

# Lin Rel & Func Ls 4: Functions

Understand what a function is

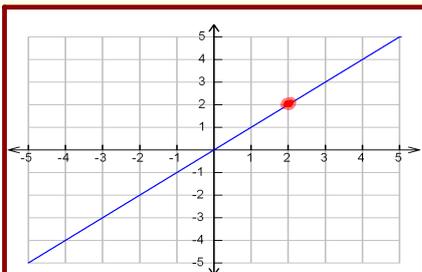
Identify functions from a graph, table of values or ordered pairs

Understand function notation

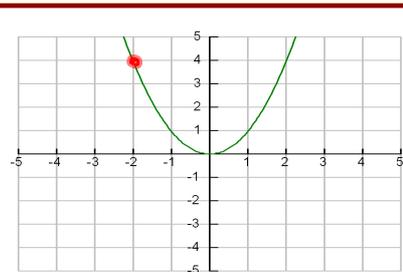
Solve problems involving function notation in order to determine output when given input or vice versa.

## Analyzing Output

Determine the output of each relation for the given inputs.



Input = 2 Output = 2



Input = -2 Output = 4

x	y
5	10
6	15
7	20

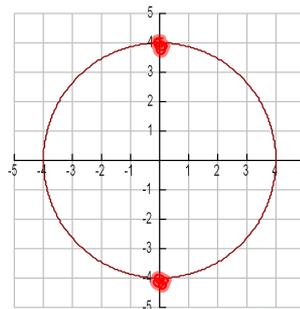
Input = 6 Output = 15

$\{(10, 10), (12, 10), (14, 12), (16, 12)\}$

Input = 12 Output = 10

$\{(10, 10), (12, 10), (12, 14), (12, 16)\}$

Input = 12 Output = 10, 14, 16



Input = 0 Output = ±4

x	y
6	10
6	15
7	20

Input = 6 Output = 10, 15

# Define Function & Relation

**Relation:** an association between two quantities.

**Function:** a relation where every input has exactly one output.

e.g. Function machine - show that the output is always the same for each input.

<http://www.littlefishsw.co.uk/card/functionmachine.html>



e.g. Gum Ball Machine vs. Vending Machine



Input = \$  
Output = Gumball  
Function!

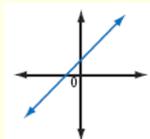
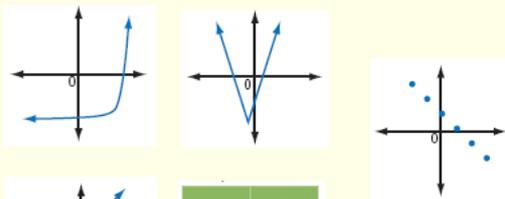


Input = \$  
Output → chips  
          → choc. Bar  
          → Candy  
Not a Function!

# Identify Functions

The following relations are sorted improperly. Please sort them properly using the function sorting activity handout.

## Function

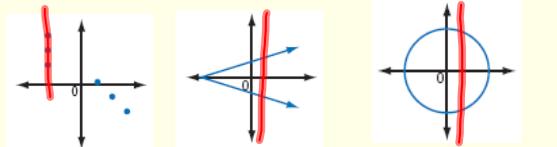


x	y
11	3
21	3
31	3

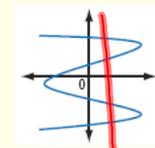
{(-2, -5), (0, 4), (2, 13), (4, 22)}

x	y
5	10
6	15
7	20

## Not a Function



x	y
3	11
3	21
3	31

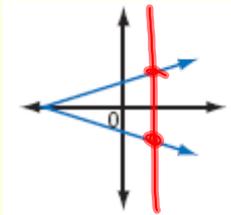


{(7, 5), (7, 8), (9, 11), (11, 14)}

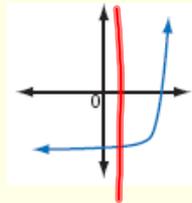
# Strategies for Identifying Functions

From a Graph - use the **Vertical Line Test**

If you can draw a vertical line at any place and it intersects the graph more than once ... it is not a function.



Not a Function



Function

From a Table of Values or Ordered Pairs - **analyze input values**

If any input values are repeated ... it is not a function.

x	y
5	10
6	15
7	20

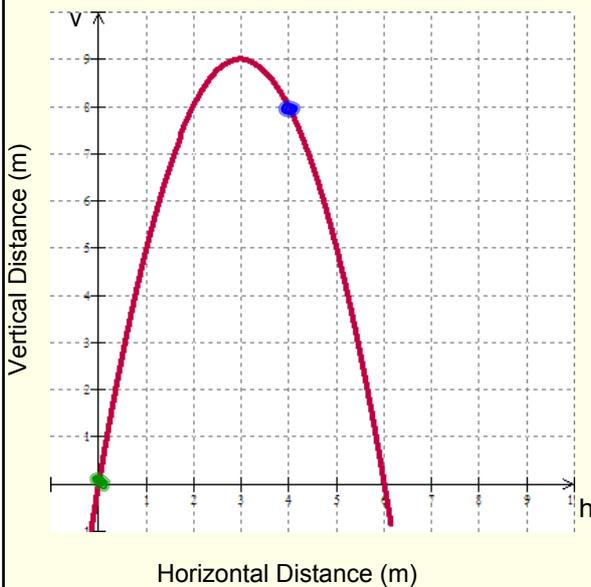
Function

$(7, 5), (7, 8), (9, 11), (11, 14)$

Not a Function

Practice: Text pg. 128: 1

## Function Notation



Albert hits the ball with his sand wedge onto the green. The independent variable is horizontal distance,  $h$ , and the dependent variable is vertical distance,  $v$ .

If  $v(0) = 0$  and  $v(4) = 8$ ,

then determine:

a)  $v(1) = \underline{\quad}$       b)  $v(6) = \underline{\quad}$

c)  $v(\underline{\quad}) = 5$       d)  $v(h) = 9$

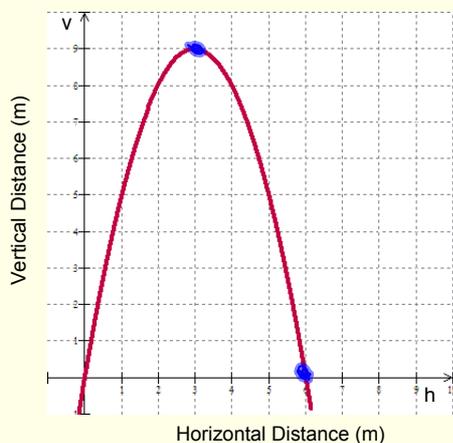
Practice: Function Notation Assignment

## Function Notation

$$v = -h^2 + 6h$$

$$\star v(h) = -h^2 + 6h$$

$$\text{"v of h"} = -h^2 + 6h$$



For each of the following, change between words and function notation.

The vertical distance is equal to 9m when horizontal distance is 3m .

$$v(3) = 9$$

The vertical distance is equal to 0m when horizontal distance is 6m .

$$v(6) = 0$$

$$v(1) = 5$$

$$\text{When } h = 1, v = 5$$

$$v(2) = 6$$

$$\text{When } h = 2, v = 6$$

## Function Notation (Board Work)

Skye has a cell phone plan for a monthly fee of \$20 plus 15¢ for each text message to or from a number not on a list of favourites. Skye's monthly bill can be modelled by the relation  $C = 0.15n + 20$ , where  $C$  is the total charge, in dollars, and  $n$  is the number of additional text messages. (MHR pg. 309)



- Write the relation in function notation.
- Make a table of values to show the cost if Skye sends up to eight additional text messages.
- Explain the meaning of  $C(10)$  and solve.
- Explain the meaning of  $C(12)$  and solve.
- If  $C(n) = \$22.25$ , then write the meaning of this statement and solve.

## Cell Phone Cost (Solution)



a) Write the relation in function notation.

$$C(n) = 0.15n + 20$$

b) Make a table of values to show the cost if Skye sends up to eight additional text messages.

$n$	$C(n)$
0	20
1	20.15
2	20.30
3	20.45
4	20.60
5	20.75
6	20.90
7	21.05
8	21.20

c) Explain the meaning of  $C(10)$  and solve.

$C(10)$  represents the cost if 10 additional text messages are sent.

$$\begin{aligned} C(10) &= 0.15(10) + 20 \\ &= \$21.50 \end{aligned}$$

d) Explain the meaning of  $C(12)$  and solve.

$C(12)$  is the cost for 12 additional texts

$$\begin{aligned} C(12) &= 0.15(12) + 20 \\ &= \$21.80 \end{aligned}$$

e) If  $C(n) = \$22.25$ , then write the meaning of this statement and solve.

If the cost is \$22.25 how many extra texts were sent.

$$22.25 = 0.15n + 20$$

$$2.25 = 0.15n$$

$$n = 15$$

Practice: Function Notation Assignment #1,2

(Verify graphical solutions using equations)

6.4 Functions pg. 128: 1 - 8