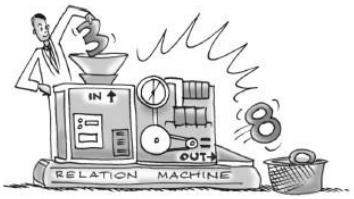
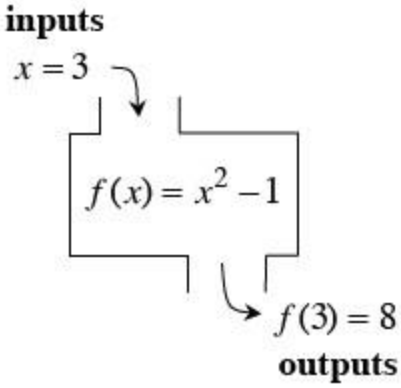
1.2.3 What is the function?



Function Machines

1-53. FUNCTION MACHINES

A function works like a machine, as shown in the diagram below. A function is given a name that can be a letter, such as *f* or *g*. The notation *f*(*x*) represents the output when *x* is processed by the machine. (Note: *f*(*x*) is read, "*f* of *x*.") When *x* is put into the machine, *f*(*x*), the value of a function for a specific *x*-value, comes out. In this notation, *f*(*x*) replaces *y*.

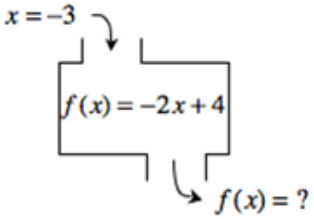


Find the output for $f(x) = x^2 - 1$ when the input is $x = 4$; that is, find $f(4)$. Now find $f(-1)$ and $f(10)$.

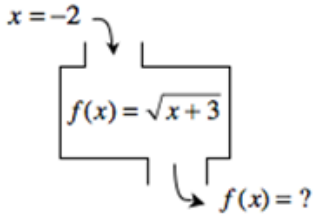
$f(4) =$ $f(-1) =$ $f(10) =$

1-55. Find the corresponding outputs or inputs for the following functions. If there is no possible output for the given input, explain why not.

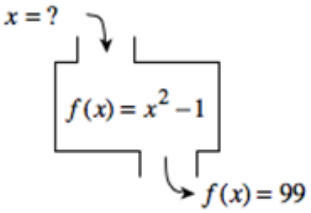
a.



b.



c.

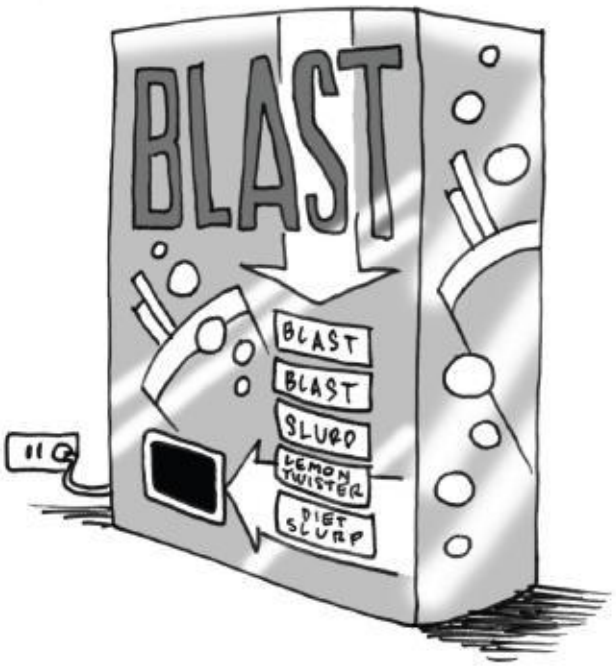


Can I predict the output?

1-62. THE COLA MACHINE

The cola machine at your school offers several types of soda. There are two buttons for your favorite drink, *Blast*, while the other drinks (*Slurp, Lemon Twister,* and *Diet Slurp)* each have one button.

a. Describe the input and output of this soda machine.



b. While buying a soda, Ms. Whitney pushed the button for *Lemon Twister* and got a can of *Lemon Twister*. Later she went back to the same machine, but this time pushing the*Lemon Twister* button got her a can of *Blast.* Is the machine functioning consistently? Why or why not?

c. When Brandi pushed the top button for *Blast* she received a can of *Blast.* Her friend, Miguel, decided to be different and pushed the second button for *Blast.* He, too, received a can of *Blast.* Is the machine functioning consistently? Why or why not?

d. When Lou pushed a button for *Slurp,* he received a can of *Lemon Twister*! Later, Tayeisha also pushed the *Slurp* button and received a can of *Lemon Twister*. Still later, Tayeisha noticed that everyone else who pushed the *Slurp* button received a *Lemon Twister*. Is the machine functioning consistently? Explain why or why not.

1-63. FUNCTIONS

In a relationship like the soda machine, we want the outcome to be consistent and predictable. When it is, we say that the machine is functioning properly.

a. Examine each of the tables and graphs below that show different inputs and their outputs. Decide if the graph or table could be describing a soda machine that is "functioning properly." Explain your reasoning.

i.

Button Number	1	1	2	4	2	3
Type of Candy	Stix	Stix	M&Ns	M&Ns	Duds	Duds

ii.

x	7	−2	0	4	9	−3	6
$f(x)$	6	−3	4	2	10	−3	0

iii.

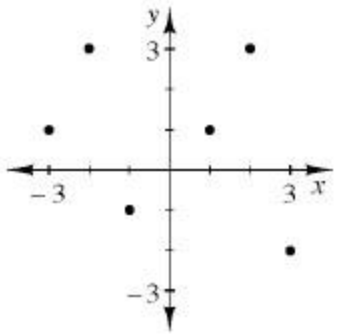
x	3	−1	2	0	1	2	9
y	4	−5	9	7	4	−8	2

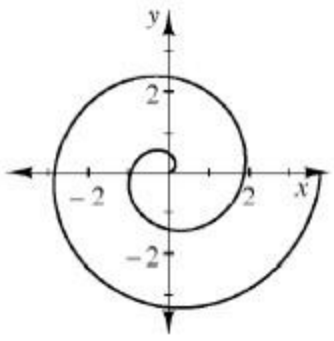
b. A relationship between inputs and outputs is called a **function** if the inputs and outputs behave like a soda machine that is functioning properly. Discuss with your team what it means for a relationship between inputs and outputs to be a **function**.

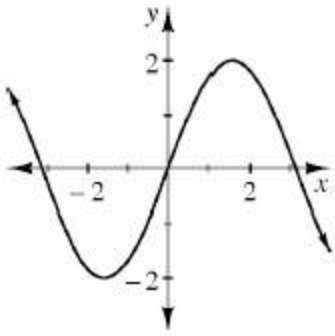
c. Examine each of the tables and graphs below. Compare the inputs and outputs and decide if the graph or table could be a **function**. Explain your reasoning.

i. ii. iii.

i



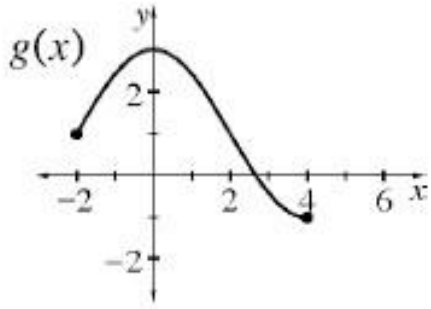




What can go in? What can come out?

Domain and Range

1-73. Now examine $g(x)$ graphed at right.



a. Is $g(x)$ a function? How can you tell?

b. Which x-values have points on the graph? That is, what is the domain of $g(x)$?

c. What are the possible outputs for $g(x)$? This is called the **range** of the function.

d. Ricky thinks the range of $g(x)$ is: −1, 0, 1, 2, and 3. Is he correct? Why or why not?

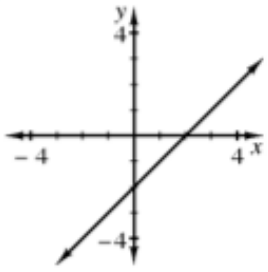
1-74. FINDING DOMAIN AND RANGE

The domain and range are good descriptors of a function because they help you know what numbers can go into and come out of a function.

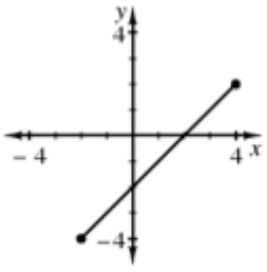
Work with your team to describe in words the domain and range of each relationship below. Then state whether or not the relationship is also a function.

a.

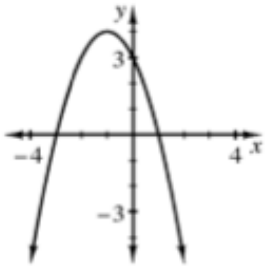
b.



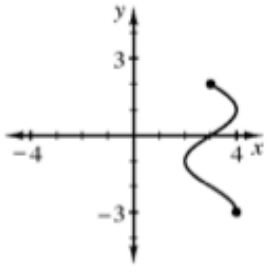
c.



d.



e.



f.