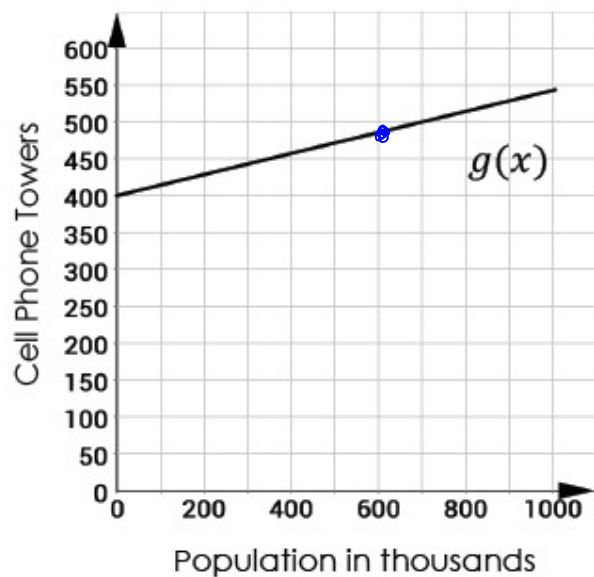
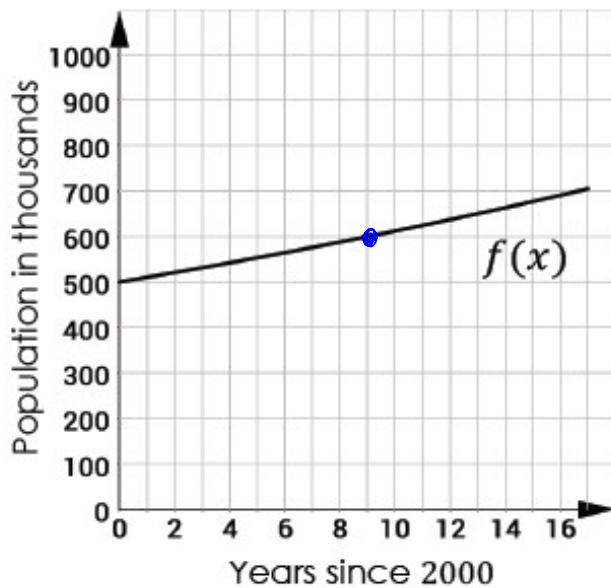


Consider the graph below of $f(x)$, which shows the population in thousands of a small town since 2000. The graph of $g(x)$ shows the number of cell phone towers based on the population in the same town since 2000.



What is the value of $f(9)$, and what does it represent in the context of this example? *600,000 people in 2009*

What is the value of $g(600)$, and what does it represent in the context of this example? *approximately 480 cell towers*

What is the value of $g(f(9))$ and what does it represent in the context of this example?

There are approximately 480 cell phone towers when there is a population of 600,000 in 2009.

In general, what can we say about $g(f(x))$ in the context of this situation?

The number of cell phones towers increases as the population increases since 2000.

Let's Practice! \circ means $\circ f$

1. Consider $f(x) = x^2 - 5x + 2$ and $g(x) = -4x$.

a. Find $(f \circ g)(2)$.

$$1. g(2) = -4(2)$$

$$g(2) = -8$$

$$(f \circ g)(2) = 106$$

$$f(-8) = (-8)^2 - 5(-8) + 2$$

$$f(-8) = 64 + 40 + 2$$

$$f(-8) = 106$$

b. Find $g(f(2))$.

$$f(2) = (2)^2 - 5(2) + 2$$

$$f(2) = 4 - 10 + 2$$

$$f(2) = -4$$

$$g(-4) = -4(-4)$$

$$g(-4) = 16$$

$$g(f(2)) = 16$$

c. Find $f(g(-3))$.

$$g(-3) = -4(-3)$$

$$g(-3) = 12$$

$$f(12) = (12)^2 - 5(12) + 2$$

$$f(12) = 144 - 60 + 2$$

$$f(12) = 86$$

$$f(g(-3)) = 86$$

d. Find $(g \circ f)(-3)$.

$$f(-3) = (-3)^2 - 5(-3) + 2$$

$$f(-3) = 9 + 15 + 2$$

$$f(-3) = 26$$

$$g(-3) = -4(26)$$

$$g(-3) = -104$$

$$(g \circ f)(-3) = -104$$

Try It!

2. Consider $f(x) = x - 3$ and $g(x) = x^2$.

a. Find $(f \circ g)(x)$.

$$(f \circ g)(x) = x^2 - 3$$

b. Find $(g \circ f)(x)$.

$$(g \circ f)(x) = (x-3)^2 \rightarrow \begin{array}{l} (x-3)(x-3) \\ x^2 - 3x - 3x + 9 \end{array}$$

$$(g \circ f)(x) = x^2 - 6x + 9$$

BEAT THE TEST!

1. Consider the following functions.

$$f(x) = 2x$$

$$g(x) = \sqrt{x}$$

$$h(x) = x^2 + 3$$

Match the functions below with their compositions.

D $H(x) = \sqrt{x^2 + 3}$ **A.** $(g \circ f)(x)$

A $G(x) = \sqrt{2x}$ **B.** $(h \circ g)(x)$

~~E~~ $F(x) = 4x^2 + 3$ **C.** $(f \circ g)(x)$

F $H(x) = 2x^2 + 6$ **D.** $(g \circ h)(x)$

C $G(x) = 2\sqrt{x}$ **E.** $(h \circ f)(x)$

B $F(x) = x + 3$ **F.** $(f \circ h)(x)$

Assignment: Practice workbook

Section 1: Topic 5