Name: _____ Date: _____

THE ABSOLUTE VALUE AND STEP FUNCTIONS
COMMON CORE ALGEBRA I

There are two very interesting functions that can be considered related to linear, the **absolute value function** and the **step function**. Let's start with the simpler of the two, the **absolute value**.

***Exercise* #1:** The absolute value gives us the "size" or **magnitude** of a number. Find each of the following.

(a) $|-7|$ (b) $|-2|$ (c) $|6|$ (d) $|0|$

O.k. So, that is easy enough. Now, what does the basic **absolute value** function "look like."

***Exercise* #2:** Consider the absolute value function $f(x)=|x|$. Do the following.

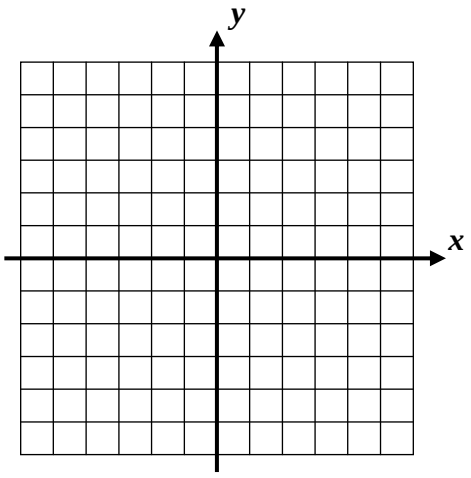
(a) Evaluate $f(-7)$ and $f(4)$.

(b) Fill out the table below and graph the function over this interval. This should be extremely quick.

x	-3	-2	-1	0	1	2	3
$f(x)$							

(c) What is the minimum value of the function on this interval?

(d) Over what domain interval is $f(x)=|x|$ increasing?



***Exercise* #3:** For the function $f(x)=|x-4|+7$ which of the following is the value of $f(1)$? Show the calculations that lead to your answer.

(1) 10 (3) 12

(2) −2 (4) 4

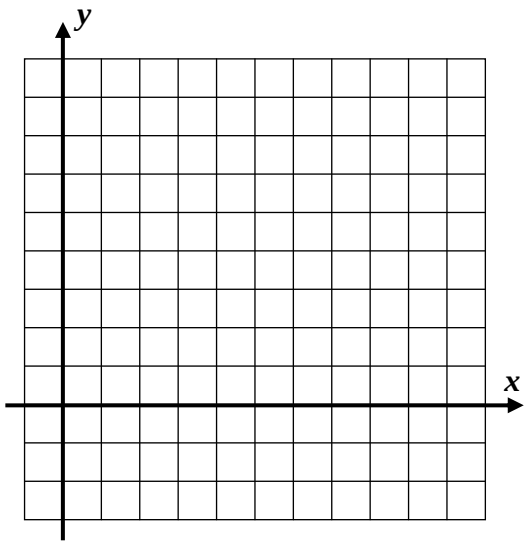
Step functions are another type of function that is related to the linear family. It's graph will reflect its **well chosen name**.

***Exercise* #4:** Consider the step function given by $f(x)=\begin{cases}2 & 0\le x<5\\ 6 & 5\le x\le 10\end{cases}$.

(a) Evaluate each of the following. After you do your evaluation, write down what coordinate point must lie on the graph as a result of the calculation.

$f(0)=$ $f(2)=$ $f(4)=$

$f(5)=$ $f(7)=$ $f(10)=$

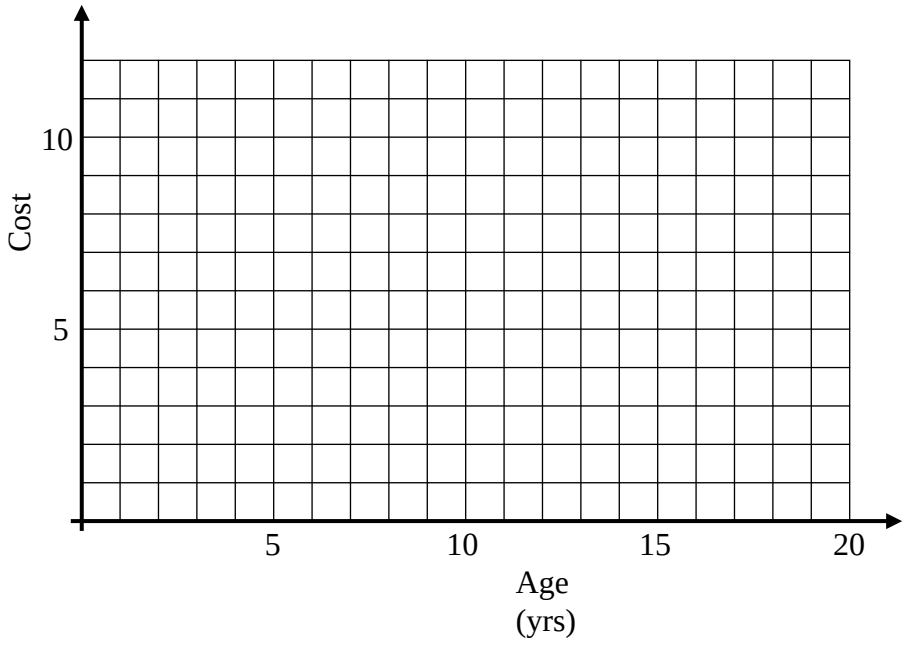


(b) Graph the step function on the grid to the right.

Step functions can arise in the real world whenever the **output** to a particular function is **constant** over particular ranges. Here's an example

***Exercise* #5:** At a local amusement park, the park charges an admission based on age. Graph the amount of money a person would have to pay for admission based on their age. Remember that someone who is one day short of 4 years old can consider themselves three and under.

Age Range	Price
3 and under	Free
8 and under	$4.00
16 and under	$8.00
17 and older	$12.00



Name: _____ Date: _____

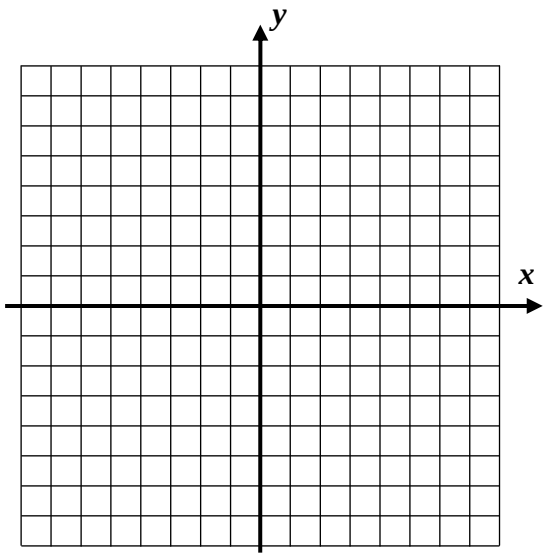
ABSOLUTE VALUE AND STEP FUNCTIONS
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. Consider the absolute value function $f(x)=|x+3|$ only on the interval $-6 \le x \le 2$.

   (a) Evaluate $f(-5)$ and $f(2)$ without a calculator.

   (b) Graph this function over the interval $-6 \le x \le 2$. Show your table below.



x	−6	−5	−4	−3	−2	−1	0	1	2
y									

   (c) Over which of the following intervals is $f(x)$ always increasing? Circle the correct choice.

   (1) $-6 < x < -3$ (3) $-4 < x < 0$

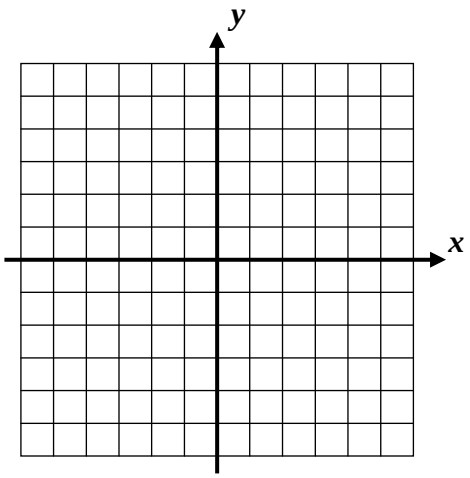
   (2) $-2 < x < 1$ (4) $-5 < x < 2$

   (d) State the range of $f(x)$ on this domain interval.

2. Are the two expressions $|x-5|$ and $|x|-5$ equivalent? Give evidence to support your yes or no answer. Remember, for expressions to be equivalent, they must have the same value for all values of the input variable, *x*.

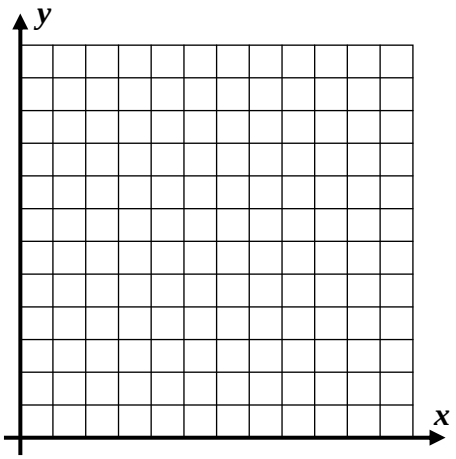
3. For each of the following **step functions**, produce a graph on the grid given.

(a)



$$f(x)=\begin{cases}-4 & -5\le x<0\\ 4 & 0\le x\le 5\end{cases}$$

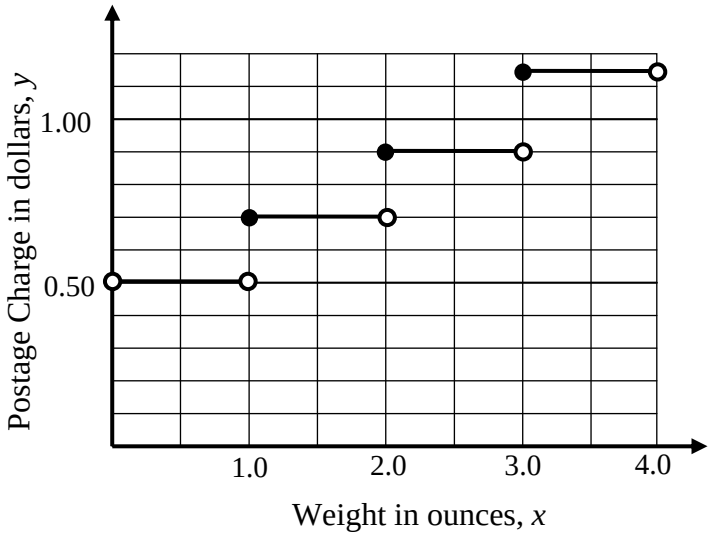
(b)



$$g(x)=\begin{cases}10 & 0\le x<4\\ 7 & 4\le x<8\\ 4 & 8\le x\le 12\end{cases}$$

APPLICATIONS

4. Postage rates on envelopes are a great example of **step functions**. There is a fixed price for a certain range of weights and then another fixed price for another range of weights, etcetera. Below is the graph of one such price structure.



(a) According to this graph, what would be the postage rate on a letter weighing 1.5 ounces?

(b) What would be the postage rate on a letter weighing exactly 3.0 ounces?

(c) Write a piecewise defined function for the postage rates:

$$y=\begin{cases}\\ \\ \\ \\ \\ \\ \end{cases}$$

(d) Why would it be incorrect to state that the range of this function is $0.50\le y\le 1.15$?