LESSON MAKER PRO

Function Mashups

Build new functions by combining familiar ones.

HIGH SCHOOL · HSF-BF.A.1b

CCSS.Math.Content.HSF-BF.A.1b "Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model."

NAME _____ DATE _____

COMBINE THE OUTPUTS

To combine functions, perform the operation on their outputs at the same input. For example, $(f - g)(x)=f(x)-g(x)$, and $(fg)(x)=f(x)g(x)$. In a model, a constant function can represent a baseline while another function represents the changing part.

WORKED EXAMPLE

Let $f(x)=12x+19$ and $g(x)=4^x$. Define $h(x)=f(x)+g(x)$. Find $h(3)$.

1. Write the combined function: $h(x)=(12x+19)+4^x$.
2. Substitute 3: $h(3)=12(3)+19+4^3$.
3. Evaluate: $h(3)=36+19+64=119$.

Answer: h(3)=119

PRACTICE 6 problems

1 Let $f(x)=2x-8$ and $g(x)=x^2$. Write $(f+g)(x)$ in simplified form.

ANSWER _____

2 Let $p(x)=5^x$ and $q(x)=9$. Write $(p-q)(x)$.

ANSWER _____

3 Let $a(x)=x+10$ and $b(x)=x-2$. Write $(ab)(x)$ in simplified form.

ANSWER _____

4 Let $r(x)=8x$ and $s(x)=x-10$. Find $(r/s)(5)$.

ANSWER _____

5 Let $f(x)=x^2+7$ and $g(x)=2x$. If $m(x)=f(x)-g(x)$, find $m(-2)$.

ANSWER _____

6 Let $f(x)=2^x+7$ and $g(x)=5x$. Write $k(x)=f(x)+g(x)$ in simplified form.

ANSWER _____

APPLY IT Show your work

1 At a gaming club, a laptop begins at 148 degrees F and cools toward a room temperature of 68 degrees F. Its temperature above room temperature is $A(t)=80(1/2)^t$ after t hours. Let $R(t)=68$ and $T(t)=R(t)+A(t)$. Write T(t), state what each addend represents, and find T(2).

WORK SPACE

ANSWER _____

2 An esports club has a $42 sponsor donation for its tournament and earns $7 for each ticket sold. Let $D(x)=42$ and $S(x)=7x$, where x is the number of tickets. Write the total-income function $C(x)=D(x)+S(x)$, then find C(8).

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let $f(x)=2^x+8$ and $g(x)=x^2-6x$. Define $h(x)=f(x)-g(x)$. Write h(x) in simplified form, then find h(2). Explain which signs change when you subtract g(x).

WORK SPACE AND ANSWER

Function Mashups

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let f(x)=2x-8 and g(x)=x^2. Write (f+g)(x) in simplified form.	**x^2+2x-8**
2	Let p(x)=5^x and q(x)=9. Write (p-q)(x).	**5^x-9**
3	Let a(x)=x+10 and b(x)=x-2. Write (ab)(x) in simplified form.	**x^2+8x-20**
4	Let r(x)=8x and s(x)=x-10. Find (r/s)(5).	**-8**
5	Let f(x)=x^2+7 and g(x)=2x. If m(x)=f(x)-g(x), find m(-2).	**15**
6	Let f(x)=2^x+7 and g(x)=5x. Write k(x)=f(x)+g(x) in simplified form.	**2^x+5x+7**

PART 2 · APPLY IT

1. **T(t)=68+80(1/2)^t. The 68 represents room temperature, and 80(1/2)^t represents the temperature above room temperature. T(2)=88 degrees F.** Use the constant room-temperature function plus the decaying temperature-above-room-temperature function. At t=2, the changing part is 20, so the total is 88.
2. **C(x)=42+7x, and C(8)=98 dollars.** Add the fixed donation and ticket-income functions. Eight tickets bring in 56 dollars, and 42+56=98.

CHALLENGE

h(x)=2^x-x^2+6x+8, and h(2)=20. Subtracting g(x) changes +x^2 to -x^2 and -6x to +6x.

Accept equivalent forms with terms in a different order. For products and differences, accept correct unsimplified expressions when the required operation and signs are accurate.