Activity 4 - Numerical Function Composition with Units

In addition to there being complications with function composition due to the numerical values involved, there can also be issues that arise due to the context in which the functions are set. In this activity, you will have to consider both the numerical and the contextual as you work with the provided functions and their composition.

Part I - Consider $f(x)$ and $g(x)$ below, which track some of your "incredible" exercising and dieting trends.

x calories burned	10	13	29	35	48	59	64	75
$f(x)$ grams of sugar you will let yourself eat	3.5	6	18	21	29	45	66	85

x minutes exercising	5	8	19	22	28	35	37	48
$g(x)$ calories burned	10	13	29	35	48	59	64	75

a. Consider $(f \circ g)(x)$ numerically, without taking the units into consideration. Does this composition make sense? If so, what is the domain? What is the range?

b. Now, take the units into consideration. Can we make sense of $(f \circ g)(x)$? If so, build a new table making sure to include units.

x								
$(f \circ g)(x)$								

c. What composition should you do if you wanted to know how much sugar you would eat if you had exercised for 22 minutes? What is the amount of sugar?

d. What equation would you be solving if you wanted to find the amount of exercise you would have to if you wanted to consume 45 grams of sugar? What is the amount of minutes you must exercise?

Part II- Consider $f(x)$ and $k(x)$ below in which $f(x)$ is a function of one's profit after having been open for x days and $k(x)$ is the number of packages (of iPads) sold after spending x hundred dollars in marketing.

x days since opening	1	3	9	12	18	29	34	45
$f(x)$ hundred dollars in profit	3.5	6	78	21	20.3	16	27	35

x hundred dollars in cost	1	2	5	9	12	20	34	40
$k(x)$ packages sold	1	3	9	12	18	29	34	45

a. If we ignore the units, can we make sense of $(f \circ k)(x)$?
b. If we account for the units, can we make sense of $(f \circ k)(x)$? If not, why?

Part III- In the following two exercises, we will be looking at tables for which the input and output values present no barrier to the existence of either $(f \circ g)(x)$ or $(g \circ f)(x)$. These problems will prepare us for the following and final activity in which we work with functions represented by words, not tables.

x dollars spent on coffee	1	2	3	4	5	6	7	8
$f(x)$ cups of coffee to drink	1	2	3	4	5	6	7	8

x cups of coffee to drink	1	2	3	4	5	6	7	8
$g(x)$ trips to the restroom	1	2	3	4	5	6	7	8

a. Does $(f \circ g)(x)$ exist? Explain. If the composition does exist, provide the input units and output units for $(f \circ g)(x)$.
b. Does $(g \circ f)(x)$ exist? Explain. If the composition does exist, provide the input units and output units for $(g \circ f)(x)$.

x apple trees planted	1	2	3	4	5	6	7	8
$f(x)$ square meters of shade grass needed to plant	1	2	3	4	5	6	7	8

x hundred pounds of apples requested	1	2	3	4	5	6	7	8
$g(x)$ apple trees needed to plant	1	2	3	4	5	6	7	8

a. Does $(f \circ g)(x)$ exist? Explain. If the composition does exist, provide the input units and output units for $(f \circ g)(x)$.
b. Does $(g \circ f)(x)$ exist? Explain. If the composition does exist, provide the input units and output units for $(g \circ f)(x)$.