

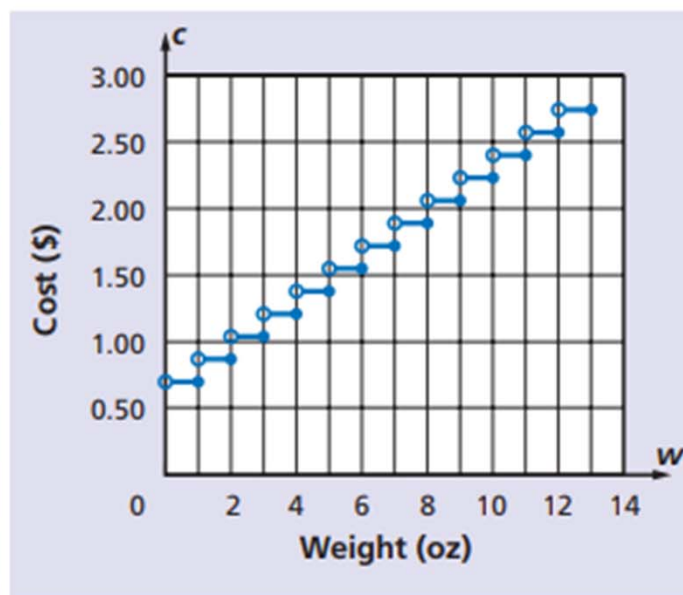
Step Functions

Textbook Section 2-6

In 2007, the U.S. postage rate for first class flats (certain large envelopes) was \$0.70 for the first ounce plus \$0.17 for each additional ounce or part of an ounce. First-class mail rates for flats up to 13 ounces are given in the table below. Notice that the phrase “up to and including the given weight” means that the weight is *rounded up* to the nearest ounce. For instance, an envelope weighing 4.4 ounces is charged at the 5-ounce rate.

2007 First-Class Mail Rates for Flats*			
Weight (oz)	Rate (dollars)	Weight (oz)	Rate (dollars)
1	0.70	8	1.89
2	0.87	9	2.06
3	1.04	10	2.23
4	1.21	11	2.40
5	1.38	12	2.57
6	1.55	13	2.74
7	1.72		

*Rate is for a flat up to and including the given weight.



COD at the Post Office

The table at the right shows the typical fees charged by the postal service for its COD (collect on delivery) service as a function of the amount of money to be collected from the recipient (as of 2008).

- Can these data be modeled by a step function?
- Fill in the Blank** Complete the following piecewise definition of a function that gives the COD fee $F(a)$ (in dollars) as a function of the amount a (in dollars) to be collected.

$$F(a) = \begin{cases} 5.10, & \text{if } a \leq 50 \\ \underline{\quad?}, & \text{if } 50 < a \leq 1000 \end{cases}$$

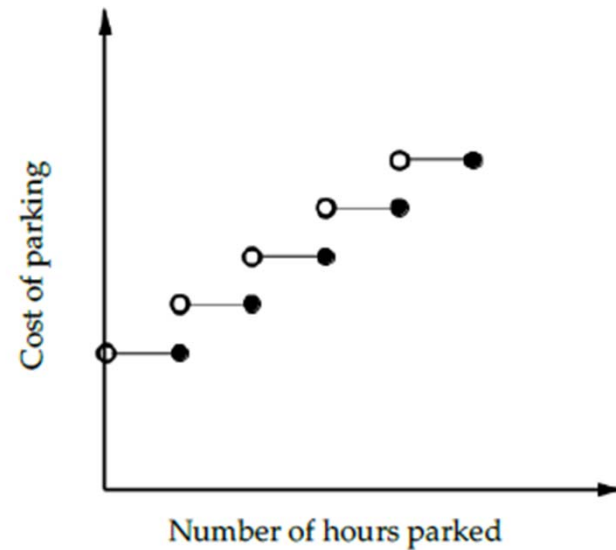
Amount Collected from Recipient (dollars)	COD Fee (dollars)
0.01 to \$50.00	5.10
50.01 to 100.00	6.25
100.01 to 200.00	7.40
200.01 to 300.00	8.55
300.01 to 400.00	9.70
400.01 to 500.00	10.85
500.01 to 600.00	12.00
600.01 to 700.00	13.15
700.01 to 800.00	14.30
800.01 to 900.00	15.45
900.01 to 1000.00	16.60

Parking Garage

When parking in a garage, you pay a larger amount for the first hour. You then pay a smaller amount for each additional hour (or part of an hour.)

x = the amount of time, in hours, you were parked

y = the cost of parking



Parking Garage

A parking garage charges customers \$7.50 per hour or any fraction thereof. Draw a graph that represents this situation.

- a) How much would it cost to park for 3 hours?
- b) How much would it cost to park for 4 and a half hours?
- c) How much would it cost to park for 7 hours and 15 minutes?



$$2 \lceil 3.5 \rceil = 2(3) = 6$$

Step Parent Function

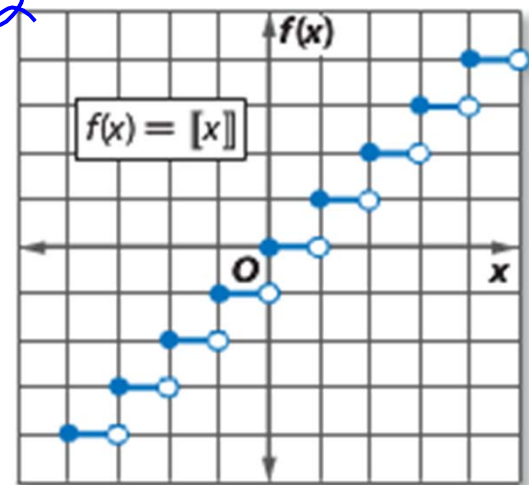
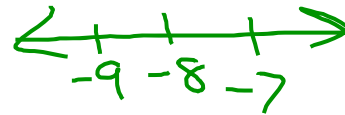
$$f(x) = \lceil x \rceil$$

$$\lceil 32.9 \rceil = 32$$

$$\lceil 3.5 \rceil = 3$$

Means the greatest integer less than or equal to x

$$\left\{ \begin{array}{l} 7.50; 0 \leq x < 1 \\ 1.5; 1 \leq x < 2 \\ 22.50; 2 \leq x < 3 \end{array} \right.$$



$$f(x) \left\{ \begin{array}{l} 6; 6 \leq x < 7 \end{array} \right.$$

Parking Garage

A parking garage charges customers \$7.50 per hour or any fraction thereof. Draw a graph that represents this situation.

- a) What would be the equation of this step function?

$$7.50 \lceil x \rceil$$



Jet Skis!

Renting jet skis in the Bahamas cost \$40 per hour (or part of an hour) plus a \$15 gas fee. Create a function that models the cost in terms of the number of hours the jet ski was rented.

- How much would it cost to rent for 3 hours?
- How much would it cost to rent for 4 hours and 45 minutes?
- What would be the equation of this function?

$$f(x) = 40[x] + 15$$



$$40[3] + 15$$
$$40(3) + 15 = \$135$$

$$40[4.75] + 15$$
$$40(4) + 15$$
$$= \$175$$

Homework

Worksheet on Step Functions