

Algebra 1

3.2 Modeling with Functions

Explore 1 Identifying Independent and Dependent Variables

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

Identify dependent and independent variables in each situation.

In the winter, more electricity is used when the outside temperature goes down, and less is used when the outside temperature rises.

(A) The amt of electricity depends on the temperature.

(B) Dependent: amt of electricity
Independent: temperature



(C) The cost of shipping a package is based on its weight.

The Cost depends on the weight.

(D) Dependent: Cost Independent: weight

(E) The faster Tom walks, the quicker he gets home.

The time he gets home depends on the speed he walks.

(F) Dependent: time he gets home Independent: speed he walks

Explore 2 Applying Function Notation

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

The dependent variable is a function of the independent variable.
 y is a function of x .
 $y = f(x)$

Write an equation in function notation.

Amanda babysits and charges \$5 per hour.

Time Worked in Hours (x)	1	2	3	4
Amount Earned in Dollars (y)	5	10	15	20

(A) The amt earned is \$5 times the # of hrs worked.

(B) An algebraic expression that defines a function is a **function rule**. Write an equation using two variables to show this relationship.

Amount earned is \$5 times the number of hours worked.
 $y = 5 \cdot x$

(C) The dependent variable is a function of the independent variable. Write the equation in function notation.

$$f(x) = 5x$$

Explain 1 Modeling Using Function Notation

The value of the dependent variable depends on, or is a function of, the value of the independent variable. If x is the independent variable and y is the dependent variable, then the function notation for y will 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.

Example 1 For each example identify the independent and dependent variables. Write an equation in function notation for each situation, and then use the equation to solve the problem.

- (A) A lawyer's fee is \$180 per hour for his services. How much does the lawyer charge for 5 hours?

I: # of hrs
D: fee for services

$$f(x) = 180x$$

$$180 \cdot 5 = \boxed{\$900}$$

You try

- (B) The admission fee at a carnival is \$9. Each ride costs \$1.75. How much does it cost to go to the carnival and then go on 12 rides?

I: rides
D: total amt spent @ carnival

$$f(x) = 9 + 1.75x$$

$$f(12) = 9 + 1.75(12)$$

$$f(12) = 30$$

$$(12, 30) \quad \boxed{\$30}$$

Explain 2 Choosing a Reasonable Domain and Range

When a function describes a real-world situation, every real number is not always a reasonable choice 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 2 Write a function in function notation for each situation. Find a reasonable domain and range for each function.

- (A) Manuel has already sold \$20 worth of tickets to the school play. He has 4 tickets left to sell at \$2.50 per ticket. Write a function for the total amount collected from ticket sales.

Independent Dependent

$$f(x) = 20 + 2.50x$$

D: {0, 1, 2, 3, 4}

R: {20, 22.50, 25, 27.50, 30}

You try

- (B) A telephone company charges \$0.25 per minute for the first 5 minutes of a call plus a \$0.45 connection fee per call. Write a function for the total cost in dollars of making a call.

$$f(x) = .25x + .45$$

D: {1, 2, 3, 4, 5}

R: {.70, .95, 1.20, 1.45, 1.70}

Homework

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