

## SM3 5.4 Compose Functions

Vocab:

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

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

The  $\circ$  operator is a small, centered circle. It is said "composed with" or "of", for short. It means to evaluate the left side function of the right side function.

Problems:

Given  $f(x) = 2x + 5$  and  $g(x) = 3x - 2$ , simplify the expressions:

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

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

3)  $(f \circ g)(2)$

4)  $(g \circ f)(0)$

5)  $(f \circ f)(x)$

6)  $(g \circ g)(x)$

7)  $(f \circ f)(9)$

8)  $(g \circ g)(-1)$

Given  $f(x) = \{(1, 1), (2, 3), (4, 2), (3, 4), (5, 0)\}$  and  $g(x) = \{(0, 1), (1, 2), (2, 3), (3, 4), (4, 5)\}$ , simplify the expressions.

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

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

11)  $(g \circ f)(4)$

12)  $(f \circ g)(2)$

Given  $c(x) = \{(1, 2), (2, 3), (3, 4), (4, 1)\}$  and  $d(x) = \{(1, 3), (2, 4), (3, 1)\}$ , simplify the expressions:

13)  $(c \circ d)(x)$

14)  $(d \circ c)(x)$

15)  $(c \circ d)(2)$

16)  $(d \circ c)(3)$

Given  $r(x) = 4x$ ,  $s(x) = x^2$ , and  $t(x) = x - 3$ , simplify the expressions:

17)  $(r \circ s)(x)$

18)  $(s \circ t)(x)$

19)  $(r \circ s \circ t)(x)$

20)  $(r \circ t \circ s)(x)$

21)  $(s \circ s \circ s)(x)$

22)  $(t \circ r \circ s \circ t)(4)$

Application: You are an investment broker at Wytiaz Brokerage Firm with access to information about how different banks will pay for access to your clients' funds. Goliath National Bank (GNB) pays \$52 if you invest your money with them for a year. First Brooklyn Savings Bank (FBSB) pays 5% of your investment if you invest your money with them for a year.

Write a function,  $g(x)$ , that models the money you could earn from the first bank (GNB) in one year:

23)  $g(x) =$

Write a function,  $f(x)$ , that models the money you could earn from the second bank (FBSB) in one year:

24)  $f(x) =$

Write a composition of functions that models the money you could earn by investing for a year in the second bank, then withdrawing your funds and investing in the first bank for a year:

25)

26) An important client's daughter has \$1000 to invest for two years. Mr. Wytiaz wants you to come up with the best plan for her yearly investments in order to maximize her money. Devise such a plan and write a sentence or two explaining why your plan is the best plan. Note that when writing to your boss, you should try and seem impressive and worthy of promotion!