Algebra Functions Practice

Use this key to check answers and read the explanations.

1. Which relation has exactly one output for each of its inputs?
   A. {(0, 2), (1, 2), (2, 5)}
   B. {(0, 2), (0, 5), (2, 5)}
   C. {(0, 2), (1, 2), (1, 5)}
   D. {(0, 2), (2, 2), (2, 5)}
   Correct answer: A. {(0, 2), (1, 2), (2, 5)}
   In the pairs (0, 2), (1, 2), and (2, 5), each input occurs with a single output. Different inputs may share the same output.

2. If $f(x) = x^2 + 5x - 1$, what is $f(-3)$?
   A. 23
   B. −25
   C. −7
   D. −5
   Correct answer: C. −7
   Substitute −3 for both occurrences of x. The result is 9 − 15 − 1 = −7.

3. A function has exactly these input–output pairs. (−4, 7), (0, 9), and (6, 7). What is the domain?
   A. {7, 9}
   B. {−4, 0, 6}
   C. {−4, 0, 6, 7, 9}
   D. {−4, 6}
   Correct answer: B. {−4, 0, 6}
   The domain is the set of input values. Read the first coordinate from each pair.

4. A function sends 1 to 9, 2 to 4, 3 to 9, and 4 to 1. Which set is its range?
   A. {1, 2, 3, 4, 9}
   B. {1, 2, 3, 4}
   C. {4, 9}
   D. {1, 4, 9}
   Correct answer: D. {1, 4, 9}
   The range contains the outputs 9, 4, 9, and 1. A set lists the repeated output 9 once.

5. For f(x) = 5x − 11, which input gives the output 9?

A. −2/5
B. 4
C. −4
D. 20

Correct answer: B. 4
Set 5x − 11 equal to 9. Adding 11 gives 5x = 20, so the input is 4.

6. Let f(x) = x + 8 and g(x) = 3x − 2. What is f(g(2))?

A. 12
B. 28
C. 4
D. 10

Correct answer: A. 12
First evaluate g(2) = 4. Then evaluate f at that output to get f(4) = 12.

7. For the original function f(x) = ((x − 7)(x + 4))/(x − 7), which real input must still be excluded after simplifying?

A. Every input between −4 and 7
B. −4
C. Both −4 and 7
D. 7

Correct answer: D. 7
The original denominator is zero at x = 7. Canceling the common factor simplifies the rule for permitted inputs, leaving 7 outside the domain.

8. Which describes the real inputs for h(x) = √(4 − 3x)?

A. x < 4/3
B. x ≥ 4/3
C. x ≤ 4/3
D. All real x

Correct answer: C. x ≤ 4/3
A real square root allows a zero or positive radicand. Solving 4 − 3x ≥ 0 gives x ≤ 4/3.

9. Let f(x) = 4x − 6. Which rule reverses f for every real number?

A. Add 6, then divide by 4.
B. Divide by 4, then add 6.
C. Subtract 6, then divide by 4.
D. Multiply by 4, then add 6.

Correct answer: A. Add 6, then divide by 4.
The original rule multiplies by 4 and then subtracts 6. Undo those steps in reverse order.

10. If $f(x) = (x + 5)^2 - 4$ for every real x, which values can f(x) take?

A. All real values strictly greater than −4
B. All real values at least 5
C. All real values no greater than −4
D. All real values at least −4

Correct answer: D. All real values at least −4
The square is at least zero and reaches zero when x = −5. Subtracting 4 gives a minimum of −4, and the output can grow without bound.

11. Let $f(x) = \sqrt{(x - 1)}$ and $g(x) = 3 - 2x$. What is the largest real input allowed for f(g(x))?

A. 3/2
B. 2
C. 1
D. No largest input

Correct answer: C. 1
The composition has radicand (3 − 2x) − 1, or 2 − 2x. It must be at least zero, so x can be at most 1.

12. A function maps 1 to 6 and 2 to 9. Which additional mapping keeps the resulting function one-to-one?

A. 3 maps to 6
B. 3 maps to 8
C. 3 maps to 9
D. 2 maps to 8

Correct answer: B. 3 maps to 8
Input 3 and output 8 are both unused. The addition gives one output for each input and a different output for every input.

13. The function $f(x) = (x - 3)^2 + 2$ is restricted to $x \le 3$. If y = f(x), which expression recovers x for every $y \ge 2$?

A. $\sqrt{(y - 2)} - 3$
B. $3 + \sqrt{(y - 2)}$
C. $2 - \sqrt{(y - 3)}$
D. $3 - \sqrt{(y - 2)}$

Correct answer: D. $3 - \sqrt{(y - 2)}$
Solving gives x − 3 equal to either square-root sign. The restriction $x \le 3$ requires the nonpositive branch $x - 3 = -\sqrt{(y - 2)}$.

14. Let $f(x) = x - 3$ and $g(x) = x^2$. For which real x does $f(g(x)) = g(f(x))$?

A. 2
B. -2
C. 1
D. 3

Correct answer: A. 2
The two sides are $x^2 - 3$ and $(x - 3)^2$. Expanding and canceling x^2 gives $-3 = -6x + 9$, so $x = 2$.

15. An invertible function satisfies $f(2) = 7$, $f(4) = 5$, and $f(6) = 9$. A second function satisfies $g(2) = 6$, $g(4) = 2$, and $g(6) = 4$. What is $g(f^{-1}(f(g(2))))$?

A. 5
B. 2
C. 4
D. 9

Correct answer: C. 4
The innermost g sends 2 to 6. The pair f and its inverse sends 6 to 9 and back to 6. The final g maps 6 to 4.