LESSON MAKER PRO

Function Chain Reactions

Build a new function by feeding one output into another.

HIGH SCHOOL · HSF-BF.A.1c

CCSS.Math.Content.HSF-BF.A.1c "(+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time..."

NAME _____ DATE _____

COMPOSE FUNCTIONS

To compose functions, put the output of the inside function into the input of the outside function. In f(g(x)), apply g first, then use that result as the input of f. Replace every x in the outside rule with the entire inside rule.

WORKED EXAMPLE

Let $f(x) = 5x + 8$ and $g(x) = x - 6$. Find $f(g(x))$.

1. Start with $f(g(x)) = 5(g(x)) + 8$.
2. Substitute $g(x) = x - 6$: $5(x - 6) + 8$.
3. Simplify: $5x - 30 + 8 = 5x - 22$.

Answer: $f(g(x)) = 5x - 22$

PRACTICE 6 problems

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

ANSWER _____

2 Let $p(x) = x - 9$ and $q(x) = 4x$. Find $q(p(x))$.

ANSWER _____

3 Let $h(x) = 11 - x$ and $k(x) = 3x + 2$. Find $h(k(x))$.

ANSWER _____

4 Let $m(x) = x^2 + 4$ and $n(x) = 2x + 1$. Find $m(n(3))$.

ANSWER _____

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

ANSWER _____

6 Let $f(x) = 12/x$ and $g(x) = x - 3$. Find $f(g(15))$.

ANSWER _____

APPLY IT Show your work

1 A video platform estimates a creator's weekly views with V(t) = 21t + 7, where t is the number of short videos posted. The platform then estimates fan messages with M(v) = v/7 + 3, where v is the number of views. Find M(V(t)). Then find the estimated number of fan messages when the creator posts 11 short videos.

WORK SPACE

ANSWER _____

2 In a fitness game, a player's distance after t sessions is d(t) = 4t + 2. The game awards score points using S(d) = 9d + 11. Find S(d(t)). Then find the score after 7 sessions.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Let a(x) = 2x - 3, b(x) = x^2 + 1, and c(x) = 4x. Find a(b(c(x))). State the order in which the functions are applied.

WORK SPACE AND ANSWER

ANSWER KEY

Function Chain Reactions

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let f(x) = 2x + 1 and g(x) = x^2. Find f(g(x)).	**$2x^2 + 1$**
2	Let p(x) = x - 9 and q(x) = 4x. Find q(p(x)).	**4x - 36**
3	Let h(x) = 11 - x and k(x) = 3x + 2. Find h(k(x)).	**9 - 3x**
4	Let m(x) = x^2 + 4 and n(x) = 2x + 1. Find m(n(3)).	**53**
5	Let f(x) = 4x - 1 and g(x) = x^2 + 2. Find g(f(-2)).	**83**
6	Let f(x) = 12/x and g(x) = x - 3. Find f(g(15)).	**1**

PART 2 · APPLY IT

1. **M(V(t)) = 3t + 4; M(V(11)) = 37 fan messages** Substitute V(t) into M(v): M(V(t)) = (21t + 7)/7 + 3 = 3t + 4. Substitute t = 11 to get 37.
2. **S(d(t)) = 36t + 29; S(d(7)) = 281 points** Substitute d(t) into S(d): S(d(t)) = 9(4t + 2) + 11 = 36t + 29. Substitute t = 7 to get 281.

CHALLENGE

a(b(c(x))) = $32x^2$ - 1; apply c first, then b, then a.

Accept equivalent algebraic forms, such as -3x + 9 for problem 3. For composed notation, students must apply the rightmost or inside function first.