Function Operations and Composition of Functions

Algebra Worksheet · Grade 9–11

Name: _____ Date: _____

Learning Objectives

- Evaluate functions at specific input values and interpret results as coordinates
- Perform operations (addition, subtraction, multiplication, division) on functions
- Find and simplify composite functions using function notation

Problems

1. Given the functions below, evaluate f of 3.

$$f(x) = 2x + 3$$

2. Using the functions below, write f of 9 equals 21 as an ordered pair.

$$f(9) = 21$$

3. Using the functions below, evaluate h of 2 minus g of 3.

$$h(x) = -3x, \quad g(x) = x^2$$

4. Using the functions below, find f of x plus g of x and simplify.

$$f(x) = 2x + 3, \quad g(x) = x^2$$

5. Using the functions below, find f of x times h of x and simplify.

$$f(x) = 2x + 3, \quad h(x) = -3x$$

6. Using the functions below, evaluate the quotient of g of x divided by f of x at x equals 1.

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$f(x) = 2x + 3, \quad g(x) = x^2$

7. Find the composite function f of g of x and simplify.

$f(x) = 2x + 3, \quad g(x) = x^2$

8. Find the composite function g of h of x and simplify.

$g(x) = x^2, \quad h(x) = -3x$

9. Find the composite function f of h of x evaluated at x equals 1.

$f(x) = 2x + 3, \quad h(x) = -3x$

10. Using all three functions below, find f of g of h of x and simplify completely.

$f(x) = 2x + 3, \quad g(x) = x^2, \quad h(x) = -3x$

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Function Operations and Composition of Functions — Answer Key

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Answer Key

1. Answer: f(3) = 9
- Replace x with 3: f(3) = 2(3) + 3
- Simplify: 6 + 3 = 9

2. Answer: (9, 21)
- The input value is the x-coordinate: x = 9
- The output value is the y-coordinate: y = 21, so the ordered pair is (9, 21)

3. Answer: -15
- Find h(2): -3(2) = -6
- Find g(3): $3^2 = 9$
- Subtract: -6 - 9 = -15

4. Answer: $x^2 + 2x + 3$
- Write the sum: $(2x + 3) + x^2$
- Arrange in standard form: $x^2 + 2x + 3$

5. Answer: $-6x^2 - 9x$
- Multiply: (2x + 3)(-3x)
- Apply the distributive property: $-3x \cdot 2x + (-3x) \cdot 3 = -6x^2 - 9x$

6. Answer: 1/5
- Set up the division: $g(1)/f(1) = 1^2/(2(1)+3)$
- Simplify: 1/5

7. Answer: $2x^2 + 3$
- Start with f(x) = 2x + 3 and replace x with $g(x) = x^2$
- $f(g(x)) = 2(x^2) + 3 = 2x^2 + 3$

8. Answer: $9x^2$
- Start with $g(x) = x^2$ and replace x with h(x) = -3x
- $g(h(x)) = (-3x)^2 = 9x^2$

9. Answer: -3
- Replace x in f(x) with h(x): f(h(x)) = 2(-3x) + 3 = -6x + 3
- Evaluate at x = 1: -6(1) + 3 = -6 + 3 = -3

10. Answer: $18x^2 + 3$

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- First find g(h(x)): replace x in $g(x) = x^2$ with $-3x$ to get $(-3x)^2 = 9x^2$
- Then find f(g(h(x))): replace x in $f(x) = 2x + 3$ with $9x^2$ to get $2(9x^2) + 3 = 18x^2 + 3$

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