Connexions module: m19109

FUNCTION HOMEWORK – COMPOSITE FUNCTIONS*

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Abstract

This module provides sample problems designed to develop some concepts related to composite functions.

Exercise 1

You are the foreman at the Sesame Street Number Factory. A huge conveyor belt rolls along, covered with big plastic numbers for our customers. Your two best employees are Katie and Nicolas. Both of them stand at their stations by the conveyor belt. Nicolas's job is: whatever number comes to your station, add 2 and then multiply by 5, and send out the resulting number. Katie is next on the line. Her job is: whatever number comes to you, subtract 10, and send the result down the line to Sesame Street.

a. Fill in the following table.

This number comes down the line	-5	-3 -1 2 4 6 10 x 2x
Nicolas comes up with this number, and sends it down the line to Katie		
Katie then spits out this number		

Table 1

b. In a massive downsizing effort, you are going to fire Nicolas. Katie is going to take over both functions (Nicolas's and her own). So you want to give Katie a number, and she first does Nicolas's function, and then her own. But now Katie is overworked, so she comes up with a shortcut: one function she can do, that covers both Nicolas's job and her own. What does Katie do to each number you give her? (Answer in words.)

Exercise 2

Taylor is driving a motorcycle across the country. Each day he covers 500 miles. A policeman started the same place Taylor did, waited a while, and then took off, hoping to catch some illegal activity. The policeman stops each day exactly five miles behind Taylor.

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Let d equal the number of days they have been driving. (So after the first day, d = 1.) Let T be the number of miles Taylor has driven. Let p equal the number of miles the policeman has driven.

- a. After three days, how far has Taylor gone?
- **b.** How far has the policeman gone? ____
- **c.** Write a function T(d) that gives the **number of miles Taylor has traveled**, as a function of how many days he has been traveling.
- **d.** Write a function p(T) that gives the **number of mile the policeman has traveled**, as a function of the distance that Taylor has traveled.
- e. Now write the composite function p(T(d)) that gives the **number of miles the police-man has traveled**, as a function of the number of days he has been traveling.

Exercise 3

Rashmi is a honor student by day; but by night, she works as a hit man for the mob. Each month she gets paid \$1000 base, **plus** an extra \$100 for each person she kills. Of course, she gets paid in cash—all \$20 bills.

Let k equal the number of people Rashmi kills in a given month. Let m be the amount of money she is paid that month, in dollars. Let b be the number of \$20 bills she gets.

- **a.** Write a function m(k) that tells how much money Rashmi makes, in a given month, as a function of the number of people she kills.
- **b.** Write a function b(m) that tells how many bills Rashmi gets, in a given month, as a function of the number of dollars she makes.
- c. Write a composite function b(m(k))b that gives the number of bills Rashmi gets, as a function of the number of people she kills.
- d. If Rashmi kills 5 men in a month, how many \$20 bills does she earn? First, translate this question into function notation—then solve it for a number.
- e. If Rashmi earns 100 \$20 bills in a month, how many men did she kill? First, translate this question into function notation—then solve it for a number.

Exercise 4

Make up a problem like exercises #2 and #3. Be sure to take all the right steps: **define the scenario**, **define your variables clearly**, and then show the functions that relate the variables. This is just like the problems we did last week, except that you have to use three variables, related by a composite function.

Exercise 5

$$f\left(x\right)=\sqrt{x+2}\;.\;g\left(x\right)=x^{2}+x\;.$$

- **a.** f(7) =_______
- **b.** g(7) =
- **c.** f(g(x)) = **d.** f(f(x)) =
- e. g(f(x)) =______
- g. f(g(3)) =______

Exercise 6

h(x) = x - 5. h(i(x)) = x. Can you find what function i(x) is, to make this happen?