

# Composition, Inverses, and Modeling with Functions

Composite functions, inverse functions, and constructing functions from context.

Name \_\_\_\_\_ Date \_\_\_\_\_

32 main 2-up grid 2 pages

### Completion Reward



Shown here as a small pack artifact, not a preview destination.

## 1. What does $f(g(x))$ mean?

x	g(x)	f(g(x))
3	5	11
4	6	13

In  $f(g(x))$ , evaluate the inside function first and then use that result as the input to the outside function.

- A. Use the output of  $g$  as the input of  $f$ .
- B. Multiply  $f$  and  $g$ .
- C. Find the inverse of  $f$  first.
- D. Add the inputs of  $f$  and  $g$ .

## 4. In a cost model $C(x)$ , what does $x$ usually represent?

- A. The cost itself
- B. The input quantity being used to determine cost
- C. The graph's slope only
- D. The y-intercept only

## 7. Which is done first in $f(g(4))$ ?

- A.  $f(4)$
- B.  $g(4)$
- C.  $f(g)$
- D. the inverse of  $f$

## 10. Which model shows a \$15 fixed fee plus \$2 per ticket?

- A.  $C(t) = 2 + 15t$
- B.  $C(t) = 17t$
- C.  $C(t) = 15 + 2t$
- D.  $C(t) = 15 / 2t$

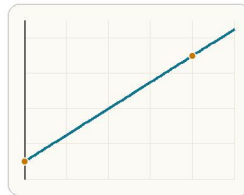
## 2. What does an inverse function do?

f	$f^{-1}$
2 $\rightarrow$ 9	9 $\rightarrow$ 2
4 $\rightarrow$ 11	11 $\rightarrow$ 4

If  $f$  maps an input to an output,  $f^{-1}$  sends that output back to the original input.

- A. It multiplies all outputs by  $-1$ .
- B. It always takes reciprocals.
- C. It forces the graph to be quadratic.
- D. It reverses the original input-output mapping.

## 5. In $C(x) = 20 + 3x$ , what does the 20 represent?



In a linear cost model, the intercept is the fixed fee and the slope is the added cost per unit.

- A. A fixed starting cost
- B. The number of items
- C. A percent growth rate
- D. The inverse input

## 8. What should happen when a function and its inverse are composed?

- A. The output should always double.
- B. The graph should become quadratic.
- C. The domain should disappear.
- D. The original input should come back.

## 11. Which model shows an initial amount of 100 that grows by 10% each period?

- A.  $A(t) = 100 + 10t$
- B.  $A(t) = 100(1.1)^t$
- C.  $A(t) = 110t$
- D.  $A(t) = 10(100)^t$

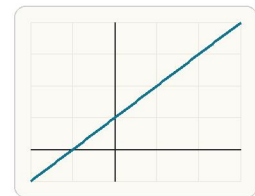
## 3. Why must a function be one-to-one to have an inverse that is also a function?

- A. Otherwise the graph would not have a y-intercept.
- B. Otherwise the domain would have to be empty.
- C. Repeated outputs would force one inverse input to map to multiple outputs.
- D. Otherwise the function would become linear.

## 6. Which notation names the inverse function of $f$ ?

- A.  $f^{-1}(x)$
- B.  $1 / f(x)$
- C.  $-f(x)$
- D.  $f(x)^{-1}$  only

## 9. Which graph description is most likely one-to-one?



A one-to-one graph gives a unique output for each input and a unique input for each output, which makes an inverse possible.

- A. A parabola opening upward
- B. A circle
- C. A line with nonzero slope
- D. A horizontal line

## 12. If $f$ sends 2 to 9, what must $f^{-1}$ send 9 to?

original	inverse
2 $\rightarrow$ 9	9 $\rightarrow$ 2
5 $\rightarrow$ 14	14 $\rightarrow$ 5

If the original function sends 2 to 9, the inverse must send 9 back to 2.

- A. 9
- B. 2
- C.  $-2$
- D. 0

13. What is the best first step when finding the inverse of  $y = 2x + 7$ ?
- Take a reciprocal.
  - Swap  $x$  and  $y$ .
  - Square both sides.
  - Set  $y$  equal to 0.
14. What is the best first step when finding  $g(f(3))$ ?
- Evaluate  $g(3)$  first.
  - Swap  $x$  and  $y$ .
  - Evaluate  $f(3)$  first.
  - Take a reciprocal.
15. A student says  $f^{-1}(x)$  always means  $1 / f(x)$ . What is the mistake?
- Inverse notation names a reversed mapping, not a reciprocal output.
  - They should square the function first.
  - They should replace  $x$  with 0.
  - They should change the slope sign only.
16. If  $f(x) = 2x + 1$  and  $g(x) = x - 3$ , find  $f(g(5))$ . Answer with a number.
17. If  $f(x) = 2x + 1$  and  $g(x) = x - 3$ , find  $g(f(4))$ . Answer with a number.
18. If  $h(x) = 3x - 4$ , find  $h^{-1}(11)$ . Answer with a number.
19. If  $C(x) = 20 + 3x$ , find  $C(4)$ . Answer with a number.
20. If  $C(F) = (F - 32) * 5 / 9$ , find  $C(68)$ . Answer with a number.
21. If  $p(x) = x^2$  and  $q(x) = x + 2$ , find  $p(q(3))$ . Answer with a number.
22. If  $f(x) = x + 1$  and  $g(x) = \sqrt{x}$ , find  $f(g(9))$ . Answer with a number.
23. If  $R(q) = 12q$ , find  $R(7)$ . Answer with a number.
24. Which student correctly writes  $f(g(x))$  when  $f(x) = x + 4$  and  $g(x) = 2x - 1$ ?
- Student B:  $f(g(x)) = x + 4 + 2x - 1$  without substitution.
  - Student C:  $f(g(x)) = 2(x + 4) - 1$ .
  - Student D:  $f(g(x)) = x + 4(2x - 1)$ .
  - Student A:  $f(g(x)) = (2x - 1) + 4$ .
25. If  $f(x) = 3x - 1$  and  $g(x) = x^2$ , write  $f(g(x))$ . Answer as an equation.
26. If  $f(x) = 3x - 1$  and  $g(x) = x^2$ , write  $g(f(x))$ . Answer as an equation.
27. Find the inverse of  $f(x) = 2x + 3$ . Answer as an equation.
28. Find the inverse of  $g(x) = 5x - 1$ . Answer as an equation.
29. Write the Celsius conversion model in terms of Fahrenheit  $F$ . Answer in the form  $C = \dots$
30. Write a revenue model for \$12 per ticket sold, using  $q$  for tickets. Answer in the form  $R = \dots$
31. Write a cost model with \$20 fixed cost and \$3 per item, using  $x$  for items. Answer in the form  $C = \dots$
32. If shipping adds \$6 after item cost  $p(x)$ , write the composite rule. Answer as an expression in terms of  $p(x)$ .