

## Answers to Function Practice

1) 48

5) -3

9)  $-3 - 3b$

13) 82

17)  $7n + 2$

2) 79

6)  $2 + a$

10)  $8x - 5$

14)  $\frac{13}{6}$

18)  $3n^3 + n + 3$

3) 4

7)  $4a - 12$

11) 97

15) -1

19)  $\frac{3x-2}{x^2-4}$

4) 26

8)  $8 - 4a$   $4(2-a)$

12) 9

16)  $-x^2 - 3x - 4$

20)  $2x^2 - 4x + 4$

⑪

$4g(6) - 3h(6)$

$$g(6) = (6)^2 - 2$$

$$= 34$$

$$h(6) = 3(6) - 5$$

$$= 13$$

$$4(34) - 3(13)$$

$$136 - 39$$

$$97$$

⑭

$g(-3) \div h(-3)$

$$g(-3) = 3(-3)^2 - 1$$

$$= 26$$

$$h(-3) = -4(-3) = 12$$

$$\frac{26}{12} = \frac{13}{6}$$

⑯  $h(1+a)$

$$h(t) = t + 1$$

$$= (1+a) + 1$$

$$= \underline{1+a+1} = a+2$$

## Composition of Functions

Ways to show functions are being composed:  $h(x)$   $g(x)$

- $h(g(x))$
- $h \circ g(x)$

What does it mean to compose two functions?

To take one function and plug into another

Always start with the inside and move to the outside

DANGER:  $h \circ g(x)$  is not  $h \cdot g(x)$   
 (composition)                      multiplication

$h(g(x)) \neq g(h(x))$   
 \*  
 Not the same

Example:  $f(x) = 2x+3$  and  $g(x) = x^2$

"x" is just a placeholder, and to avoid confusion let's just call it "input":

$$f(\text{input}) = 2(\text{input})+3$$

$$g(\text{input}) = (\text{input})^2$$

So, let's start:

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

First we apply  $f$ , then apply  $g$  to that result:



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

$$(2x+3)(2x+3)$$

$$4x^2 + 6x + 6x + 9$$

$$4x^2 + 12x + 9$$

## Examples

$f(x) = x^2 - 3x + 1$	$g(x) = 5x - 7$	$h(x) = -3x + 2$
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1. Find  $g(f(2))$

$$f(2) = (2)^2 - 3(2) + 1$$

$$f(2) = -1$$

$$g(-1) = 5(-1) - 7 = -12$$

$$g(f(2)) = -12$$

3. Find  $h(f(x))$

$$h(f(x)) = -3(x^2 - 3x + 1) + 2$$

$$= -3x^2 + 9x - 3 + 2$$

$$h(f(x)) = -3x^2 + 9x - 1$$

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

$$g(2) = 5(2) - 7 = 3$$

$$f(3) = (3)^2 - 3(3) + 1$$

$$f(3) = 1$$

$$f(g(2)) = 1$$

4. Find  $f(h(x))$

$$f(h(x)) = (-3x+2)^2 - 3(-3x+2) + 1$$

$$(-3x+2)(-3x+2) + 9x - 6 + 1$$

$$9x^2 - 6x - 6x + 4 + 9x - 6 + 1$$

$$f(h(x)) = 9x^2 - 3x - 1$$

