Warm Up

Evaluate each expression for $a = 2$, $b = -3$, and $c = 8$.

1. $a + 3c$
2. $ab - c$
3. $\frac{1}{2}c + b$

4. $4c - b$
5. $b^a + c$

3-3: Writing Functions

Objectives:

- Identify independent and dependent variables.
- Write an equation in function notation and evaluate a function for given input values.

Example 1: Determine a relationship between the $x$- and $y$-values. Write an equation.

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<td>$x$</td>
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C.I.O.-Example 1: Determine a relationship between the $x$- and $y$-values. Write an equation.

\{(1, 3), (2, 6), (3, 9), (4, 12)\}

The equation in Example 1 describes a function because for each $x$-value (input), there is only one $y$-value (output).

The input of a function is the **independent variable**. The output of a function is the **dependent variable**. The value of the dependent variable depends on, or is a function of, the value of the independent variable.

**Example 2:** Identify the independent and dependent variables in the situation.

A. A painter must measure a room before deciding how much paint to buy.

Dependent:

Independent:

B. The height of a candle decreases $d$ centimeters for every hour it burns.

Dependent:

Independent:

C. A veterinarian must weigh an animal before determining the amount of medication.

Dependent:

Independent:
C.I.O.-Example 2: Identify the independent and dependent variable in the situation.

a. A company charges $10 per hour to rent a jackhammer.

Dependent: 

Independent: 

b. Apples cost $0.99 per pound.

Dependent: 

Independent: 

An algebraic expression that defines a function is a function rule. Suppose Tasha earns $5 for each hour she babysits. Then $5 \cdot x$ is a function rule that models her earnings.

If $x$ is the independent variable and $y$ is the dependent variable, then function notation for $y$ is $f(x)$, read “$f$ of $x$,” where $f$ names the function. When an equation in two variables describes a function, you can use function notation to write it.

The dependent variable is a function of the independent variable.

\[
y \quad \text{is} \quad \text{a function of} \quad x. \\
y \quad = \quad f \quad (x)
\]

\[
y \quad = \quad f(x)
\]
**Example 3:** Identify the independent and dependent variables. Write an equation in function notation for the situation.

A. A math tutor charges $35 per hour.

   Dependent: 
   
   Independent:

B. A fitness center charges a $100 initiation fee plus $40 per month.

   Dependent: 
   
   Independent:

C.I.O.-Example 3: Identify the independent and dependent variables. Write an equation in function notation for the situation.

a. Steven buys lettuce that costs $1.69/lb.

   Dependent: 
   
   Independent:

b. An amusement park charges a $6.00 parking fee plus $29.99 per person.

   Dependent: 
   
   Independent:

You can think of a function as an input-output machine.

For Tasha’s earnings, \( f(x) = 5x \).

If you input a value \( x \), the output is 5x.
Example 4: Evaluate the function for the given input values.

A. For \( f(x) = 3x + 2 \), find \( f(x) \) when \( x = 7 \) and when \( x = -4 \).

B. For \( g(t) = 1.5t - 5 \), find \( g(t) \) when \( t = 6 \) and when \( t = -2 \).

C. For \( h(r) = \frac{1}{3}r + 2 \), find \( h(r) \) when \( r = 600 \) and when \( r = -12 \).

C.I.O.-Example 4: Evaluate the function for the given input values.

a. For \( h(c) = 2c - 1 \), find \( h(c) \) when \( c = 1 \) and when \( c = -3 \).

b. For \( g(t) = \frac{1}{4}t + 1 \), find \( g(t) \) when \( t = -24 \) and when \( t = 400 \).

When a function describes a real-world situation, every real number is not always reasonable for the domain and range. For example, a number representing the length of an object cannot be negative, and only whole numbers can represent a number of people.

Example 5: Joe has enough money to buy 1, 2, or 3 DVDs at $15.00 each, if he buys any at all.

Write a function to describe the situation. Find the reasonable domain and range of the function.
C.I.O.-Example 5:

The settings on a space heater are the whole numbers from 0 to 3. The total number of watts used for each setting is 500 times the setting number. Write a function to describe the number of watts used for each setting. Find the reasonable domain and range for the function.

Lesson Quiz: Part I

Identify the independent and dependent variables. Write an equation in function notation for each situation.

1. A buffet charges $8.95 per person.
   
   Dependent: 
   Independent:

2. A moving company charges $130 for weekly truck rental plus $1.50 per mile.
   
   Dependent: 
   Independent:

Lesson Quiz: Part II

Evaluate each function for the given input values.

3. For \( g(t) = \frac{1}{2} t - 3 \), find \( g(t) \) when \( t = 20 \) and when \( t = -12 \).
   
   4. For \( f(x) = 6x - 1 \), find \( f(x) \) when \( x = 3.5 \) and when \( x = -5 \).
Lesson Quiz: Part II

Write a function to describe the situation. Find the reasonable domain and range for the function.

5. A theater can be rented for exactly 2, 3, or 4 hours. The cost is a $100 deposit plus $200 per hour.


14) $y = -x$   16) independ.: items wrapped; depend.: cost  18) independ.: lawns mowed; depend.: amount earned; $f(x) = 28x$

20) $f(0) = -5; f(3) = 4$  22) $f(9) = 9; f(-3) = 1$  26) 0; 2; 6; 12  28a) D: $\{0 \leq g \leq 20\}$; R: $\{0 \leq d \leq 600\}$  28b) 360 mi