Composition of Functions.
9.16.15

A ***composition of functions*** is when one function operation uses the output from one function as the input of a second function.

Composition of Functions

The composition of functions f and g is notated

$$(f \circ g)(x) = f(g(x)).$$

The domain of $(f \circ g)(x)$ is all values of x in the domain of g such that $g(x)$ is in the domain of f.

$$f(x) = x + 2$$
$$f(3) = (3) + 2$$
$$f(x + 2) = (x + 2) + 2$$
$$f(g(x)) = (g(x)) + 2$$

I Try:

$Given\ f(x) = x + 2\ and\ g(x) = x^2$

Solve for $(f \circ g)(x)$

Given	$f(x) = x + 2$ $g(x) = x^2$ Solve for $f(g(x))$
Set up the composition	$f(g(x)) = g(x) + 2$
Simplify	$f(x^2) = x^2 + 2$

I Try:

$Given\ f(x) = x + 2\ and\ g(x) = x^2$

Solve for $(g \circ f)(x)$

Given	$f(x) = x + 2$ $g(x) = x^2$ Solve for $g(f(x))$
Set up the composition	$g(f(x)) = (f(x))^2$
Simplify	$g(x + 2) = (x + 2)^2$ $= (x + 2)(x + 2)$ $= x^2 + 2x + 2x + 4$ $= x^2 + 4x + 4$

We Try:

$Given\ f(x) = 3x\ and\ g(x) = x^2 - 1$

Solve for $(g \circ f)(x)$

Given	$f(x) = 3x$ $g(x) = x^2 - 1$ Solve for:
Set up the composition	
Simplify	

We Try:

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

Solve for $(f \circ g)(x)$

Given	$f(x) = 3x$ $g(x) = 3x^2 - x$ Solve for:
Set up the composition	
Simplify	

You Try with your partners on the whiteboards.
Right column talks, Left column writes.

$Given\ f(x) = -2x\ and\ g(x) = x^2 + 2x$

Solve for $(f \circ g)(x)$

Given	$f(x) = -2x$ $g(x) = x^2 + 2x$
Set up the composition	
Simplify	

You Try with your partners on the whiteboards.
Left column talks, Right column writes.

$Given\ f(x) = -2x\ and\ g(x) = x^2 + 2x$

Solve for $(g \circ f)(x)$

Given	$(x) = -2x$ $g(x) = x^2 + 2x$
Set up the composition	
Simplify	

I Try:

Evaluating Composite Functions

$Given\ f(x) = x + 2\ and\ g(x) = x^2$

Solve for $(f \circ g)(5)$

Given	$f(x) = x + 2$ $g(x) = x^2$ Solve for $f(g(5))$
Set up the composition	$f(g(x)) = g(x) + 2$
Simplify	$f(x^2) = x^2 + 2$
Plug in value	$f(g(5)) = 5^2 + 2$ $= 25 + 2$ $= 27$

I Try:

$Given\ f(x) = x + 2\ and\ g(x) = x^2$

Solve for $(g \circ f)(5)$

Given	$f(x) = x + 2$ $g(x) = x^2$ Solve for $g(f(5))$
Set up the composition	$g(f(x)) = (f(x))^2$
Simplify	$g(x+2) = (x+2)^2$ $= (x+2)(x+2)$ $= x^2 + 2x + 2x + 4$ $= x^2 + 4x + 4$
Plug in Value	$g(f(5)) = 5^2 + 4(5) + 4$ $= 25 + 20 + 4$ $= 49$

We Try:

$Given\ f(x) = -x\ and\ g(x) = x^2 + 1$

Solve for $(g \circ f)(-2)$

Given	$f(x) = 3x$ $g(x) = x^2 - 1$ Solve for:
Set up the composition	
Simplify	
Plug in Value	

You Try with your partners on the whiteboards.
Right column talks, Left column writes.

$Given\ f(x) = -2x\ and\ g(x) = x^2 + 2x$

Solve for $(f \circ g)(-1)$

Given	$f(x) = -2x$ $g(x) = x^2 + 2x$
Set up the composition	
Simplify	

You Try with your partners on the whiteboards.
Left column talks, Write column writes.

$Given\ f(x) = x + 1\ and\ g(x) = -2x$

Solve for $(f \circ g)(-2)$

Given	$f(x) = x + 1$ $g(x) = -2x$
Set up the composition	
Simplify	