

Function Chain Quest

Build outputs by feeding one function into another.

HIGH SCHOOL • MA.912.F.3.5

MA.912.F.3.5 "Solve mathematical and real-world problems involving composite functions."

NAME _____

DATE _____

THE BIG IDEA

A composite function, written $(f \circ g)(x)$, means put x into g first, then put that result into f . Work from the inside function to the outside function, and substitute carefully.

WORKED EXAMPLE

Let $f(x)=x+11$ and $g(x)=x-13$. Find $(f \circ g)(17)$.

1. Evaluate inside: $g(17)=17-13=4$.

2. Use that output in f : $f(4)=4+11=15$.

Answer: $(f \circ g)(17)=15$

PRACTICE 6 problems

1 Let $f(x)=x+6$ and $g(x)=3x$. Find $(f \circ g)(2)$.

ANSWER _____

2 Let $f(x)=x^2$ and $g(x)=x-8$. Find $(g \circ f)(9)$.

ANSWER _____

3 Let $p(x)=12-x$ and $q(x)=x^2+7$. Find $p(q(x))$.

ANSWER _____

4 Function t has $t(0)=6$. Function u has $u(6)=8$. Find $(u \circ t)(0)$.

ANSWER _____

5 Let $f(x)=x/7+6$ and $g(x)=8x$. Find $(f \circ g)(x)$.

ANSWER _____

6 Let $f(x)=x^2+9$ and $g(x)=12-x$. Find $(g \circ f)(x)$.

ANSWER _____

APPLY IT Show your work

- 1** A gaming club uses $g(w)=w+7$ to give badge points for w tournament wins. It then uses $f(p)=2p+3$ to turn p badge points into prize tickets. If you have 9 wins, how many prize tickets do you have after both rules?

WORK SPACE

ANSWER _____

- 2** Your film club estimates raw footage with $g(c)=3c$, where c is the number of short clips. The editor uses $f(r)=r-8$ to find the minutes in the final cut after trimming r raw minutes. If the club starts with 10 clips, how many minutes are in the final cut?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Let $f(x)=2x+7$ and $g(x)=x^2-6$. Solve $(f \circ g)(x)=31$. Explain your reasoning with an equation.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Let $f(x)=x+6$ and $g(x)=3x$. Find $(f \circ g)(2)$.	12
2	Let $f(x)=x^2$ and $g(x)=x-8$. Find $(g \circ f)(9)$.	73
3	Let $p(x)=12-x$ and $q(x)=x^2+7$. Find $p(q(x))$.	$5-x^2$
4	Function t has $t(0)=6$. Function u has $u(6)=8$. Find $(u \circ t)(0)$.	8
5	Let $f(x)=x/7+6$ and $g(x)=8x$. Find $(f \circ g)(x)$.	$8x/7+6$
6	Let $f(x)=x^2+9$ and $g(x)=12-x$. Find $(g \circ f)(x)$.	$3-x^2$

PART 2 • APPLY IT

- 35 prize tickets** Compute $g(9)=16$ badge points. Then compute $f(16)=35$ prize tickets.
- 22 minutes** Compute $g(10)=30$ raw minutes. Then compute $f(30)=22$ minutes.

CHALLENGE

$2(x^2-6)+7=31$, so $x^2=18$. Therefore, $x=3\sqrt{2}$ or $x=-3\sqrt{2}$.

Accept equivalent algebraic forms, including $8x/7+6$ or $(8x+42)/7$. For the challenge, accept $x=3\sqrt{2}$ or $x=-3\sqrt{2}$, or $x=\pm 3\sqrt{2}$.