Composition of Functions Relay (Chain Reaction)

SPI 3103.3.6   Combine functions (such as <mark>polynomial</mark>, rational, radical and absolute value expressions) by addition, subtraction, multiplication, division, or by <mark>composition</mark> and evaluate at specified values of their variables.

Preparation

Prepare one set of cards containing each of the functions for each group. Print the sheets of functions on different colors of cardstock and laminate each sheet; then cut the functions out and put one of each color in a sandwich bag for easy distribution and collection.

Directions

Divide students in groups of four or five. In groups of five, each person will receive a card containing a different function. For groups of four, one student in each group will receive two cards; be sure to have the groups rotate who has two cards from round to round.

Each group should have one sheet of paper on which to work the problems. To begin the relay, the teacher calls out a number. The student with function number one evaluates his function for the number called by the teacher; he must show work (at least substitution of the number into the function) and write the answer to his step on the group's paper. After evaluating the function for the number called out, that student passes the group's answer sheet to the person with function number two; that student then substitutes the value obtained by the first student into function number two. After evaluating function number two using the answer obtained by the first student, the paper is then passed to the student with function number three; that student evaluates function number three using the value obtained by the second student. This continues until all five functions have been evaluated using the value obtained by the previous student.

At the conclusion of round one of the relay, each group should have work and an answer for each step of the relay. As groups finish, they show their work to the teacher who will tell them if their answer is correct or not. If it is not, the group may work together to fix their answer sheet; after finding their error(s), they may resubmit their answer.

Teachers may use a variety of methods to keep score, or they may choose to reward the winning group after each round. I usually award points for each round based on the order in which groups finish. At the end of the activity, the winning group receives some type of reward; of course, with some classes, bragging rights are the only motivation needed.

After round one, have students switch cards so that they will have practice with different types of functions. Proceed with round two by calling out a new number to be used to evaluate function number one, …

I have provided an answer key that shows answers at each step for a variety of numbers. This type of relay can be used for a variety of topics in various mathematics courses.

Function #	1	2	3	4	5
Number Called by Teacher	$f(x) = x^2 - 3x + 1$	$g(x) = 5x - 7$	$h(x) = -3x + 2$	$j(x) = x^2 - 10x - 7$	$k(x) = \dfrac{1}{2}x - \dfrac{3}{2}$
−1	5	18	−52	3,217	1,607
2	−1	−12	38	1,057	527
−5	41	198	−592	356,377	178,187
0	1	−2	8	−23	−13
10	71	348	−1,042	1,096,177	548,087
−3	19	88	−262	71,257	35,627
$\dfrac{1}{2}$	$-\dfrac{1}{4}$ **Or** −0.25	$-8\dfrac{1}{4}$ **Or** $-\dfrac{33}{4}$ **Or** −8.25	$26\dfrac{3}{4}$ **Or** $\dfrac{107}{4}$ **Or** 26.75	$441\dfrac{1}{16}$ **Or** $\dfrac{7057}{16}$ **Or** 441.0625	$219\dfrac{1}{32}$ **Or** $\dfrac{7009}{32}$ **Or** 219.03125
$-\dfrac{2}{3}$	$\dfrac{31}{9}$ **Or** $3.\overline{4}$ **Or** $3\dfrac{3}{9}$	$\dfrac{92}{9}$ **Or** $10.\overline{2}$ **Or** $10\dfrac{2}{9}$	$-\dfrac{86}{3}$ **Or** $-28.\overline{6}$ **Or** $-28\dfrac{2}{3}$	$\dfrac{9913}{9}$ **Or** $1101.\overline{4}$ **Or** $1101\dfrac{4}{9}$	$\dfrac{4943}{9}$ **Or** $549.\overline{2}$ **Or** $549\dfrac{2}{9}$

At some point during the activity (usually after round 1), I discuss the fact that they have just evaluated the composition of functions; and we discuss the notation for composition of functions. During subsequent rounds, I have them submit their final answer written in one of the forms used for composition of functions. Most choose the form (k(j(h(g(f(#)))))) = answer.

Function 1 $f(x) = x^2 - 3x + 1$	**Function 1** $f(x) = x^2 - 3x + 1$
Function 1 $f(x) = x^2 - 3x + 1$	**Function 1** $f(x) = x^2 - 3x + 1$
Function 1 $f(x) = x^2 - 3x + 1$	**Function 1** $f(x) = x^2 - 3x + 1$
Function 1 $f(x) = x^2 - 3x + 1$	**Function 1** $f(x) = x^2 - 3x + 1$

Function 2 $g(x) = 5x - 7$	**Function 2** $g(x) = 5x - 7$
Function 2 $g(x) = 5x - 7$	**Function 2** $g(x) = 5x - 7$
Function 2 $g(x) = 5x - 7$	**Function 2** $g(x) = 5x - 7$
Function 2 $g(x) = 5x - 7$	**Function 2** $g(x) = 5x - 7$

Function 3	**Function 3**
$h(x) = -3x + 2$	$h(x) = -3x + 2$
Function 3	**Function 3**
$h(x) = -3x + 2$	$h(x) = -3x + 2$
Function 3	**Function 3**
$h(x) = -3x + 2$	$h(x) = -3x + 2$
Function 3	**Function 3**
$h(x) = -3x + 2$	$h(x) = -3x + 2$

Function 4

$j(x) = x^2 - 10x - 7$

Function 4

$j(x) = x^2 - 10x - 7$

Function 4

$j(x) = x^2 - 10x - 7$

Function 4

$j(x) = x^2 - 10x - 7$

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Function 4

$j(x) = x^2 - 10x - 7$

Function 5

$$k(x) = \frac{1}{2}x - \frac{3}{2}$$

Function 5

$$k(x) = \frac{1}{2}x - \frac{3}{2}$$

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