**"WARM UP**
The deepest mine in the world, East Rand mine in South Africa reaches 3585 m into Earth's crust. Another South African mine, Western Deep is being deepend to 4100m. Suppose the temperature at the top of the mine shaft is $11^{\circ}$C and that it increases at a rate of $0.015^{\circ}$C per meter as you descend.**"**

## FUNCTION NOTATION
Notation, such as $f(x)$, is used to represent the value of the dependent variable (the **output**) for a given value of independent variable, x - the **input**.
In other words, instead of the letter we use for the "y", replace it with $f(x)$ or $C(d)$ or any other letter.

**a)** Write an equation for temperature. Let $T$ represent the temperature in degrees Celcius and $d$ depth in metres.

$$T = 11 + 0.015d \quad \text{independent}$$
dependent

**b)** Read the textbox "Function Notation" and then rewrite the equation above using the **function notation.**

$$T(d) = 11 + 0.015d$$

**c)** Does the equation above represent a function? **Justify.**

It does because it is a linear relationship.

**d)** Determine the temperature at the bottom of each mine.

EAST RAND  d = 3585

$$T(d) = 11 + 0.015d$$
$$T(3585) = 11 + 0.015(3585) \rightarrow \text{put 'em all in at once.}$$
$$\doteq 64.8^{\circ}$$
∴ It's approximately 64.8°C

WESTERN
$$T(4100) = 11 + 0.015(4100)$$
$$= 72.5$$
∴ It's 72.5°C.

put 'em all in your calc.

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Usually a function is represented by a mathematical expression.   $f(d)$

INPUT (x)

$$f(x) = 11 + 0.015x$$

That tells you what to do with the input value in order to produce the corresponding output

notation of the function. Any letter can be used
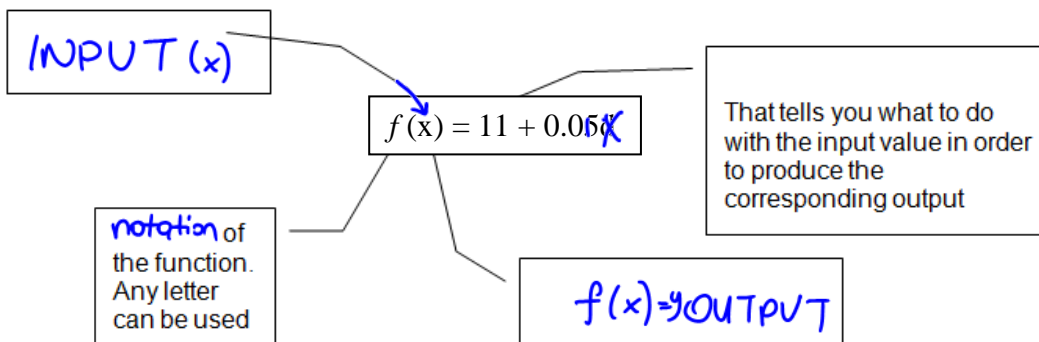
$$f(x) = OUTPUT$$

$$T(d) = 11 + 0.015d$$

* **Don't confuse f(x) with multiplication!** The entire symbol f(x) represents a function, its input, and its output. It is not the same as an algebraic expression.

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## The notation $f(x)$ is read "f at x" or "f of x".

## SOME CONCEPT PRACTICE

**Ex1**. If $f(x) = 2x + 3$, find

a) $f(6) = ?$   sub 6 for "x" in the equation

$= 2(6) + 3$
$= 15$     $\therefore f(6) = 15$   or   $(6,5)$
or
$y = 5$

b) $f(-5) = ?$   $2(-5) + 3$   $\therefore f(-5) = -7$
$= -10 + 3$
$= -7$     $(-5, -7)$

(top right) $x \downarrow \quad y \uparrow$

c) $f(x+1) = ?$
$= 2(x+1) + 3$
$= 2x + 2 + 3$
$f(x+1) = 2x + 5$

d) $f(2x) = ?$   $f(2x) = 2(2x) + 3$
$= 4x + 3$

e) If $g(x) = x^2 + x$, then $g(x+3) = ?$

$g(x+3) = (x+3)^2 + x$
$= (x+3)(x+3) + x$
$= x^2 + 6x + 9 + x$

$\Rightarrow g(x+3) = x^2 + 7x + 9$

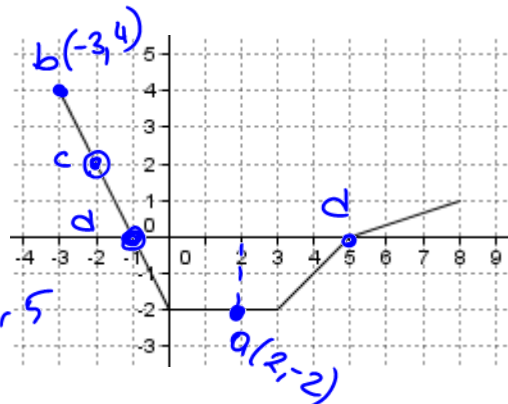--------------------------------------------

**Ex2.** Given the graph to the right, find

a) $f(2) = -2$

b) $f(-3) = 4$

c) x if $f(x) = 2 \Rightarrow y=2$   when $y=2$, x is $-2$

d) x if $f(x) = 0$   when $y=0$, x is either $-1$ or $5$

(graph labels) $b(-3, 4)$ ... $c$ ... $d$ ... $a(2, -2)$

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## THINKING

A family played a game to decide who got to eat the last piece of pizza. Each person had to think of a number, double it, and subtract the result from 12. Finally, they each multiplied the resulting difference by the number they first thought of. The preson with the highest final number won the pizza slice.
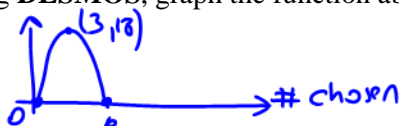
| Tim | 5 |
|-----|-----|
| Tom | -2 |
| Tia | 7 |
| Toa | 10 |

a) Use function notation to express the final answer in terms of the original number.

$x \downarrow$
$2x \downarrow$

*Let f (x) represent the final answer (output) and x the original number.*

$f(x) = x(12 - 2x) = -2x^2 + 12x$

$f(x) = x(12 - 2x)$

b) Using **DESMOS**, graph the function above and sketch it below.

$(3, 18)$   →# chosen

$f(5) = -2(5)^2 + 12(5) = 10$
$f(-2) = -2(-2)^2 + 12(-2) = -32$
$f(7) = -2(7)^2 + 12(7) = -14$

$f(10) = -2(10)^2 + 12(10) = -80$

c) The original numbers chosen by the family members are shown. Who won the pizza slice?   Tim's answer is the highest

d) What would be the best number to choose? Why? (*Hint: Best number gives highest number*)

Best number would maximize the product. It's the vertex; therefore, it's 3.

**Extra Practice**: p.22 #1-3, 5-8, 11, 12, 16, and 17