

Lesson 4 – Functions and Function Notation

Objective:

I can deepen my understanding of functions and understand and apply the special notation used when working with functions.

Functions Every function defines a relationship between an input (independent variable, domain) and an output (dependent variable, range).

Function Notation **Function Notation** uses parenthesis to name the input, or independent, variable for a function.

For example, the function $y = f(x)$ is read as “y equals f of x” which means that “y is a function of x” or “y depends on x”.

Examples of Functions An equation that is also a function can be written using this notation. Here are 3 examples of equations written with function notation.

Equation	Written with function notation (the letters f,g,h are commonly used)
1. $y = 2x + 4$	$f(x) = 2x + 4$
2. $y = x^2$	$g(x) = x^2$
3. $y = 5(2^x)$	$h(x) = 5(2^x)$

The notation $f(3)$ tells you to substitute 3 in for x into the equation $y = 2x + 4$. So $f(3) = 2(3) + 4$ and therefore $f(3) = 10$.

When $x=3$ $y=10$ or $F(x)=10$
 $h(x)=5(2^x)$

Find $g(5)$

$$\begin{aligned} g(x) &= x^2 \\ g(5) &= 5^2 \\ g(5) &= 25 \\ x=5 \quad y=25 \\ x=5 \quad \text{or} \quad g(x)=25 \end{aligned}$$

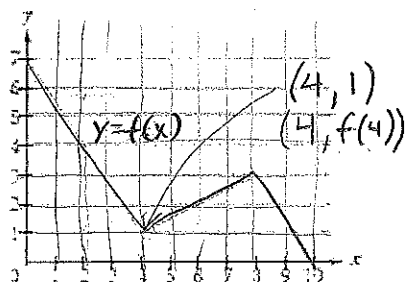
Find $h(4)$

$$\begin{aligned} h(4) &= 5(2^4) = 5(16) \\ h(4) &= 80 \\ x=4 \quad y=80 \\ \text{or} \quad h(x) &= 80 \end{aligned}$$

Find $f(-3)$

$$\begin{aligned} f(-3) &= 2(-3) + 4 \\ f(-3) &= -6 + 4 \\ f(-3) &= -2 \\ x = -3 \quad y = -2 \\ \text{or} \quad f(x) &= -2 \end{aligned}$$

Not all functions are equations, sometimes we see them as graphs and there is no rule to follow. For example the following graph is represented by the function $f(x) = y$



If given the point $x = 4$, then the coordinate would be $(4, 1)$ or $(4, f(4))$. This means that $f(4) = 1$.

Using the graph above, find the following values.

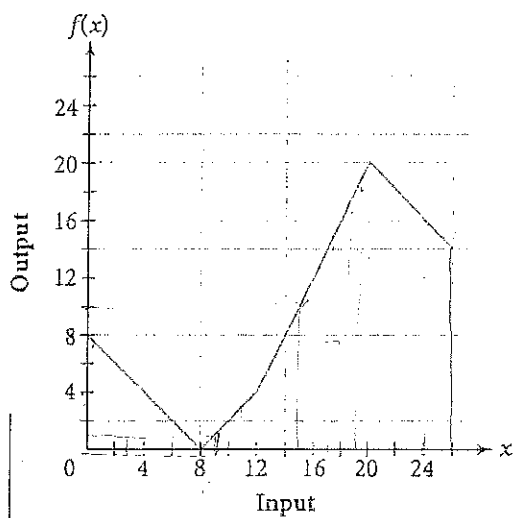
a. $f(2)$ $x = 2$ $y = 4$ $f(2) = 4$

b. $f(6) = 2$

c. find x if $f(x) = 3$

$x = 8$ or $x = 2.8$
 $f(8) = 3$ or $f(2.8) = 3$

Complete the following problems using the graph below.



Step 1: Describe the Domain and Range for this function.

Domain	Range
$[0, 26]$	$[0, 20]$

Step 2: Use the graph to find each function value and complete any given operations.

Notation	Value
$f(3)$	5
$f(18) + f(3)$	$16 + 5 = 21$
$f(5) \cdot f(4)$	$3 \cdot 4 = 12$
$f(15) / f(6)$	$10 / 2 = 5$
$f(20) - f(10)$	$20 - 2 = 18$

Step 3: Use the rules for the order of operations to evaluate these expressions that involve function notation. Complete any operations in parenthesis first, and then use the graph to find the function values and do any remaining operations.

Notation	Value
$f(0) + f(1) - 3$	$8 + 7 - 3 = 12$
$5 \cdot f(9)$	$5 \cdot 1 = 5$
x when $f(x) = 10$	15
$f(9 + 8) \quad f(17)$	14
x when $f(x) = 0$	8
$f(8 \cdot 3) - 5 \cdot f(11)$	$16 - 5 \cdot 3 = 16 - 15 = 1$
$f(4 \cdot 5 - 1) \quad f(19)$	18
$f(12)$	4

Additional
Practice

You can use the function $f(x) = \frac{9}{5}x + 32$ to find the temperature $f(x)$ in degrees Fahrenheit for any given temperature x in degrees Celsius. Find each given value and label in degrees Fahrenheit or degrees Celsius.

a. $f(15) = \frac{9}{5}(15) + 32 = \frac{9}{5} \cdot \frac{15}{1} + 32 = \frac{27}{1} + 32 = 27 + 32 = 59^\circ\text{F}$
 $15^\circ\text{C} = 59^\circ\text{F}$

b. $f(-10)$

c. x when $f(x) = 41$

$$41 = \frac{9}{5}x + 32$$

$$\underline{-32 \quad -32}$$

$$5 \cdot 9 = \frac{9}{5}x \cdot 5$$

$$\frac{45}{9} = \frac{9x}{9} \quad x = 5^\circ\text{C}$$

d. x when $f(x) = -4$