

THE STRENGTH OF NOTATION

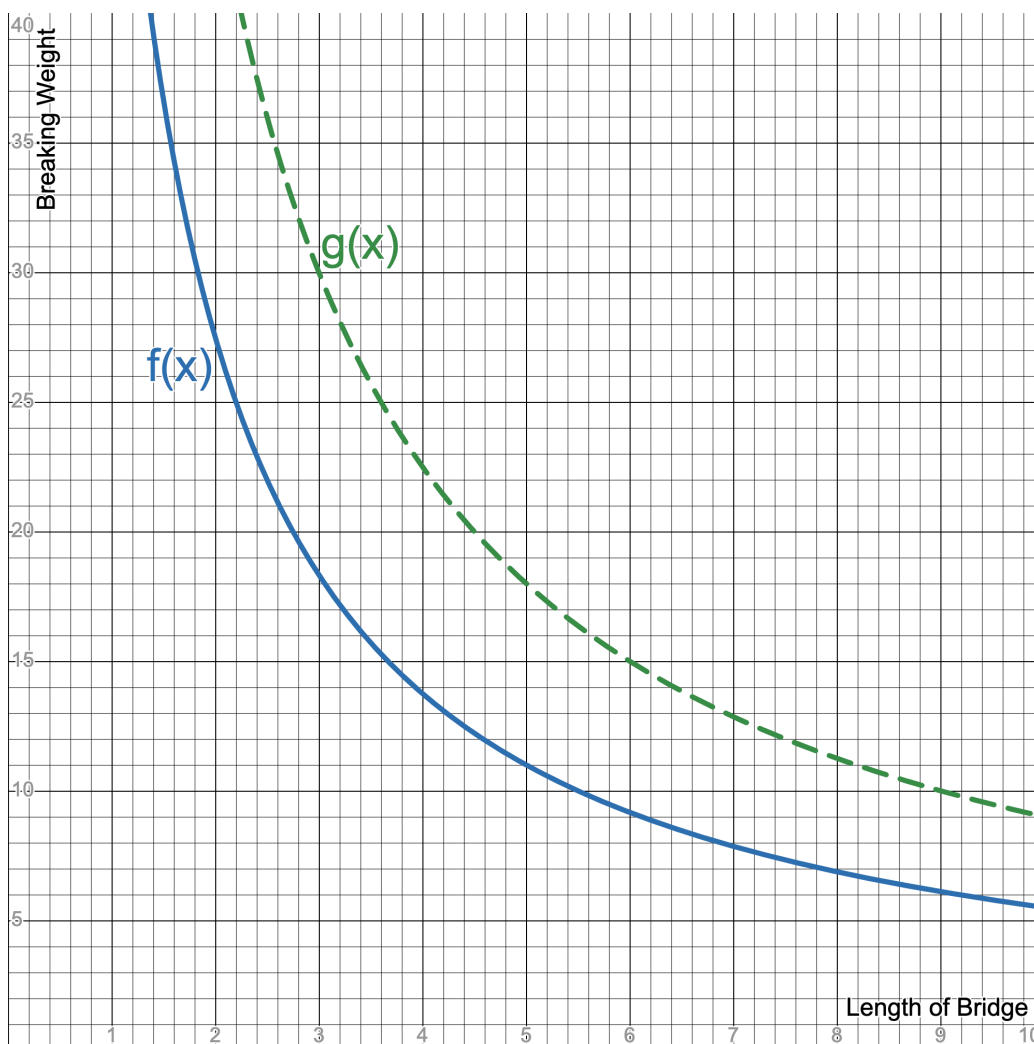
In *Layers, Length, and Strength*, you built a model for the strength of a bridge based on either the length of the bridge or the number of layers in the bridge. These models can help us to see and describe the relationship between these variables. You've practiced describing these relationships in words, and today you will learn how to describe them using notation.

1. The page that is provided has several different representations of functions for bridge strength. Use those representations to fill in the blank on each of the statements below.
 - a. What is the breaking weight of a 1-layer bridge that is 8 inches long?
 - b. $g(5) = ?$
 - c. If L is 2, then $h(L) = ?$
 - d. If the breaking weight of a 2-layer bridge is 10 pennies, how long is the bridge?
 - e. $f(?) = 11$
 - f. What is the length of a 3-layer bridge that can hold 22 pennies?
 - g. If the input to function f is 2, what is the output?
 - h. A 2-layer bridge that is 3 inches long will break with how many pennies?
 - i. $h(4) = ?$
 - j. $g(?) = 18$
2. Go back through each of the statements in Question 1. If the statement was in words, translate it to function notation. If the statement was in function notation, translate it into words (relating to bridge length, layers, and strength).



The graph below shows two functions.

The function $f(x)$ gives the breaking weight of a **1-layer bridge** as a function of the length. The function $g(x)$ gives the breaking weight of a **2-layer bridge** as a function of the length.



The function $h(L)$ gives the breaking weight of a **3-layer bridge** as a function of the length

Length of
3-Layer Bridge
(inches)

$$h(L) = \frac{110}{L}$$

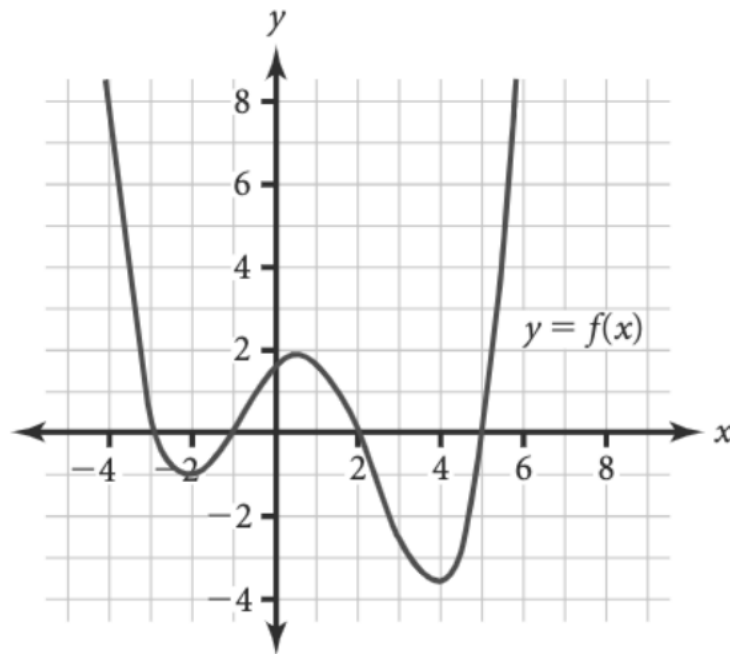
Breaking Weight
(number of pennies)

ON YOUR OWN

The Strength of Notation

Can I describe functional relationships using words and symbols?
Can I explain what a function is (and isn't)?

1. The graph shows the variable y as a function of x , but it doesn't give the formula for this function. Answer the questions based on the graph. State any assumptions you make about any portion of the graph that isn't visible. Give approximate answers if necessary.



- a. What is the output when $x = 4$?
- b. What is $f(0)$?
- c. What number would you get for y when $x = -1$?
- d. What is $f(-4)$?
- e. Find all the values of x for which $y = 0$.
- f. What could the x value have been if $y = 7$?
- g. $f(?) = 1$
- h. If the output is -2 , what could the input(s) have been?
- i. $f(?) = -5$
- j. Find the values of x that will give a positive value for y . Describe all possible answers.

2. The relationship between the amount of time a car is parked, in hours, and the cost of parking, in dollars, can be described with a function.
- Identify the independent variable and the dependent variable in this function.
 - Describe the function with a sentence of the form "_____ is a function of ____."
 - Suppose it costs \$3 per hour to park, with a maximum cost of \$12. Create a table and graph of the relationship for the first 6 hours.



3. The distance a person walks, d , in miles, is a function of time, t , in minutes, since the walk begins. Select all true statements about the input variable of this function.
- Distance is the input.
 - Time of day is the input.
 - Time since the person starts walking is the input.
 - As the input increases, the output decreases
 - The input is measured in hours.
 - For each input, there are sometimes two outputs.



4. Which of the expressions below are **equivalent** to $4x^2 - 25$? Explain how you know.
- $(2x + 5)^2$
 - $(2x - 5)^2$
 - $(2x - 5)(2x + 5)$
 - $4x^2 - 10x + 25$