sheet.</li> <li>• Direct students to Function Builder simulation on the PhET website.</li> <li>• Ask students to explore the simulation for about 5 minutes and encourage students to explore each screen of the simulation and record their observations in the indicated box.</li> <li>• Circulate the room and ask students questions.               <ol style="list-style-type: none"> <li>1. How does what you see in the sim remind you of something from our discussion at the beginning of class?</li> <li>2. How do you think that function rule changes the inputs?</li> <li>3. What do you notice about this simulation?</li> <li>4. What do you wonder about this simulation?</li> </ol> </li> <li>• Ask students to share what they noticed while exploring the simulation and discuss any of the questions from above.</li> </ul>	<ul style="list-style-type: none"> <li>• Explore the simulation and build whatever functions they choose.</li> <li>• Respond to teacher's questions</li> <li>• Record their observations on the activity sheet.</li> </ul>
<b>Guided Exploration</b>	<b>20 - 25 minutes</b>
Teacher will...	Students will...
<ul style="list-style-type: none"> <li>• Encourage students to complete the remainder of the activity sheet. Give students some time to just work before questioning/assisting.</li> <li>• Circulate the room to be available for questions and ask students questions.               <ol style="list-style-type: none"> <li>1. How would you describe that function?</li> <li>2. How is your ___ function different than ___?</li> <li>3. What do you notice about the equation for the function and the operations in your function rule?</li> <li>4. Can you make a function that always has the same output?</li> <li>5. Can you make a function that has two different outputs for the same input?</li> <li>6. For your function, what would the output be if the input was 20?</li> <li>7. What happens if you don't add a rule to the function?</li> <li>8. How would the outputs change if you switched the order of the operations in your function?</li> <li>9. Is there only one way to write an equation that would match this function?</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>• Complete the activity sheet.</li> <li>• Respond to teacher questions</li> <li>• Discuss ideas with a partner</li> <li>• Ask questions or ask for help as needed</li> </ul>

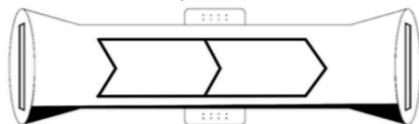
<b>Discussion and Summary</b>	<b>10 minutes</b>
Teacher will...	Students will...
<ul style="list-style-type: none"> <li>Write headings on the board <b>Function Rule</b> and <b>Equation</b> and ask students to write their functions and equations from #2.</li> <li>Facilitate a class discussion to compare the written form of a function to its algebraic form.</li> </ul> Possible questions... <ol style="list-style-type: none"> <li>How do you know that your equation is accurate?</li> <li>Why do you think there are parenthesis here?</li> <li>Do you think there are other ways that this equation could be written?</li> <li>Why might the equation be useful?</li> <li>What do you notice about the equations and their verbal descriptions?</li> </ol>	<ul style="list-style-type: none"> <li>Write answers on the board.</li> <li>Answer teacher's questions.</li> </ul>
<b>Informal Assessment</b>	<b>5 minutes</b>
Teacher will...	Students will...
<ul style="list-style-type: none"> <li>Distribute exit ticket</li> </ul>	<ul style="list-style-type: none"> <li>Complete exit ticket.</li> </ul>

**Describing Functions - Exit Ticket**

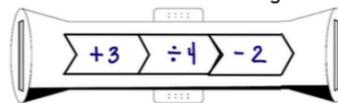
Name: \_\_\_\_\_

1. Fill in the function rule to match the verbal description.

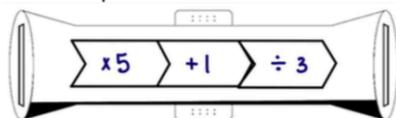
"The function adds 3 to the inputs and then multiplies by 4."



2. Describe how the function changes the inputs.



3. Write an equation to model the function rule.



4. Fill in the function rule to match the equation.

$$y = 3\left(\frac{x}{4} - 1\right)$$

