

Name: _____

Date: _____

STEP FUNCTIONS COMMON CORE ALGEBRA I

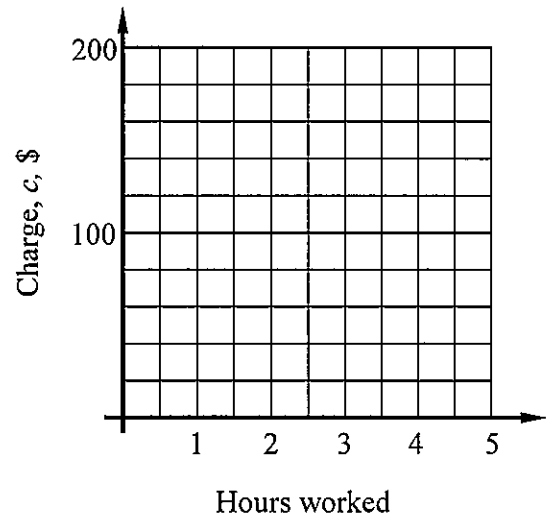


Step functions, or ones whose outputs stay constant and then **jump** to a new constant value, are critical to a number of real world applications. Many times these types of functions arise in the areas of business.

Exercise #1: An electrician works at a job site at a rate of \$40 per hour or any portion of an hour. In other words, he will charge you \$40 as soon as he comes up to the first hour, and then \$40 for the second hour, etcetera.

(a) Graph the amount the electrician charges, c , in dollars as a function of the number of hours he works.

(b) How much does he charge for working 3.5 hours? Circle the point on the graph that shows this answer.



Step functions are rather simple because they consist of multiple **horizontal lines**. When reading their formula definitions, it is important to pay attention to the **domain intervals**.

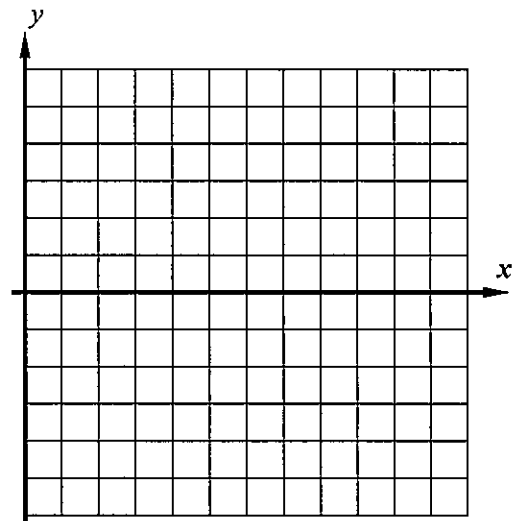
Exercise #2: A step function is defined using the piecewise formula $f(x) = \begin{cases} 2 & 0 \leq x < 3 \\ 5 & 3 \leq x < 5 \\ -4 & 5 \leq x \leq 10 \end{cases}$.

(a) Evaluate the following:

$f(2.7) =$ $f(5) =$

$f(3.5) =$ $f(0) =$

(b) Graph $f(x)$ on the grid to the right.



(c) State the domain and range of this function.

Domain:

Range:

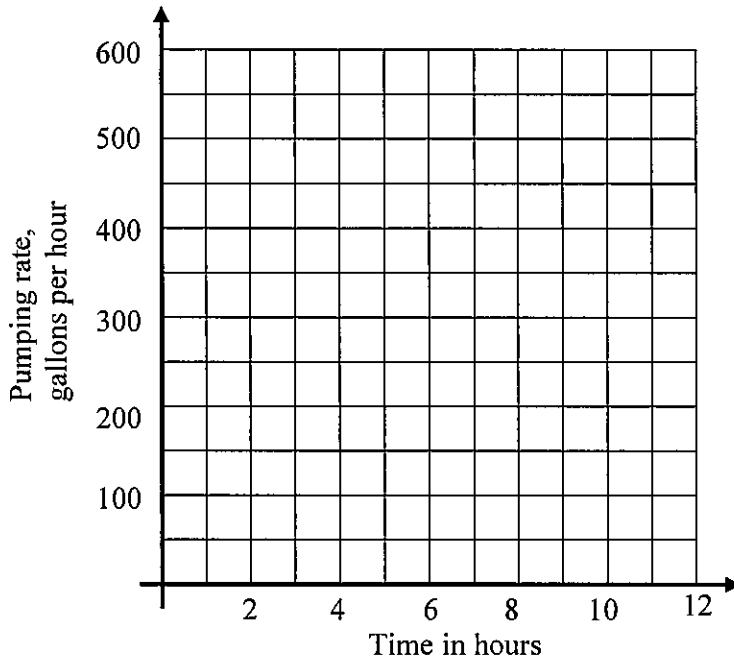


Step functions are used in engineering to signify when we have changes in constant rates. These functions can give rise then to piecewise linear functions.

Exercise #3: A pumping station is draining a reservoir with a set of pumps that drain the water at a rate of 250 gallons per hour. After 5 hours, additional pumps are turning on such that they pump at an overall rate of 600 gallons per hour for the next 7 hours.

(a) Draw a graph of the pump rate function on the grid provided.

(b) How many total gallons of water are pumped out of the reservoir over the 12 hour period? Show the calculations that lead to your answer.



(c) The reservoir originally contains 8,250 gallons of water. How much does it contain after 5 hours if water is only pumped out? Show the work that leads to your answer.

(d) Engineers want to turn off the pumps when the reservoir reaches a level of 2,000 gallons. Will they need to turn the pumps off during this 12-hour time period? Show evidence to support your yes/no answer.

(e) Assuming engineers do not turn off any pumps, how many total hours will it take, to the nearest tenth of an hour, to drain the reservoir of all of its water?

