Inside First

Does the claim use the functions in the right order?

A1P.AF.E.17.b "Use function composition to combine different types of standard functions to write and evaluate functions."

NAME _____ DATE _____

MATCHES THE ORDER

For $(f \circ g)(a)$, apply g to a first, then apply f to the result. A MATCH claim gives that value.

$p(x)=|x|$, $q(x)=x+7$. The claim $(p \circ q)(-9)=2$ is a MATCH because $q(-9)=-2$ and $p(-2)=2$.

REVERSES THE ORDER

A REVERSED claim applies f first, then g. It gives $(g \circ f)(a)$ instead of the requested $(f \circ g)(a)$.

$r(x)=x^3$, $s(x)=2x$. The claim $(r \circ s)(3)=54$ is REVERSED because $r(3)=27$ and $s(27)=54$.

1 SORT

8 items

Circle MATCH or REVERSED for each claim, then choose two items and show the steps that prove your choices.

1. $f(x)=x^2$, $g(x)=x+3$. Claim: $(f \circ g)(1)=16$ MATCH REVERSED

2. $f(x)=\sqrt{(x)}$, $g(x)=x^2+9$. Claim: $(f \circ g)(4)=5$ MATCH REVERSED

3. $f(x)=3x-2$, $g(x)=|x|$. Claim: $(f \circ g)(-2)=8$ MATCH REVERSED

4. $f(x)=1/x$, $g(x)=x+2$. Claim: $(f \circ g)(2)=1/4$ MATCH REVERSED

5. $f(x)=2^x$, $g(x)=x-1$. Claim: $(f \circ g)(3)=7$ MATCH REVERSED

6. $f(x)=x^2$, $g(x)=\sqrt{(x)}+1$. Claim: $(f \circ g)(9)=10$ MATCH REVERSED

7. $f(x)=|x-5|$, $g(x)=4-x$. Claim: $(f \circ g)(1)=2$ MATCH REVERSED

8. $f(x)=x^2+2$, $g(x)=3x$. Claim: $(f \circ g)(2)=18$ MATCH REVERSED

2 PROVE IT

Explain your thinking

Pick two items from Part 1. For each one, tell how you knew where it belonged.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Define a linear function and a different type of function, then write two new claims of the form $(f \circ g)(a)$=number: one MATCH and one REVERSED.

MATCH

REVERSED

CHALLENGE

Use one of your new function pairs for which the orders give different results, and calculate both $(f \circ g)(a)$ and $(g \circ f)(a)$; explain why they differ.

ANSWER KEY # Inside First

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	$f(x)=x^2$, $g(x)=x+3$. Claim: $(f\circ g)(1)=16$	**MATCH**	$g(1)=4$, then $f(4)=16$.
2	$f(x)=\sqrt{x}$, $g(x)=x^2+9$. Claim: $(f\circ g)(4)=5$	**MATCH**	$g(4)=25$, then $f(25)=5$.
3	$f(x)=3x-2$, $g(x)=\lvert x\rvert$. Claim: $(f\circ g)(-2)=8$	**REVERSED**	$g(f(-2))=g(-8)=8$, but $f(g(-2))=f(2)=4$.
4	$f(x)=1/x$, $g(x)=x+2$. Claim: $(f\circ g)(2)=1/4$	**MATCH**	$g(2)=4$, then $f(4)=1/4$.
5	$f(x)=2^x$, $g(x)=x-1$. Claim: $(f\circ g)(3)=7$	**REVERSED**	$g(f(3))=g(8)=7$, but $f(g(3))=f(2)=4$.
6	$f(x)=x^2$, $g(x)=\sqrt{x}+1$. Claim: $(f\circ g)(9)=10$	**REVERSED**	$g(f(9))=g(81)=10$, but $f(g(9))=f(4)=16$.
7	$f(x)=\lvert x-5\rvert$, $g(x)=4-x$. Claim: $(f\circ g)(1)=2$	**MATCH**	$g(1)=3$, then $f(3)=2$.
8	$f(x)=x^2+2$, $g(x)=3x$. Claim: $(f\circ g)(2)=18$	**REVERSED**	$g(f(2))=g(6)=18$, but $f(g(2))=f(6)=38$.

PART 2 · PROVE IT

Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **MATCH**: $f(x)=2x+1$, $g(x)=x^2+2$. Claim: $(f\circ g)(2)=13$.
- **REVERSED**: $f(x)=x-4$, $g(x)=x^2+1$. Claim: $(f\circ g)(3)=2$.

Challenge: For $f(x)=2x+1$, $g(x)=x^2+2$, and $a=2$, $(f\circ g)(2)=f(6)=13$, while $(g\circ f)(2)=g(5)=27$. Squaring before applying the linear function gives a different result from applying the linear function before squaring.

In Part 2, accept any two items with steps that apply g first to check the claim. For a REVERSED item, students should also show that applying f first produces the claimed value.