

Activity 5 - Function Composition with Words

We've developed an understanding now of where function composition can go wrong with the inputs and outputs not aligning well symbolically, numerically, and with units. In this last activity, we will deepen our appreciation for the importance of units and context to see where function composition can be helpful or fails to be useful.

Part I- The function $D(p)$ gives the number of items that will be demanded when the price is p . The production cost $C(x)$ is the cost (in dollars) of producing x items. To determine the cost of production when the price is \$6, you would do which of the following?

- Evaluate $D(C(6))$
- Evaluate $C(D(6))$
- Solve $D(C(x)) = 6$
- Solve $C(D(x)) = 6$

Part II- The function $P(t)$ gives the energy bill in dollars for completely charging your new electrically powered vehicle after driving for t hours, and the function $D(E)$ gives the amount of time one can drive in hours when your car has E kilowatt-hours charged.

- Which function composition order makes sense?
- What are the input units for your function composition?
- What are the output units for your function composition?

Part III- Your town's waste treatment plant operator has developed two functions. The first function, $L(x)$, determines how much solution of a cleaning agent to use in liters based upon the number of millions of gallons of wastewater that has come into the plant. The second function, $G(x)$ gives the amount of money in dollars needing to be budgeted based upon the number of liters of solution used.

- Which function composition makes sense in this situation? $(G \circ L)(x)$ or $(L \circ G)(x)$?
 - What are the input and output units of the appropriate composition?
 - In your own words, what does this composite function tell you?
- Suppose the treatment plant operator is looking at the meter's readings for the past week and has the following facts and figures (not necessarily in order of how they were computed):
 - 17.5 million gallons of wastewater came through the plant
 - \$2,132.31 is to be allocated for cleaning agent
 - 1,008 Liters of cleaning agent were used

Which of the following pairs of function values make sense?

A. $L(1,008) = 17.5$; $G(17.5) = 2,132.31$

B. $L(17.5) = 1,008$; $G(1,008) = 2,132.31$

C. $L(1,008) = 2,132.31$; $G(2132.31) = 17.5$

D. $L(17.5) = 1,008$; $G(1,008) = 2,132.31$