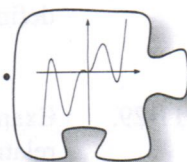


11.1.3 Can I predict the output?

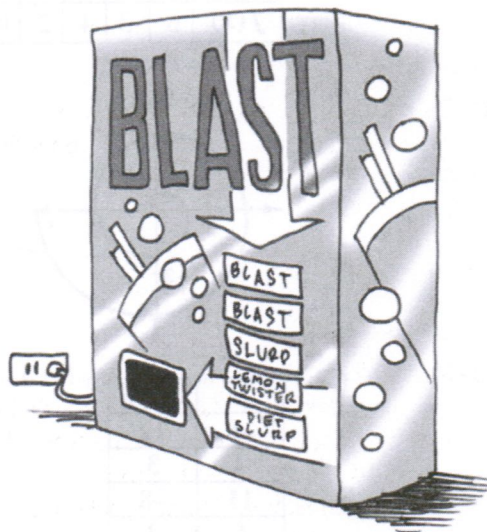
Functions



You have studied relations and have learned that each relation defines a relationship between the input and output values. But what happens when your relation gives you unpredictable results? That is, what happens when you cannot predict the output for a given input? Today you will study this situation and will be introduced to a special type of relation called a *function*.

11-27. 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.



- Explain how the cola machine is a relation.
- Describe the input and output of this soda machine.
- 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?
- 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?
- When Loutfi pushed a button for *Slurp*, he received a can of *Lemon Twister*! Later, Tayaisha also pushed the *Slurp* button and received a can of *Lemon Twister*. Still later, Tayaisha noticed that everyone else who pushed the *Slurp* button received a *Lemon Twister*. Is the machine functioning consistently? Explain why or why not.
- When a relation is functioning consistently and predictably, we call that relation a **function**. What is the main difference between a relation that is a function and a relation that is not a function?

11-28. Using your own words, write a definition of a function. Be prepared to share your definition with the class.

11-29. Examine each of the relations below. Compare the inputs and outputs of each relation and decide if the relation is a function. Explain your reasoning. Use your definition of a function (from problem 11-28) to help you **justify** your conclusion.

a.

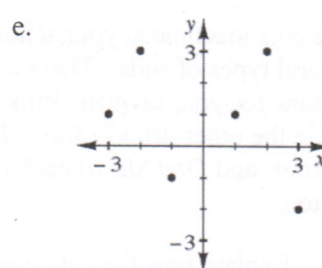
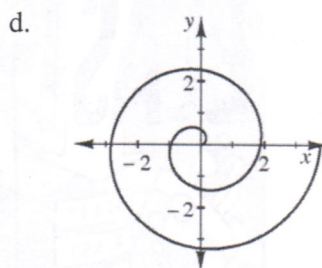
Button Number	1	1	2	4	2	3
Type of Candy	Stix	Stix	M&Ns	M&Ns	Duds	Duds

b.

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

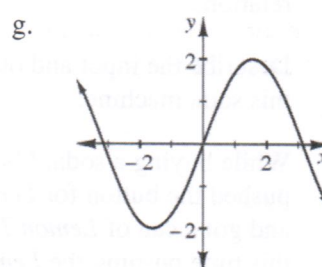
c.

x	3	-1	2	0	1	2	9
$g(x)$	4	-5	9	7	4	-8	2

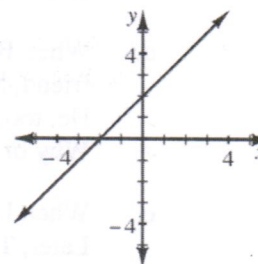


f.

x	$h(x)$
-8	11
4	3
11	-8
6	3
-8	11



11-30. Jade noticed that the line graphed at right is a function. “Hey – I think *all* lines are functions!” she exclaimed. Is she correct? Support your claim with a diagram.



11-31. In your Learning Log, describe what it means for a relationship to be a **function**. Think of another type of machine that you use on a regular basis and describe how it also operates as a function. Title this entry “Functions” and include today’s date.





11-32. If $g(x) = \sqrt{x-7}$, find $g(8)$, $g(32)$, and $g(80)$.

11-33. Solve the system of equations below using any method. Be sure to check your solution.

$$\begin{aligned}5u + 6v &= 2 \\ u - 2v &= 10\end{aligned}$$

11-34. Solve each equation below. Check each solution.

a. $6 - (3 + x) = 10$

b. $100(x + 3) = 200$

c. $\frac{1}{3}x + 4 = x - 2$

d. $\frac{4}{5} = \frac{x+2}{45}$

11-35. Solve for x . Use any method. Check your solutions by testing them in the original equation.

a. $|x - 3| = 5$

b. $5|x| = 35$

c. $|x + 1| = 2$

d. $|x + 3| - 6 = -4$

11-36. Rewrite each of the expressions below with no parentheses and no fractions. Negative exponents are acceptable in your answer.

a. $(5a^{-2}b^3)^8 \cdot (5ab^{-2})^{-6}$

b. $\frac{15x^{-5}y^2}{(3x^2)^2 \cdot y^{-3}}$

11-37. **Multiple Choice:** Which line below is parallel to $y = -\frac{2}{3}x + 5$?

a. $2x - 3y = 6$

b. $2x + 3y = 6$

c. $3x - 2y = 6$

d. $3x + 2y = 6$