NAME DATE PERIOD

Lesson 4: Pulling a Rabbit Out of the Hat

Solidify Understanding

Jump Start

Fill in the blanks with words, numbers, or algebraic expressions that make the statement true.

If $f($_____$) =$ _____, then $f^{-1}($_____$) =$ _____.

Explain why your statement is true.

Learning Focus

Understand the input-output relationship between a function and its inverse.

Find the inverse of a function.

How can we be sure that two functions are inverses?

How can we find inverse functions?

Open Up the Math

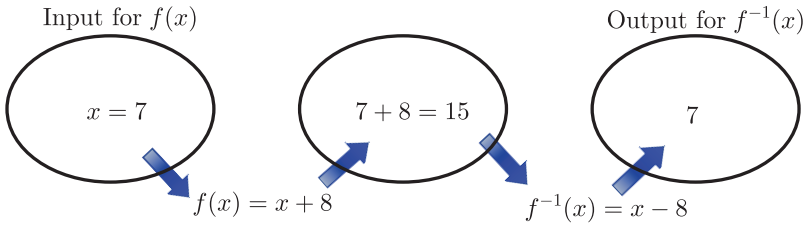
Launch, Explore, Discuss

I have a magic trick for you:

- Pick a number, any number
- Add 6
- Multiply the result by 2
- Subtract 12
- Divide by 2
- The answer is the number you started with!

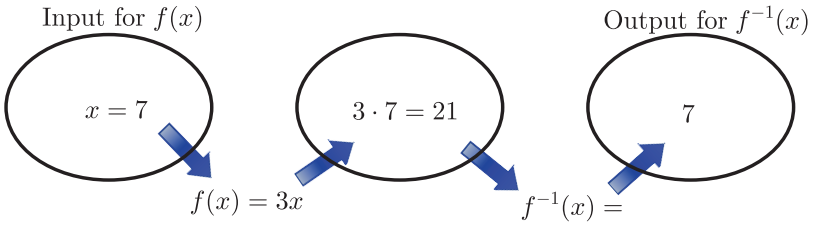
People are often mystified by such tricks, but those of us who have studied inverse operations and inverse functions can easily figure out how they work and even create our own number tricks. Let's get started by figuring out how inverse functions work together.

NAME DATE PERIOD



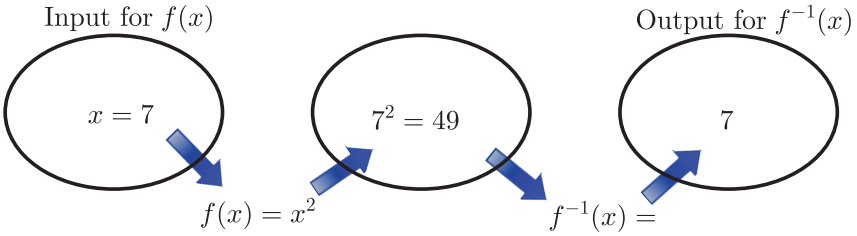
Inverse in words:
Subtract 8 from the result

1.



Inverse in words:

2.

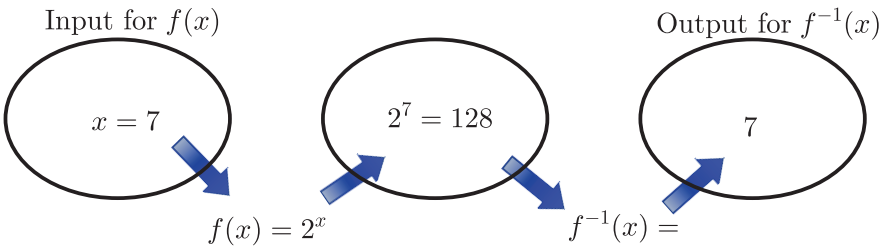


Inverse in words:

Pause and Reflect

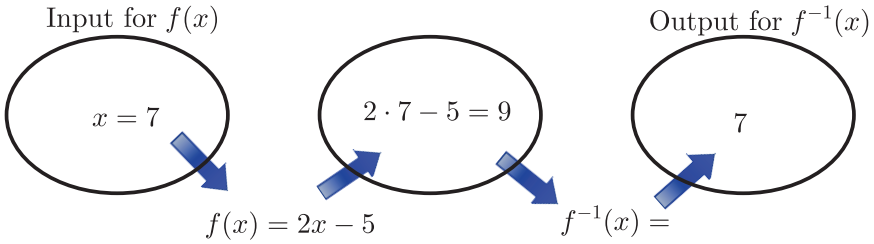
NAME DATE PERIOD

3.



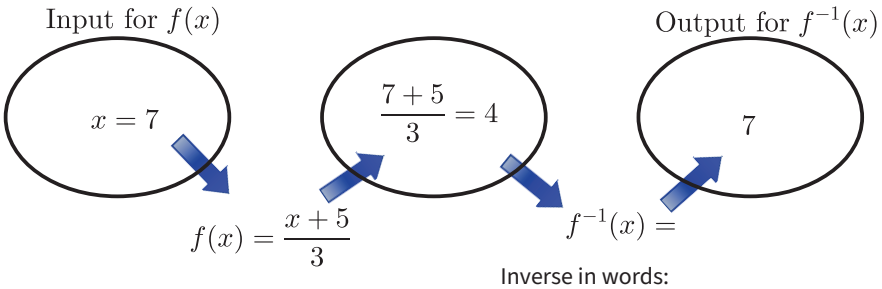
Inverse in words:

4.



Inverse in words:

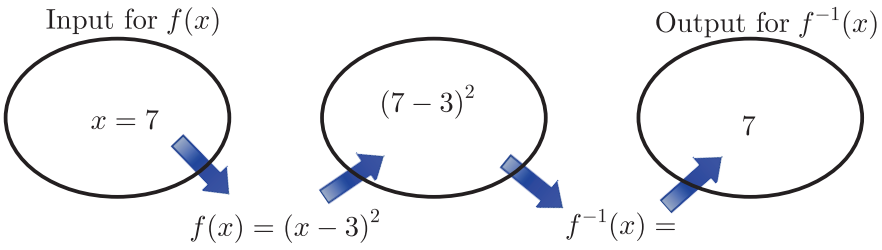
5.



Inverse in words:

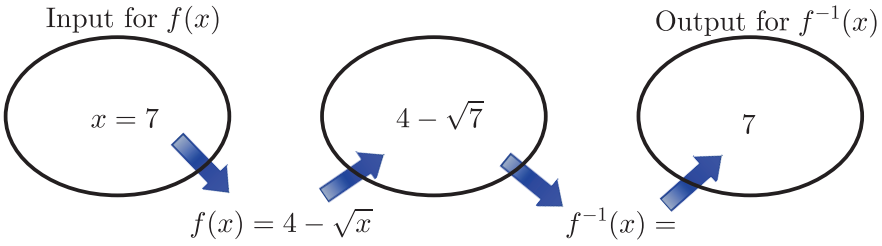
NAME DATE PERIOD

6.



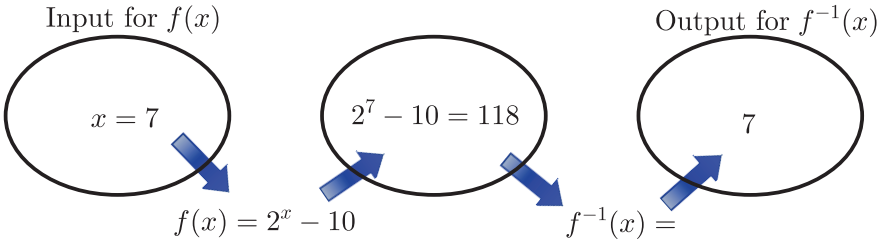
Inverse in words:

7.



Inverse in words:

8.



Inverse in words:

9. Each of these problems begins with $x = 7$. What is the difference between the x used in $f(x)$ and the x used in $f^{-1}(x)$?

NAME DATE PERIOD

10. In #6, could any value of x be used in $f(x)$ and still give the same output from $f^{-1}(x)$? Explain. What about #7?

11. Based on your work in this task and the other tasks in this unit, what relationships do you see between functions and their inverses?

Ready for More?

The task began with a magic number trick. Impress your friends by writing your own magic number trick that includes as many operations as you can. Write the trick in words, and then use symbols to show why it works algebraically.

Takeaways

The definition of inverse functions:

The equation of the inverse of a function has the inverse operations in the opposite order.

NAME DATE PERIOD

To find the inverse of a function:

Example:

Build the Function: ⬇ $y = \frac{-2(x+3)}{6}$	**Operation:**	**Inverse Operation:**	**Inverse Function:**
	Start	End	
	Switch ➡		Build Inverse ⬆

Alternatively:

- **To find the inverse of a function:**

Example:

NAME DATE PERIOD

Function: $y = \frac{-2(x+3)}{6}$

Lesson Summary

In this lesson, we learned that the equation of the inverse function has the inverse operations in the reverse order of the original function. Using this idea, we learned a method for finding the inverse of a function if the function is invertible or the domain has been restricted to make it invertible.

Retrieval

1. Write an equivalent expression for $7^{-9} \cdot 7^4$. Leave your answer in exponential form with only positive exponents.

2. $f(x) = \frac{-2(x+3)}{6}$ and $g(x) = \frac{6x}{-2} - 3$

   Calculate $f(g(x))$ and $g(f(x))$.