Lesson 3-3

Modeling with Functions

Practice and Problem Solving: A/B

Identify the dependent and independent variables in each situation.

1. The cost of a dozen eggs depends on the size of the eggs.
   
   dependent: ____________________  independent: ____________________

2. Ally works in a shop for $18 per hour.
   
   dependent: ____________________  independent: ____________________

3. 5 pounds of apples cost $7.45.
   
   dependent: ____________________  independent: ____________________

For each situation, write a function as a standard equation and in function notation.

4. Keesha will mow grass for $8 per hour.
   
   standard: ____________________  function: ____________________

5. Oranges are on sale for $1.59 per pound.
   
   standard: ____________________  function: ____________________

For each situation, identify the dependent and independent variables. Write a function in function notation, and use the function to solve the problem.

6. A plumber charges $70 per hour plus $40 for the call. What does he charge for 4 hours of work?
   
   Solution: ____________________

   dependent: ____________________  independent: ____________________

   function: ____________________

7. A sanitation company charges $4 per bag for garbage pickup plus a $10 weekly fee. A restaurant has 14 bags of garbage. What will the sanitation company charge the restaurant?
   
   Solution: ____________________

   dependent: ____________________  independent: ____________________

   function: ____________________
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Practice and Problem Solving: Modified

Identify the independent (input) variable and the dependent (output) variable for each situation. The first one is done for you.

1. how much Sam earns when he makes $15 per hour

   The ______ amount earned ______ depends on the number of hours worked.

   Independent variable: number of hours worked

   Dependent variable: amount earned

2. the cost of a bunch of grapes at $1.19 per pound

   The ______________________ depends on the ______________________.

   Independent variable: ______________________

   Dependent variable: ______________________

Rewrite each equation as a function. The first one is done for you.

3. 2y – 2x = 8

   y = x + 4

   f(x) = x + 4

4. y + 5x = 16

5. 4y – 8x = −16

Write a function for each situation. The first one is done for you.

6. An electrician charges $60 per hour. How much does he charge for 6 hours?

   The ______ total cost ______ depends on the number of hours worked.

   Independent variable: the number of hours worked

   Dependent variable: the total cost

   Equation: ______ y = 60x ______ Function: ______ f(x) = 60x ______

7. A drone costs $300 plus $25 for each set of extra propellers. What is the cost of a drone and 4 extra sets of propellers?

   The ______________________ depends on the ______________________.

   Independent variable: ______________________

   Dependent variable: ______________________

   Equation: ______________________ Function: ______________________
Modeling with Functions

Reading Strategies: Use Examples and Non-Examples

In a function, the value of the dependent, or output variable depends on the value of the independent, or input variable.

The input value is the independent variable. The output value is the dependent variable. The output value depends on the input value.

Identify the independent and dependent variable in each situation.

1. Jake is a personal trainer and he charges $45 per hour.
   The ______________________ is 45 times the ______________________.
   
   Independent variable: ________________________________________________
   
   Dependent variable: ________________________________________________

2. A company charges $1.25 for each pound of freight shipped on its trucks.
   The ______________________ is 1.25 times the ______________________.
   
   Independent variable: ________________________________________________
   
   Dependent variable: ________________________________________________

3. There are 52 cards in a standard deck of playing cards.
   The ______________________ is ___ times the ______________________.
   
   Independent variable: ________________________________________________
   
   Dependent variable: ________________________________________________

4. Shari’s car can travel 32 miles on each gallon of gas.
   The ______________________ is ___ times the ______________________.
   
   Independent variable: ________________________________________________
   
   Dependent variable: ________________________________________________

5. It takes 3 ounces of detergent to wash a load of laundry.
   The ______________________ is ___ times the ______________________.
   
   Independent variable: ________________________________________________
   
   Dependent variable: ________________________________________________
To write a function for a situation, identify the independent variable and the dependent variable.

In a word problem, the output is usually the answer to the problem, but not always.

**Example:**

Nick earns $21 per hour. How much will he make working for 8 hours?

Think: $8 \times 21 = \text{the total amount Nick earns.}$

Nick can work any number of hours. This is the independent variable.
Nick will earn (number of hours \times $21). The total depends on the number of hours. This is the dependent variable.

**Identify the independent variable and the dependent variable in 1–3.**

1. Brandie earns $8 per hour. How much will she earn working 7 hours?
   
   Think: $\underline{\text{}} \times 8 = \underline{\text{}}$

   Independent variable: $\underline{\text{}}$
   
   Dependent variable: $\underline{\text{}}$

2. A cell phone company charges $0.15 per minute. Zach used his phone 103 minutes last month. How much will he be charged?
   
   Think: $\underline{\text{}} \times 0.15 = \underline{\text{}}$

   Independent variable: $\underline{\text{}}$
   
   Dependent variable: $\underline{\text{}}$

3. Every serving of lasagna has 410 calories. Ed ate 3 servings. How many calories did he eat?
   
   Think: $\underline{\text{}} \times 410 = \underline{\text{}}$

   Independent variable: $\underline{\text{}}$
   
   Dependent variable: $\underline{\text{}}$
Modeling with Functions

Success for English Learners

Input = independent variable
Output = dependent variable

If you change the independent variable, the dependent variable will change, too.

Problem 1
What is the independent variable? What is the dependent variable?

Mike earns $15 for each hour he works. How much does he earn in 15 hours?

The amount he earns depends on the number of hours he works.
The independent variable = the number of hours he works.
The dependent variable = how much he earns in all.

Problem 2
Find the range of the function.

\[ f(x) = 3x + 1 \] for \( D = \{3, 5, 7\} \)

Substitute each number and solve.

\[
\begin{align*}
    f(x) &= 3x + 1 \\
    f(x) &= 3(3) + 1 \\
    f(x) &= 10
\end{align*}
\]

\[
\begin{align*}
    f(x) &= 3x + 1 \\
    f(x) &= 3(5) + 1 \\
    f(x) &= 16
\end{align*}
\]

\[
\begin{align*}
    f(x) &= 3x + 1 \\
    f(x) &= 3(7) + 1 \\
    f(x) &= 22
\end{align*}
\]

Range: \{10, 16, 22\}

1. Name the independent and dependent variables.
   It takes 5 apples to bake an apple pie. Maria baked 6 pies. How many apples did she use?

   Independent variable: ____________________________

   Dependent variable: ____________________________

2. Find the range of the function \( f(x) = 2x + 7 \) for the domain \{-2, 3, 8\}.

   Range: ____________________________