

# Combining Functions

## Algebra 1 • Section 4.9

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / 12

### Quick Review and Helpful Hints

A function pairs each input with exactly one output. Pay attention to what the input means, what rule is being applied, and whether the question asks for a value, a rule, a domain, or an interpretation.

▶ **Example:** For  $f(x) = 2x + 5$ , find  $f(4)$ .

**Work:** Replace  $x$  with 4:  $f(4) = 2(4) + 5 = 13$ .

★ **Answer:** 13

### ◆ Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. If  $f(x) = 2x + 1$  and  $g(x) = x - 4$ , find  $(f + g)(x)$ . \_\_\_\_\_

6. If  $f(3) = 10$  and  $g(3) = -2$ , find  $(fg)(3)$ . \_\_\_\_\_

2. Find  $(f - g)(x)$  for  $f(x) = 5x + 2$ ,  $g(x) = x - 7$ . \_\_\_\_\_

7. For  $f(x) = x^2$  and  $g(x) = 3x$ , find  $(f + g)(4)$ . \_\_\_\_\_

3. Find  $(fg)(x)$  for  $f(x) = x + 3$ ,  $g(x) = x - 2$ . \_\_\_\_\_

8. For  $f(x) = 2x$  and  $g(x) = x + 5$ , find  $(f \circ g)(x)$ . \_\_\_\_\_

4. Find  $\left(\frac{f}{g}\right)(x)$  for  $f(x) = x + 1$ ,  $g(x) = x - 5$ . \_\_\_\_\_

9. For  $f(x) = x - 1$  and  $g(x) = x^2$ , find  $(g \circ f)(x)$ . \_\_\_\_\_

5. If  $f(2) = 7$  and  $g(2) = 4$ , find  $(f + g)(2)$ . \_\_\_\_\_

10. Find the domain of  $\frac{x+2}{x^2-4}$ . \_\_\_\_\_

### ◆ Word Problems

11. A discount function subtracts 5, and a tax function multiplies by 1.08. Write tax after discount for price  $p$ . \_\_\_\_\_

12. A height function is  $h(t) = 40 + 3t$  and a bonus function adds 8. Write the combined output. \_\_\_\_\_



## Answer Keys

- |                                |                    |
|--------------------------------|--------------------|
| 1. $3x - 3$                    | 7. $28$            |
| 2. $4x + 9$                    | 8. $2x + 10$       |
| 3. $x^2 + x - 6$               | 9. $(x - 1)^2$     |
| 4. $\frac{x+1}{x-5}, x \neq 5$ | 10. $x \neq -2, 2$ |
| 5. $11$                        | 11. $1.08(p - 5)$  |
| 6. $-20$                       | 12. $48 + 3t$      |

### Step-by-Step Explanations

- Adding functions just means stacking their expressions and gathering like terms.
- Subtract the entire second function, so distribute that minus:  $5x + 2 - (x - 7) = 4x + 9$ .
- Multiplying functions means multiplying the binomials — FOIL through:  $x^2 - 2x + 3x - 6$ .
- Stack one over the other, but remember the bottom can't be zero, so  $x = 5$  is banned.
- When both are evaluated at the same input, you just add the outputs:  $7 + 4 = 11$ .
- For a product at one input, multiply the two outputs together: 10 times  $-2$  is  $-20$ .
- Evaluate each at 4 first — 16 and 12 — then combine them for 28.
- Composition means  $g$  goes inside  $f$ : feed  $x + 5$  into  $f$ , getting  $2(x + 5) = 2x + 10$ .
- Now  $f$  runs first and its result enters  $g$ , so you square the whole  $x - 1$ .
- Factor the denominator into  $(x - 2)(x + 2)$  and exclude whatever makes it zero — both 2 and  $-2$ .
- Order matters: knock off the \$5 first, then the 1.08 tax acts on that lowered price.
- Tacking the bonus on top means  $h(t) + 8$ , and  $40 + 8$  merges into  $48 + 3t$ .



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