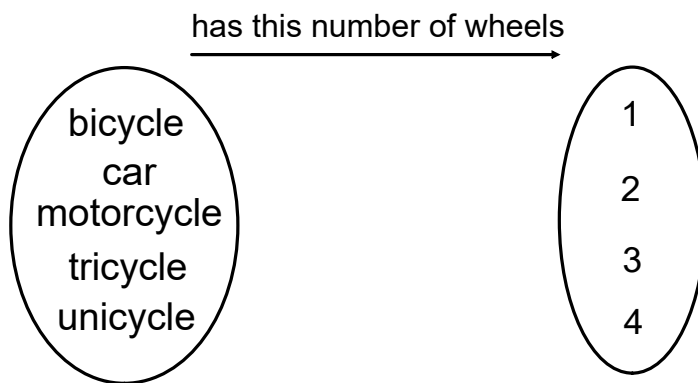


## Section 5.2 Properties of Functions

### Example 1

a) Complete the arrow diagram for the relation.



The first set of elements are:

- the independent variable
- the  $x$  values
- is called the domain

The second set of elements are:

- the dependent variable
- the  $y$  values
- is called the range

### Function

A *special* type of relation in which each element in the domain is matched with exactly one element in the range.

b) Is the above relation a function? Explain.

## Example 2

a) Refer to the ordered pairs. Is this relation a function? Explain.

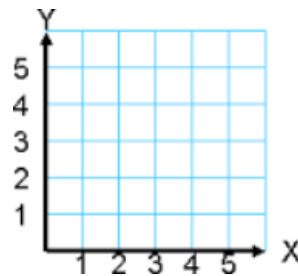
(1, 3)

(2, 4)

(3, 2)

(4, 2)

b) Plot the points on a graph.



## Example 3

a) Refer to the ordered pairs. Is this relation a function? Explain.

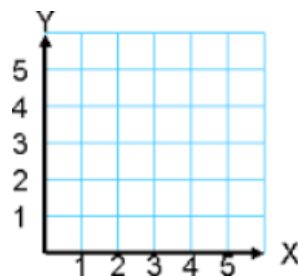
(1, 3)

(2, 4)

(3, 2)

(1, 5)

b) Plot the points on a graph.



## Example 4

Refer to the plotted points in Example 2 and Example 3.  
How can a function be determined from a graph?

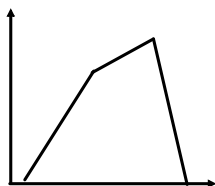
## How to determine if a relation is a function:

- Check the ordered pairs for repetition in the domain values.  
(x values repeat, it is NOT a function)
- From a graph do a *Vertical Line Test*.
  - ↳ if you can draw a vertical line anywhere on the graph and it only intersects the graph once, then it is a function.
  - ↳ A graph is a function if it passes the **vertical line test**.

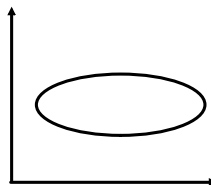
### Example 5

Using the vertical line test, determine whether or not the graphs below are functions. Justify your answer.

A.



B.



### NOTE:

**All functions are relations.**

- ↳ because a relation associates elements of one set with elements of another set.

**But not all relations are functions.**

- ↳ because a function is a special type of relation in which each element in the domain is matched with exactly one element in the range.

[Work Book Questions](#)

p.270 - 271 #4abc, 5ab, 9a, 10abc

[Extra Practice Questions](#)

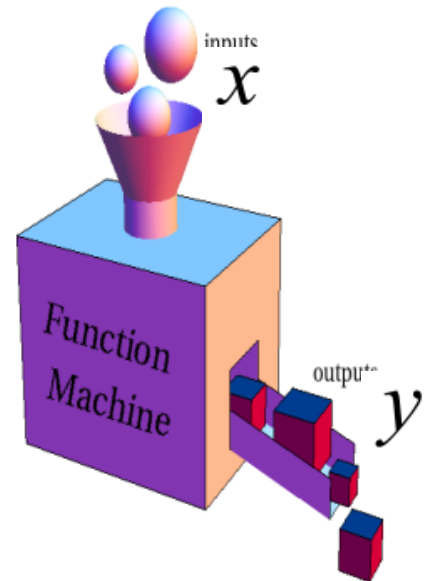
p.270 - 271 #5cd, 8ab, 9b, 12ab

## More work with Functions!

We can think of a function as an input/output machine.

Input - Independent variable - the domain

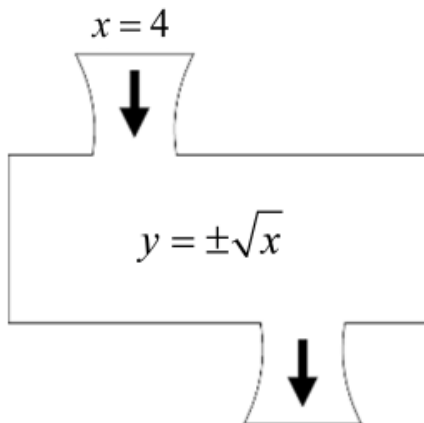
Output - Dependent variable - the range



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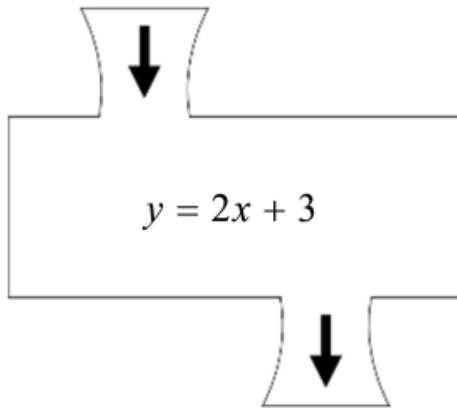
**Example 6** This machine is  $y = \pm\sqrt{x}$

a) Does this relation represent a function. Explain why or not?



**Example 7** This machine is the relation  $y = 2x + 3$ .

a) Is this relation a function? Explain.



---

**NOTE:**

Any equation that represents a function can be written in **function notation**.

---

b) Write the equation  $y = 2x + 3$  in function notation.

---

In function notation,  $f(x)$  is most commonly used. However, any letter can be used, for example,  $g(x)$ ,  $h(x)$ , or  $k(x)$ .

- $f(x)$  represents the dependent variable, or range. It is another way to represent the y-value.
- The letter inside the brackets is the independent variable, or domain.

---

**Note:**

Any equation written in function notation, can be rewritten as an equation with two variables.

---

**Example 8** Write each function as an equation.

a)  $C(n) = 300 + 25n$  Equation:

b)  $g(x) = -2x + 5$  Equation:

**Example 9**

a) What is the value of  $f(5)$  for the function  $f(x) = 3x - 2$  ?

**Note:**

$f(5)$  means what is the value of the function when  $x = 5$ . It **does not mean**  $f$  times 5 !

b) Write the answer as an ordered pair.

### Example 10

The equation  $V = -0.08d + 50$  represents the volume,  $V$  in liters, of gas remaining in a vehicle's tank after travelling,  $d$ , kilometers. The gas tank is not refilled until it is empty.

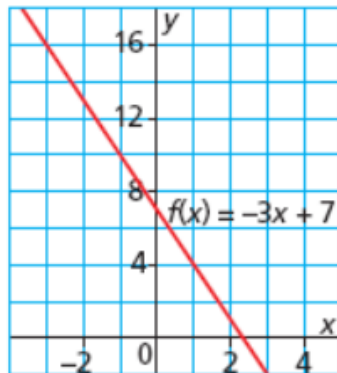
a) Describe the function. Write the function in function notation.

b) Determine the value of  $V(600)$ . What does this number represent?

c) Determine the value of  $d$  when  $V(d) = 26$ . What does this value represent?

## Example 11

Here is a graph of the function  $f(x) = -3x + 7$ .



- a) What is the range value when the domain value is -2?  
Verify your answer using the function.
- b) What is the domain value when the range value is 4?  
Verify your answer using the function.

### Work Book Questions

p. 271 #6ac, 7ac, 14ab, 15a (i) (ii), 16abc  
p. 294 - 296 #5, 6ab, 16ab, 17ab

### Extra Practice

p.271 #6bd, 7bd, 14cd,  
#15b (i) (ii), 17ab