LESSON MAKER PRO

Function Mashups

Compose functions, then track possible inputs and outputs.

HIGH SCHOOL · MA.912.F.3.4

MA.912.F.3.4 "Represent the composition of two functions algebraically or in a table. Determine the domain and range of the composite function."

NAME _____ DATE _____

BUILD THE COMPOSITE

To find f(g(x)), put g(x) everywhere x appears in f. The composite domain includes inputs that work in g and make g(x) a valid input for f. The range is the set of outputs the composite can produce.

WORKED EXAMPLE

Let f(x)=11x-13 and g(x)=x+17. Find f(g(x)), its domain, and its range.

1. Start with f(g(x))=11(x+17)-13.
2. Distribute: 11x+187-13.
3. Simplify: f(g(x))=11x+174. Both functions accept all real inputs.

Answer: f(g(x))=11x+174; Domain: all real numbers; Range: all real numbers.

PRACTICE 5 problems

1 Let f(x)=3x+2 and g(x)=x^2. Find f(g(x)), its domain, and its range.

ANSWER _____

2 Let f(x)=x-5 and g(x)=2/(x+1). Find f(g(x)), its domain, and its range.

ANSWER _____

3 Let f(x)=sqrt(x+6) and g(x)=x-3. Find f(g(x)), its domain, and its range.

ANSWER _____

4 Let f(x)=1/x and g(x)=x^2-16. Find f(g(x)), its domain, and its range.

ANSWER _____

5 Let f(x)=|x| and g(x)=x-7. Find f(g(x)), its domain, and its range.

ANSWER _____

APPLY IT Show your work

1 A sneaker site takes 3/4 of an original price p for a sale, g(p)=3/4p. It then adds a $6 shipping fee, f(s)=s+6. For p>=0, write f(g(p)) and state its domain and range.

WORK SPACE

ANSWER _____

2 A game club gives g(m)=2m+10 points for m minutes of practice, where 0<=m<=30. Badge credits are f(p)=p/5. Write f(g(m)) and state its domain and range.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let f(x)=sqrt(x+4) and g(x)=1/(x-2). Find f(g(x)), its domain, and its range. Explain why some x-values and one output value are excluded.

WORK SPACE AND ANSWER

ANSWER KEY

Function Mashups

HIGH SCHOOL · MA.912.F.3.4

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let f(x)=3x+2 and g(x)=x^2. Find f(g(x)), its domain, and its range.	**f(g(x))=3x^2+2; Domain: all real numbers; Range: [2, infinity).**
2	Let f(x)=x-5 and g(x)=2/(x+1). Find f(g(x)), its domain, and its range.	**f(g(x))=2/(x+1)-5; Domain: x is not -1; Range: y is not -5.**
3	Let f(x)=sqrt(x+6) and g(x)=x-3. Find f(g(x)), its domain, and its range.	**f(g(x))=sqrt(x+3); Domain: [-3, infinity); Range: [0, infinity).**
4	Let f(x)=1/x and g(x)=x^2-16. Find f(g(x)), its domain, and its range.	**f(g(x))=1/(x^2-16); Domain: x is not -4 or 4; Range: (-infinity, -1/16] union (0, infinity).**
5	Let f(x)=|x| and g(x)=x-7. Find f(g(x)), its domain, and its range.	**f(g(x))=|x-7|; Domain: all real numbers; Range: [0, infinity).**

PART 2 · APPLY IT

1. **f(g(p))=3/4p+6; Domain: [0, infinity); Range: [6, infinity).** Substitute the sale price 3/4p into the shipping function. Since p cannot be negative, the smallest total occurs when p=0.
2. **f(g(m))=2m/5+2; Domain: [0, 30]; Range: [2, 14].** Substitute 2m+10 for p in p/5. Evaluate the composite at the endpoints m=0 and m=30.

CHALLENGE

f(g(x))=sqrt(1/(x-2)+4); Domain: (-infinity, 7/4] union (2, infinity); Range: [0, 2) union (2, infinity). Values in (7/4, 2) make the radicand negative, and x=2 makes the fraction undefined. Output 2 is missing because the radicand can never equal 4.

Accept equivalent algebraic forms and equivalent interval notation. For domains and ranges, accept set-builder notation that excludes the same values.