ALBERT

Name _____ Date _____

# Combining Functions Worksheet

Algebra 2 · Common Core HSF-BF.A.1b

> Write a function that describes a relationship between two quantities. b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.

## Practice

Builds the skill step by step.

1. $f(x) = 2x + 1$ and $g(x) = x^2$. What is $(f + g)(3)$?

2. $f(x) = 2x + 1$ and $g(x) = x^2$. What is $(f - g)(2)$?

3. $f(x) = 2x + 1$ and $g(x) = x^2$. What is $(f \cdot g)(1)$?

4. $f(x) = 3x$ and $g(x) = x + 4$. Write $(f + g)(x)$.

5. $f(x) = x^2 + 2$ and $g(x) = x$. What is $(f \div g)(2)$?

6. A company's cost is $C(x) = 50 + 3x$ and its revenue is $R(x) = 8x$ for $x$ items. Write the profit function $P(x) = R(x) - C(x)$.

7. Using $P(x) = 5x - 50$, what is the profit on 20 items?

8. A hot drink cools toward a room temperature of 70°F. Which function could model its temperature after t minutes?

   A. $T(t) = 120(0.9)^t$

   B. $T(t) = 70 + 120t$

   C. $T(t) = 70 + 120(0.9)^t$

   D. $T(t) = 70(0.9)^t$

9. $T(t) = 70 + 120(0.9)^t$. What is $T(0)$?

10. $f(x) = x^2$ and $g(x) = 5$. What is $(f + g)(4)$?

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## On Level

Grade-level practice.

1. $T(t) = 70 + 120(0.9)^t$. What is $T(2)$?

2. In $T(t) = 70 + 120(0.9)^t$, what does 70 represent?

   A. the starting temperature

   B. the cooling rate

   C. the time

   D. the room temperature

3. A town's population is modeled by $P(t) = 500(1.04)^t + 20t$. Using $1.04^{10} \approx 1.48$, what is $P(10)$?

4. $f(x) = x + 2$ and $g(x) = x - 2$. Write $(f \cdot g)(x)$.

5. $h(x) = 3x^2 - 2x$ is written as $f(x) + g(x)$ with $f(x) = 3x^2$. What is $g(x)$?

6. Revenue is $R(x) = 12x$ and cost is $C(x) = 200 + 4x$. Explain how to find the profit function and the break-even number of items.

7. Cost is $C(x) = 200 + 4x$. The average cost is $A(x) = C(x) \div x$. What is $A(50)$?

8. $f(x) = 2^x$ and $g(x) = 3$. What is $(f \cdot g)(2)$?

9. Coffee cools from 180°F toward a room temperature of 68°F. Which model fits?

   A. $T(t) = 68 + 112(0.95)^t$

   B. $T(t) = 180(0.95)^t$

   C. $T(t) = 68 + 112t$

   D. $T(t) = 180 - 0.95t$

10. $T(t) = 68 + 112(0.95)^t$. What value does T approach as t gets very large?

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## Challenge

Multi-step and word problems that stretch it.

1. Revenue is $R(x) = 30x - 0.5x^2$ and cost is $C(x) = 100 + 10x$. The profit is greatest at $x = 20$. What is the greatest profit?

2. $T(t) = 70 + 120(0.9)^t$. Using $0.9^{13} \approx 0.254$ and $0.9^{14} \approx 0.229$, after how many whole minutes is the temperature first below 100°F?

3. $f(x) = \frac{1}{x}$ and $g(x) = x - 2$. What is $(f \cdot g)(4)$?

4. Owning a car costs 20,000 dollars to buy, plus 0.12 dollars per mile for fuel, plus 1,000 dollars per year for insurance. What is the total cost after 3 years and 30,000 miles?

5. $h(x) = f(x) \div g(x)$ with $f(x) = x^2 - 9$ and $g(x) = x - 3$. Simplify $h(x)$ for $x \neq 3$.

6. $T(t) = 70 + 120(0.9)^t$ is a sum of which two kinds of functions?

   A. a linear function and a quadratic

   B. a constant function and a decaying exponential

   C. two growing exponentials

   D. a constant function and a linear function

7. Colony A has $A(t) = 100 \cdot 2^t$ bacteria and colony B has $B(t) = 400 + 50t$. What is $(A - B)(3)$?

8. Explain why $T(t) = 70 + 120(0.9)^t$ is a good model for a cooling drink.

9. $f(x) = 3x - 1$ and $g(x) = x^2$. Write $(f \cdot g)(x)$.

10. A rectangle has length $f(x) = x + 4$ and width $g(x) = x - 1$. What is its area when $x = 6$?