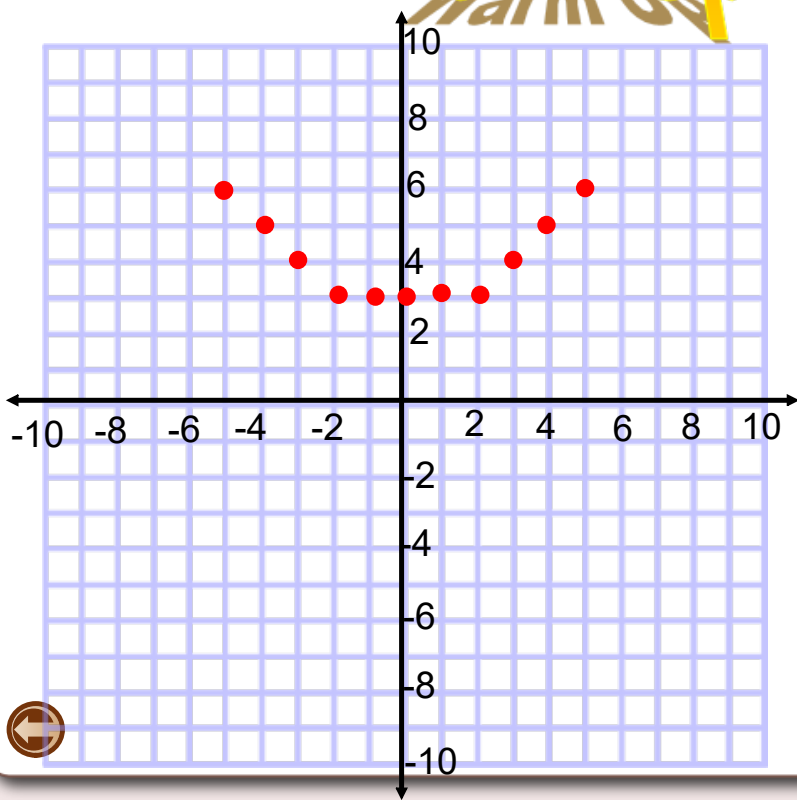
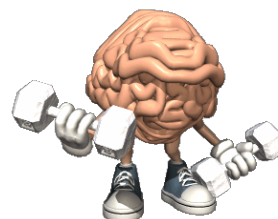


# Warm Up



Domain

Range

Function / Non-Function

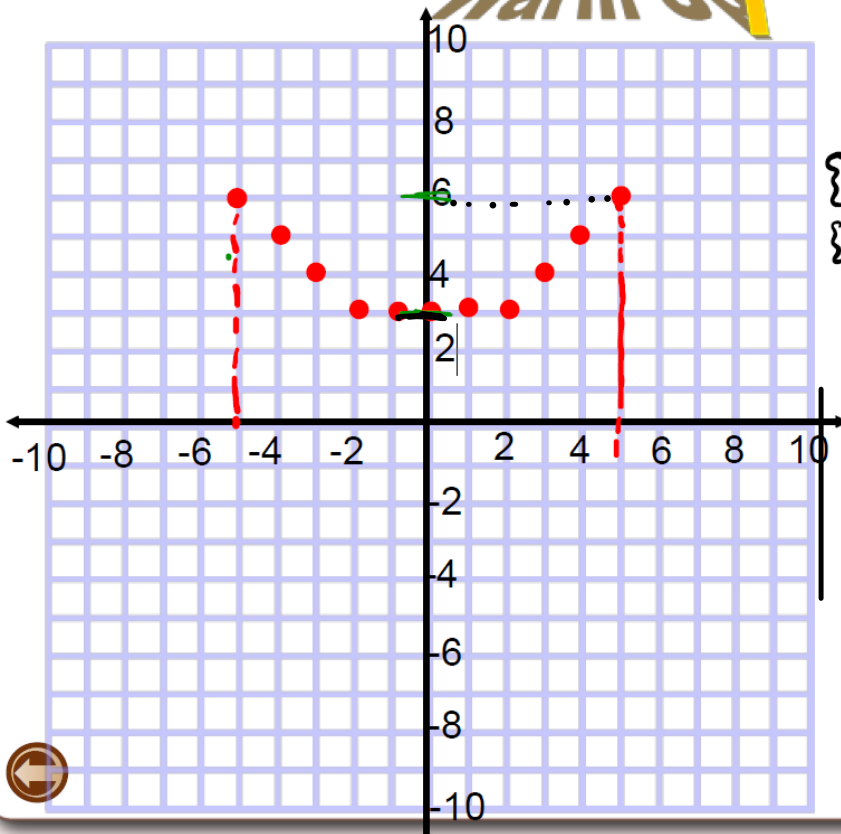
Linear / Non-Linear

Continuous / Discrete



## Solution to warm up

Warm up

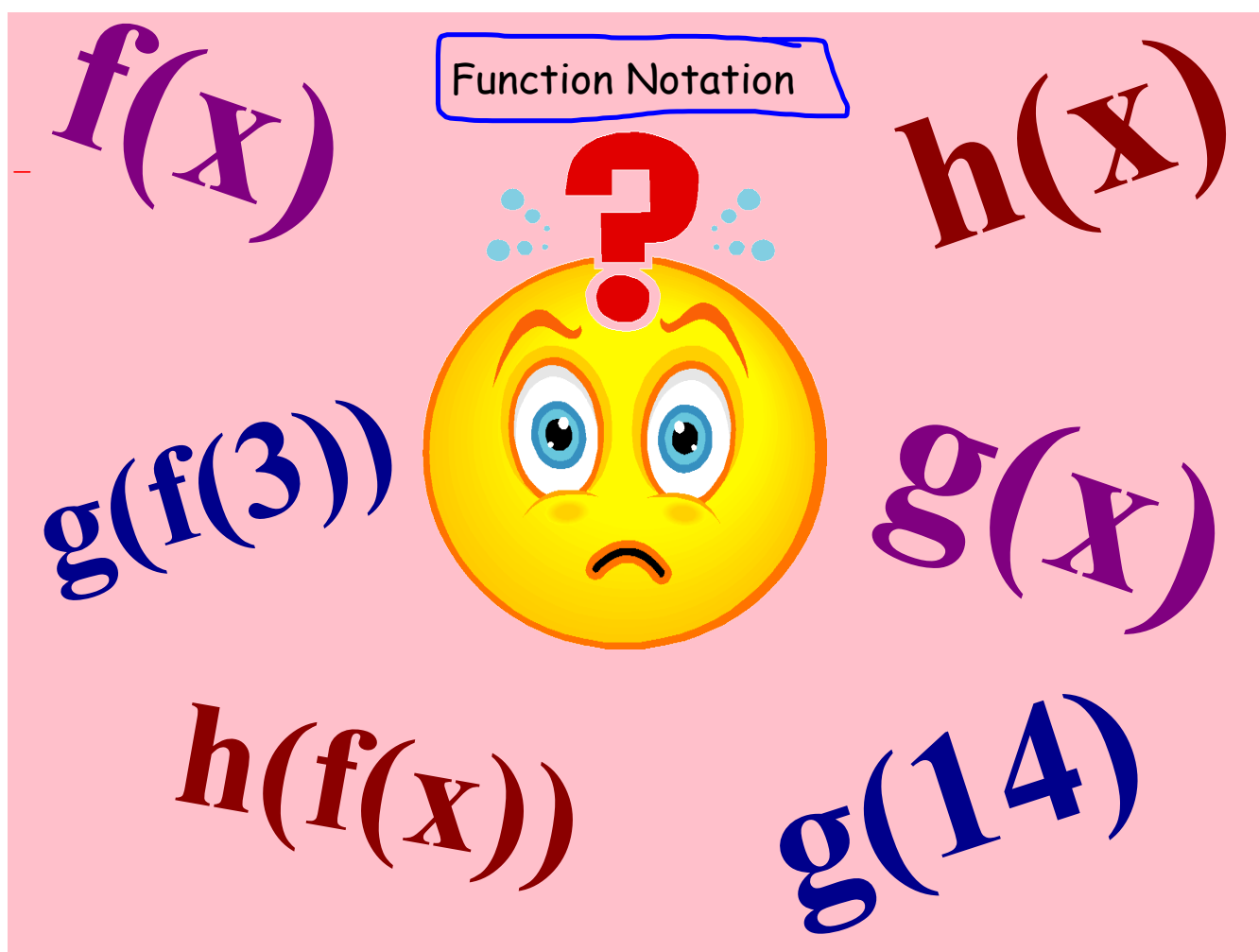


Domain & Range  
 $\{x \mid -5 \leq x \leq 5, x \in \mathbb{I}\}$   
 $\{y \mid 3 \leq y \leq 6, y \in \mathbb{I}\}$

Function/non-Function

Linear/nonlinear

Continuous or discrete



From middle school

a) Find the value of  $y$  for the equation  $y=2x +7$ , if  $x=5$

$$\begin{aligned} y &= 2x + 7 \\ &= 2(5) + 7 \\ &= 10 + 7 \\ &= 17 \end{aligned}$$

$\downarrow$   
(x, y)

So the ordered pair is (5, 17)

b) Find the value of  $x$ , if the  $y= -25$  for  $y= -9x - 7$

$$\begin{aligned} y &= -9x - 7 \\ \downarrow \\ -25 &= -9x - 7 \end{aligned}$$

Solve for  $x$  (isolate  $x$ )

$$\underline{-25 + 7} = -9x - \cancel{7 + 7}$$

$$\underline{-18} = -9x$$

$$\underline{-18} = \underline{-9x}$$

$$\underline{-9} \quad \underline{-9}$$

$$2 = x$$

so the ordered pair is (2, -25)

Try this one

1) Evaluate  $y = x^2 - 10$ , for  $x = 4$

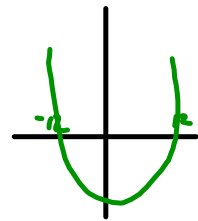
$$\begin{aligned} y &= (4)^2 - 10 \\ &= 16 - 10 \\ &= 6 \end{aligned}$$

$(4, 6)$

2) Given  $y = x^2 - 10$ , solve for  $x$  if  $y = 134$

$$\begin{aligned} 134 &= x^2 - 10 \\ 134 + 10 &= x^2 - 10 + 10 \\ 144 &= x^2 \\ \sqrt{144} &= \sqrt{x^2} \\ \pm 12 &= x \end{aligned}$$

$(12, 134)$  or  $(-12, 134)$



## Function Notation

Function notation is the way a function is written. It is meant to be a precise way of giving information about the function without a rather lengthy written explanation.

The most popular function notation is  $f(x)$  which is read "f of x". This is NOT the multiplication of f times x..

$$\begin{array}{c}
 f(x) = 3x + 1 \\
 \uparrow \qquad \underbrace{\hspace{2cm}} \\
 \text{input} \quad \text{output value} \\
 \text{value}
 \end{array}$$

This means the value of the function  $3x+1$  when  $x$  is inputted

Traditionally, functions are referred to by single letter names, such as  $f$ ,  $g$ ,  $h$  and Any letter(s), however, may be used to name a function. Examples:

$$\begin{array}{cccc}
 f(x) = x^2 + 1 & g(x) = x - 7 & h(b) = 3b^2 - 2b + 1 & S(t) = \frac{1}{2}t^2 - 3t + 1 \\
 abs(-5) = 5 & & george(x) = x^{23} &
 \end{array}$$

The  $f(x)$  notation is another way of representing the  $y$ -value in a function,  $y = f(x)$ .

The  $y$ -axis may even be labeled as the  $f(x)$  axis, when graphing. Ordered pairs may be written as  $(x, f(x))$ , instead of  $(x, y)$ .

## Equations

Often in working with a formula we may need to substitute more than one value for the variable.

**Example**

The cost,  $c$ , in cents for making pencils is given by the formula

$$C = 5 + 2n$$

$C$  Cost in cents

$n$  number of pencils made

The cost depends on the number of pencils you buy



## Function

A function is just an expression evaluated at a specific value

**Example**

The cost,  $c$ , in cents for making pencils is given by the formula



$$C(n) = 5 + 2n$$

$C(n)$  Cost in cents of  
"n" pencils

n number of  
pencils made

The cost depends on the number of pencils you buy



Try this on your own!!!!!!!!!!!!!!!!!!!!

## Example



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



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

$$V(d) = -0.08d + 50$$

1. Given the function  $f(x) = 3x - 5$ , find  $f(4)$ .  $\Rightarrow x=4$

$$f(x) = 3x - 5$$

$$f(4) = 3(4) - 5$$

$$= 12 - 5$$

$(x, f(x))$

$$f(4) = 7$$

order pair (4, 7)

2. Find the value of  $h(b) = 3b^2 - 2b + 1$  when  $b = -3$  and  $b = 2$

$b = -3$

$$h(b) = 3b^2 - 2b + 1$$

$$h(-3) = 3(-3)^2 - 2(-3) + 1$$

$$= 3(9) - 2(-3) + 1$$

$$= 27 + 6 + 1$$

$$= 34$$

order pair is  $(-3, 34)$

$$h(b) = 3b^2 - 2b + 1$$

$$h(2) = 3(2)^2 - 2(2) + 1$$

$$= 3(4) - 2(2) + 1$$

$$= 12 - 4 + 1$$

$$= 10$$

order pair is (2, 10)

3) Given the equation  $p = 3x - 4$

a) Write as function notation.

$$p(x) = 3x - 4$$

b) Find the value of  $p(20)$ .

$x = 20$

$$p(20) = 3(20) - 4$$

$$= 60 - 4$$

$$p(20) = 56$$

$(20, 56)$

c) if  $p(x) = -37$  find  $x$ ?

$y$

$$p(x) = 3x - 4$$

$$-37 = 3x - 4$$

Solve for  $x$

$$-37 + 4 = 3x - 4 + 4$$

$$\frac{-33}{3} = \frac{3x}{3}$$

$$\boxed{-11 = x}$$

$(-11, -37)$

4) if  $d(m) = -3m^2 - 5$  and  $r(t) = 10t - 6$ , Find  $r(d(3))$

step 1

$$\begin{aligned}d(3) &= -3(3)^2 - 5 \\ &= -3(9) - 5 \\ &= -27 - 5\end{aligned}$$

$$d(3) = -32$$

step 2

$$r(-32)$$

$$r(-32) = 10(-32) - 6$$

$$= -320 - 6$$

$$= -326$$

$$r(d(3)) = -326$$

# Function Notation

## Recap

- To represent functions, we use symbols like  $f(x)$  and  $g(x)$ .
- The symbol  $f(x)$  is read "f of x" and simply means that the expression that follows involves  $x$ .

Complete for Homework

# Evaluating Functions

Show all work

1) If  $f(x) = 3x^2 - x - 6$ , find...

a)  $f(5)$

b)  $f(-7)$

c)  $f(-3)$

2) If  $g(x) = x + 3$  and  $h(x) = -3x - 2$

a)  $g(5)$       b)  $g(7)$       c)  $h(-10)$       d)  $h(5)$

e)  $g(h(4))$       f)  $g(x) = 33$       g)  $h(x) = -41$

do first

## Homework

These are the functions

$$f(x) = -2x + 3$$

$$g(x) = 3x^2 + 4$$

$$h(x) = 5(x-1)$$

Use the above functions to evaluate the following

**a)  $f(2)$**

**b)  $f(x) = 31$**

**c)  $g(f(5))$**

**d)  $\underline{h(8)} - \underline{f(1)}$**

**e)  $g(x) = 80$**

Solutions for Homework

# Evaluating Functions

Show all work

1) If  $f(x) = 3x^2 - x - 6$ , find...

a)  $f(5)$

b)  $f(-7)$

c)  $f(-3)$

**SOLUTIONS**

a) $f(x) = 3x^2 - x - 6$	b) $f(x) = 3x^2 - x - 6$	c) $f(x) = 3x^2 - x - 6$
$f(5) = 3(5)^2 - 5 - 6$	$f(-7) = 3(-7)^2 - (-7) - 6$	$f(-7) = 3(-3)^2 - (-3) - 6$
$= 3(25) - 5 - 6$	$= 3(49) - (-7) - 6$	$= 3(9) - (-3) - 6$
$= 75 - 5 - 6$	$= 147 - (-7) - 6$	$= 27 - (-3) - 6$
$= 64$	$= 147 + 7 - 6$	$= 27 + 3 - 6$
	$= 148$	$= 24$

2) If  $g(x) = x + 3$  and  $h(x) = -3x - 2$

a)  $g(5)$     b)  $g(7)$     c)  $h(-10)$     d)  $h(5)$

e)  $g(h(4))$     f)  $g(x) = 33$     g)  $h(x) = -41$

**SOLUTIONS**

a) $g(x) = x + 3$	b) $g(x) = x + 3$	c) $h(x) = -3x - 2$
$g(5) = 5 + 3$	$g(7) = 7 + 3$	$h(-10) = -3(-10) - 2$
$= 8$	$= 10$	$= 30 - 2$
		$= 28$

d) $h(x) = -3x - 2$	e) $g(h(4))$
$h(5) = -3(5) - 2$	$h(x) = -3x - 2$
$= -15 - 2$	$h(4) = -3(4) - 2$
$= -17$	$= -12 - 2$
	$= -14$
	$g(-14) = x + 3$
	$g(-14) = -14 + 3$
	$= -11$

f)  $g(x) = 33$

$$g(x) = x + 3$$

$$33 = x + 3$$

$$33 - 3 = x + 3 - 3$$

$$30 = x$$

g)  $h(x) = -41$

$$h(x) = -3x - 2$$

$$-41 = -3x - 2$$

$$-41 + 2 = -3x - 2 + 2$$

$$-39 = -3x$$

$$\frac{-39}{-3} = \frac{-3x}{-3}$$

$$13 = x$$

Solution to Homework

**a)  $f(2)$**

$$f(x) = -2x + 3$$

$$f(\downarrow 2) = -2(\downarrow 2) + 3$$

$$f(2) = \underbrace{-4}_{-4} + 3$$

$$f(2) = \uparrow x \quad \quad \quad \uparrow y$$

$(x, y)$   
 $(2, -1)$

**b)  $f(x) = 31$**

$$f(x) = -2x + 3$$

$$31 = -2x + 3$$

isolate  $x$

$$31 - 3 = -2x + 3 - 3$$

$$28 = -2x$$

$$\frac{28}{-2} = \frac{-2x}{-2}$$

$$\boxed{-14 = x}$$

$(-14, 31)$



## Solution to Homework

c)  $g(f(5))$

Start inside  
find answer then find  $g$  (answer of  $f(5)$ )

$$f(x) = -2x + 3$$

$$f(5) = -2(5) + 3$$

$$= -10 + 3$$

$$f(5) = -7$$

$$g(-7) = 3x^2 + 4$$

$$= 3(-7)^2 + 4$$

$$= 3(49) + 4$$

$$= 147 + 4$$

$$g(-7) = 151$$

## Solution to Homework

d)  $h(8) - f(1)$

$$h(x) = 5(x-1)$$

$$h(8) = 5(8-1)$$

$$h(8) = 5(7)$$

$$h(8) = 35$$

$$f(x) = -2x + 3$$

$$f(1) = -2(1) + 3$$

$$f(1) = -2 + 3$$

$$f(1) = 1$$

So

$$\underbrace{h(8)}_{35} - \underbrace{f(1)}_1$$

$$\boxed{34}$$

e)  $g(x) = 80$

$$g(x) = 3x^2 + 4$$

$$\underbrace{80}_{80} = 3x^2 + 4$$
  
Solve for 'x'

$$\underbrace{80 - 4}_{76} = 3x^2 + 4 - 4$$

$$\frac{76}{3} = \frac{3x^2}{3}$$

$$25.3 = x^2$$

$$\sqrt{25.3} = \sqrt{x^2}$$

$$\pm 5.03 = x$$