LESSON MAKER PRO

Function Mix Lab

Combine functions and track where they work.

HIGH SCHOOL · A2.F.2

A2.F.2 "Analyze functions through algebraic combinations, compositions, and inverses if they exist. Add, subtract, multiply, and divide functions using function notation and recognize domain restrictions..."

NAME _____ DATE _____

KEEP THE DOMAIN

To add, subtract, multiply, or divide functions, use the same input in each function, then combine the outputs. An input must work in both functions, and a divisor cannot equal zero. For a composition, the inside function's output must be an allowed input for the outside function.

WORKED EXAMPLE

Let $f(x) = x + 13$ and $g(x) = x - 11$. Find $(f/g)(x)$ and its domain.

1. Write the quotient: $(f/g)(x) = (x + 13)/(x - 11)$.
2. The divisor is zero when $x - 11 = 0$, so $x = 11$ is excluded.

Answer: $(f/g)(x) = (x + 13)/(x - 11)$; domain: all real numbers except 11.

PRACTICE 6 problems

1 Let $f(x) = x + 2$ and $g(x) = 3x - 4$. Find $(f + g)(x)$.

ANSWER _____

2 Let $f(x) = 2x + 1$ and $g(x) = x - 6$. Find $(f - g)(x)$.

ANSWER _____

3 Let $f(x) = x - 3$ and $g(x) = x + 4$. Find $(fg)(x)$.

ANSWER _____

4 Let $f(x) = x + 8$ and $g(x) = x - 2$. Find $(f/g)(x)$ and state its domain.

ANSWER _____

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

ANSWER _____

6 Let $f(x) = 1/(x - 4)$ and $g(x) = x + 5$. Find $f(g(x))$ and state its domain.

ANSWER _____

_____

APPLY IT Show your work

1 You buy x packs of laptop stickers for $7 per pack, plus $5 shipping. Let t(x) be the total before a $3 coupon, and let d(x) = x - 3 apply the coupon to a dollar amount. Write d(t(x)), then find the cost of 4 packs.

WORK SPACE

ANSWER _____

2 A photo booth at a school dance charges $12 to set up and $2 for each printed photo. Let c(x) be the total cost of x photos, and let n(x) = x be the number of photos. Write (c/n)(x), state its domain for this situation, and find the cost per photo if your group prints 6 photos.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let f(x) = 1/(x - 3) and g(x) = $(x^2 - 9)/(x - 3)$. Find f(g(x)) and state its domain. Explain why every excluded input must stay excluded after you simplify.

WORK SPACE AND ANSWER

ANSWER KEY # Function Mix Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let f(x) = x + 2 and g(x) = 3x - 4. Find (f + g)(x).	**4x - 2**
2	Let f(x) = 2x + 1 and g(x) = x - 6. Find (f - g)(x).	**x + 7**
3	Let f(x) = x - 3 and g(x) = x + 4. Find (fg)(x).	**$x^2 + x - 12$**
4	Let f(x) = x + 8 and g(x) = x - 2. Find (f/g)(x) and state its domain.	**(x + 8)/(x - 2); domain: all real numbers except 2.**
5	Let f(x) = x^2 + 1 and g(x) = 2x - 3. Find f(g(x)).	**$4x^2 - 12x + 10$**
6	Let f(x) = 1/(x - 4) and g(x) = x + 5. Find f(g(x)) and state its domain.	**1/(x + 1); domain: all real numbers except -1.**

PART 2 · APPLY IT

1. **d(t(x)) = 7x + 2; 4 packs cost $30.** The total before the coupon is t(x) = 7x + 5. Subtract $3, then substitute x = 4.
2. **(c/n)(x) = (2x + 12)/x = 2 + 12/x; domain: positive whole numbers; 6 photos cost $4 per photo.** Divide the total cost, c(x) = 2x + 12, by the number of photos. At x = 6, the $24 total divided by 6 is $4 per photo.

CHALLENGE

f(g(x)) = 1/x; domain: all real numbers except 0 and 3. The function g is undefined at 3, even though its fraction simplifies to x + 3. At 0, g(0) = 3, which makes the denominator of f equal zero.

Accept equivalent algebraic forms. For the challenge, both exclusions are required: 3 is outside the domain of g, and 0 makes f(g(x)) undefined.