

MODEL & DISCUSS

In business, the term *profit* is used to describe the difference between the money the business earns (revenue) and the money the business spends (cost).

- A. Grooming USA charges \$25 for every pet that is groomed. Let x represent the number of pets groomed in a month. Define a revenue function for the business.



- B. Materials and labor for each pet groomed costs \$15. The business also has fixed costs of \$1,000 each month. Define a cost function for this business.

- C. Last month, Grooming USA groomed 95 pets. Did they earn a profit? What would the profit be if the business groomed 110 pets in a month?

- D. **Generalize** Explain your procedure for calculating the profit for Grooming USA. Suppose you wanted to calculate the profit for several different scenarios. How could you simplify your process? © MP.8

HABITS OF MIND

Make Sense and Persevere A business "breaks even" when its revenue equals its costs. How many pets would Grooming USA have to groom in order to break even? © MP.1

EXAMPLE 1  **Try It! Add and Subtract Functions**

- Let $f(x) = 2x^2 + 7x - 1$ and $g(x) = 3 - 2x$. Identify rules for the following functions.
 - $f + g$
 - $f - g$

EXAMPLE 2  **Try It! Multiply Functions**

- Suppose demand, d , for a company's product at cost, x , is predicted by the function $d(x) = -0.25x^2 + 1,000$, and the price, p , that the company can charge for the product is given by $p(x) = x + 16$. Find the company's revenue function.

EXAMPLE 3  **Try It! Divide Functions**

- Identify the rule and domain for $\frac{f}{g}$ for each pair of functions.
 - $f(x) = x^2 - 3x - 18$, $g(x) = x + 3$
 - $f(x) = x - 3$, $g(x) = x^2 - x - 6$

HABITS OF MIND

Communicate Precisely How are the domains of $f + g$, $f - g$, $f \cdot g$, and $\frac{f}{g}$ related to the domains of f and g ? © MP.6



Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** How do you combine, multiply, divide, and compose functions, and how do you find the domain of the resulting function?

2. **Vocabulary** In your own words, define and provide an example of a composite function.

3. **Error Analysis** Reagan said the domain of $\frac{f}{g}$ when $f(x) = 5x^2$ and $g(x) = x + 3$ is the set of real numbers. Explain why Reagan is incorrect. © MP.3

4. **Make Sense and Persevere** Explain why changing the order in which two functions occur affects the result when subtracting and dividing the functions. © MP.1

Do You KNOW HOW?

Let $f(x) = 3x^2 + 5x + 1$ and $g(x) = 2x - 1$.

5. Identify the rule for $f + g$.

6. Identify the rule for $f - g$.

7. Identify the rule for $g - f$.

Let $f(x) = x^2 + 2x + 1$ and $g(x) = x - 4$.

8. Identify the rule for $f \cdot g$.

9. Identify the rule for $\frac{f}{g}$, and state the domain.

10. Identify the rule for $\frac{g}{f}$, and state the domain.

11. If $f(x) = 2x^2 + 5$ and $g(x) = -3x$, what is $f(g(x))$?

