

Function Mashups

Build new rules by linking functions in order.

HIGH SCHOOL · MA.912.F.3

MA.912.F.3 "Create new functions from existing functions."

NAME _____

DATE _____

COMPOSE IN ORDER

To make a composite function, feed the output of the inside function into the outside function. In $(f \circ g)(x)$, do g first, then substitute its whole output wherever you see x in f . Use parentheses around the inside rule before you simplify.

WORKED EXAMPLE

Let $f(x) = 4x - 9$ and $g(x) = x + 5$.
Find $(f \circ g)(x)$.

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

$$2. = f(x + 5)$$

$$3. = 4(x + 5) - 9$$

$$4. = 4x + 11$$

Answer: $(f \circ g)(x) = 4x + 11$

PRACTICE 6 problems

1 Let $f(x) = 2x + 1$ and $g(x) = x + 3$. Find $(f \circ g)(x)$.

ANSWER _____

2 Let $p(x) = x^2 + 6$ and $q(x) = 3x$. Find $(q \circ p)(x)$.

ANSWER _____

3 Let $h(x) = 7x - 2$ and $k(x) = x^2$. Find $(h \circ k)(x)$.

ANSWER _____

4 Let $r(x) = x + 8$ and $s(x) = 2x$. Find $(r \circ s)(-1)$.

ANSWER _____

5 Let $a(x) = x^2 + 2$ and $b(x) = x - 1$. Find $(b \circ a)(x)$.

ANSWER _____

6 Let $m(x) = 6x - 1$ and $n(x) = x + 2$. Find $(n \circ m)(x)$.

ANSWER _____

APPLY IT Show your work

- 1** A student posts x short videos for a school club. The sharing function is $g(x) = 2x + 1$, where the output is the number of shares. The club point function is $f(x) = 7x + 3$, where the input is the number of shares. Find $f(g(x))$. Then state what the new function tells you.

WORK SPACE

ANSWER _____

- 2** A student orders x custom stickers for a team fundraiser. The price before a coupon is $p(x) = 8x + 6$ dollars. A coupon changes any price using $c(x) = x - 7$. Find $c(p(x))$, then find the final cost when $x = 3$.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Let $f(x) = 2x + 3$, $g(x) = x^2 + 1$, and $h(x) = x + 3$. Find $f(g(h(x)))$. Show the substitution steps.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let $f(x) = 2x + 1$ and $g(x) = x + 3$. Find $(f \circ g)(x)$.	$(f \circ g)(x) = 2x + 7$
2	Let $p(x) = x^2 + 6$ and $q(x) = 3x$. Find $(q \circ p)(x)$.	$(q \circ p)(x) = 3x^2 + 18$
3	Let $h(x) = 7x - 2$ and $k(x) = x^2$. Find $(h \circ k)(x)$.	$(h \circ k)(x) = 7x^2 - 2$
4	Let $r(x) = x + 8$ and $s(x) = 2x$. Find $(r \circ s)(-1)$.	6
5	Let $a(x) = x^2 + 2$ and $b(x) = x - 1$. Find $(b \circ a)(x)$.	$(b \circ a)(x) = x^2 + 1$
6	Let $m(x) = 6x - 1$ and $n(x) = x + 2$. Find $(n \circ m)(x)$.	$(n \circ m)(x) = 6x + 1$

PART 2 · APPLY IT

1. **$f(g(x)) = 14x + 10$. It gives the club's points from x posted videos.** Substitute $2x + 1$ into f : $f(g(x)) = 7(2x + 1) + 3 = 14x + 10$. The composite connects videos directly to club points.
2. **$c(p(x)) = 8x - 1$, and the final cost for 3 stickers is \$23.** Apply the coupon to the full price: $c(p(x)) = (8x + 6) - 7 = 8x - 1$. Substituting $x = 3$ gives 23.

CHALLENGE

$h(x) = x + 3$; $g(h(x)) = (x + 3)^2 + 1 = x^2 + 6x + 10$; $f(g(h(x))) = 2x^2 + 12x + 23$.

Accept equivalent forms that correctly preserve the order of composition, such as $2(x + 3) + 1$ for Problem 1. For word problems, accept a correct formula with an accurate context statement and dollar notation.