

3. In a certain country, income tax is assessed by using the function below, where  $f(x)$  is the percentage of the income that must be paid as tax, and  $x$  is the amount of income.

$$f(x) = \begin{cases} 0 & \text{if } x \leq \$15,000 \\ 12\% & \text{if } \$15,000 < x \leq \$30,000 \\ 18\% & \text{if } x > \$30,000 \end{cases}$$

- a. If your income is \$28,000, what amount of tax will you pay?  $.12(28000) = \$3360$
- b. If your income is \$14,500, what amount of tax will you pay?  $\emptyset$
- c. Your income last year was \$25,000 and your friend's income was \$32,000. How much more did your friend pay in taxes than you?

$$(25,000) \cdot .12$$

$$3000$$

$$32000 \cdot (.18)$$

$$5760$$

$$5760 - 3000$$

$$\boxed{\$2760}$$

4. You are buying t-shirts for the math club members. The t-shirt company will charge you according to the function below, where  $c(x)$  is the total cost of the shirts and  $x$  is the number of t-shirts that you order.

$$f(x) = \begin{cases} 12x & 0 < x \leq 10 \\ 10x & 11 \leq x \leq 50 \\ 8x & x > 50 \end{cases}$$

- a. If you can get 51 members of the math club, how much will the 51 t-shirts cost?  $8(51) = \$408$
- b. If you only have 5 members (sad!), how much will EACH t-shirt cost?  $\$12$
- c. You end up with 30 members who want to buy a t-shirt. You want to sell the shirts and end up making \$100 profit for an end-of-year party. How much should you sell each shirt for?  $10(30) = 300$

$$300 + 100 = 400$$

$$400 \div 30 = \boxed{\$13.34}$$

## Evaluating Real-world Piecewise Functions

1. Your dog groomer charges according to the following function with  $f(x)$  representing the total price and  $x$  representing the weight of the dog in pounds.

$$f(x) = \begin{cases} 35 & \text{if } 0 < x \leq 15 \\ 40 & \text{if } 15 < x \leq 40 \\ 40 + 2(x - 40) & \text{if } x > 40 \end{cases}$$

- a. If your dog weighs 15 pounds, how much will you pay?  $\boxed{\$35}$  because  $0 < 15 \leq 15$   
 b. If your dog weighs 35 pounds, how much will you pay?  $\boxed{\$40}$  because  $15 < 35 \leq 40$   
 c. If your dog weighs 56 pounds, how much will you pay?  $40 + 2(56 - 40)$   
 $40 + 2(16)$   
 $40 + 32 = \boxed{\$72}$   
 d. What is the domain of this function?  
 $(0, \infty)$

2. The function below represents the shipping charges that apply to orders from an online company, where  $f(x)$  represents the shipping charges and  $x$  represents the total cost of the order.

$$f(x) = \begin{cases} \$3.50 & \text{if } \$0.00 < x \leq \$25.00 \\ \$5.95 & \text{if } \$25.00 < x \leq \$75.00 \\ \$7.95 & \text{if } \$75.00 < x \leq \$125.00 \\ \$9.95 & \text{if } x > \$125.00 \end{cases}$$

- a. What is the domain of the function?  $(0, \infty)$   
 b. What is the range of the function?  $\{3.50, 5.95, 7.95, 9.95\}$   
 c. If your order total is \$125.00, what is the shipping charge?  $\$7.95$  because  
 $75 < 125 \leq 125$   
 d. If your order total is \$25.40, what is the shipping charge?  
 $\$5.95$  because  
 $25 < 25.40 \leq 75.00$

Piecewise Word Problems

Name: \_\_\_\_\_

1. Your cell phone plan costs \$75/month and gives you unlimited talk, and 500 text messages per month, and no data plan. After 500 text messages, it costs \$.10 per text you send.
  - a. Write and graph a piecewise function that represents this situation.

$$f(x) = \begin{cases} \$75 & x \leq 500 \\ 75 + .10(x - 500) & x > 500 \end{cases}$$

510 texts cost:

$$75 + .10(510 - 500)$$

$$75 + .10(10) = 75 + 1 = \boxed{\$76}$$

- b. Find the domain and range

$$D: (0, \infty)$$

$$R: [75, \infty)$$

2. Your favorite dog groomer charges according to your dog's weight. If your dog is 15 pounds and under, the groomer charges \$35. If your dog is between 15 and up to 40 pounds, she charges \$40. If your dog is over 40 pounds, she charges \$40, plus an additional \$2 for each pound.
  - a. Write a piecewise function that describes what your dog groomer charges.

- b. Graph the function.

- c. What would the groomer charge if your cute dog weighs 60 pounds?

3. You go to Giant to buy some candy. You decide to buy snickers because they have a special deal on snickers. A pound of snickers costs \$3.45, but if you buy 4 or more pounds, they only cost \$3.00 per bag. Write a piecewise function to represent this situation.

$$f(x) = \begin{cases} 3.45x & x < 4 \\ 3.00x & x \geq 4 \end{cases}$$

$$3.5 \text{ lbs} = \$12.08$$

$$3.5(3.45)$$

## Absolute Value and Piecewise Function Word Problems

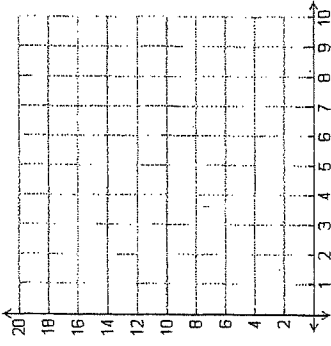
1. Sarah has \$15. She knows that Blake has some money and it varies by at most \$5 from the amount of her money. Write an absolute value inequality that represents this scenario. What are the possible amounts of money that Blake can have?
2. A company is making mirrors. Each mirror needs to be 18 inches high. Each mirror can vary by at most 0.01 inch. Write an absolute value inequality that represents the situation and allows you to answer the question; what are the acceptable heights of this company's mirrors?
3. The crowd that heard the President speak was estimated to be 10,000 people. The actual crowd could be 750 people more or less than this. What are the possible values for the actual crowd size?
4. Susie has designed an exercise program for herself. One part of the exercise program is that she plans on walking between 25 and 30 miles, inclusive, each week. She plans to walk the same distance each day. If Susie walks five days a week, what is the range in miles that she should walk each day?
5. A box of cereal should weigh more than 629.4 grams and less than 630.6 grams to pass inspection. The box that the cereal is packaged in weighs 5.5 grams. What are the possible weights for the cereal?
6. Carmen works in a sporting goods store. Her goal is to sell between \$500 and \$600 worth of sporting equipment. So far this week she has sold \$395 worth of equipment. What possible dollar amount of sales should Carmen make the rest of the week to reach her goal?
7. When a diabetic takes long-acting insulin, the insulin reaches its peak effect on the blood sugar level in about three hours. This effect remains fairly constant for 5 hours, then declines, and is very low until the next injection. In a typical patient, the level of insulin might be modeled by the following function.

Here,  $f(t)$  represents the blood sugar level at time  $t$  hours after the time of the injection. If a patient takes insulin at 6 am, find the blood sugar level at each of the following times.

- a. 7 am      b. 11 am      c. 3 pm      d. 5 pm

6. During a nine-hour snowstorm it snows at a rate of 1 inch per hour for the first two hours, at a rate of 2 inches per hour for the next six hours, and at a rate of 1 inch per hour for the final hour.

a. What are the dependent and control variables?



b. Write the piecewise function.

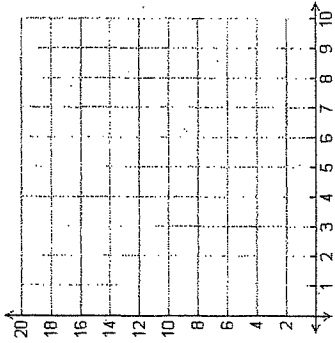
$$f(x) = \begin{cases} x & x \leq 2 \\ 2(x-2) + 2 & 2 < x \leq 8 \\ 14 + 1(x-8) & x > 8 \end{cases}$$

c. Graph the piecewise function. Label your axis.

d. How much snow is there on the ground after 7 hours?

4. A supermarket has a discount on "family packs" of meat. Chicken costs \$2.00/lb for packages over 5 lb. Smaller packages are \$2.50/lb. Express the cost as a function of weight.

a. What are the dependent and control variables?



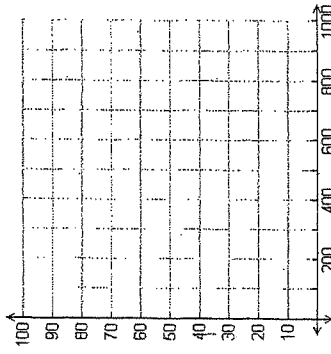
b. Write the piecewise function  $C(w)$ .

c. Graph the function. Label your axis.

d. Find  $C(3.5)$  and  $C(6)$ .

7. A cell phone company charges \$49.99 a month for up to 500 minutes. If a family talks up to 600 minutes their bill jumps to \$69.99 and if they talk up to 1000 minutes their bill is \$99.99.

a. What are the dependent and control variables?

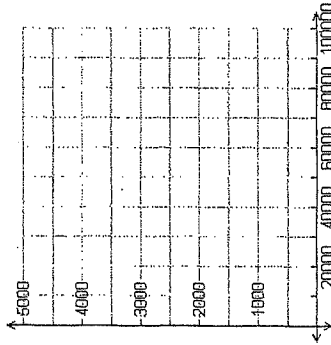


b. Write a piecewise function.

c. Graph the function. Label your axis.

5. The amount of Social Security tax you pay, part of your Federal Insurance Contributions Act deductors, depends on your annual income. As of 1999 you pay 6.2% of your income if it is less than \$72,600. If your income is at least \$72,600, you pay a fixed amount of \$4501.20.

a. What are the control and dependent variables?



b. Write the piecewise function.

c. Graph the piecewise function. Label your axis.

d. If Ms. Howard, made \$33,000 last year, how much did she pay in social security?

# 2.3 Piecewise Word Problems

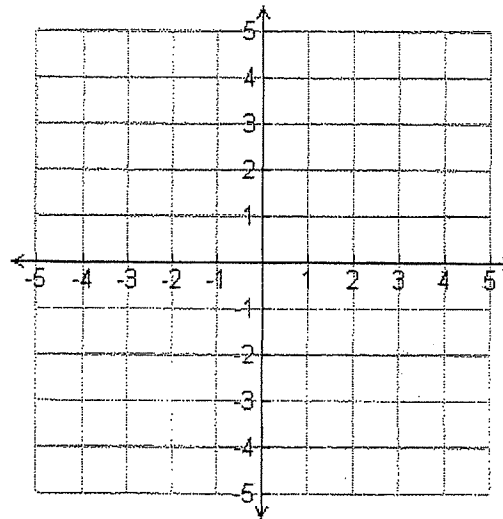
Topics 5

Name: \_\_\_\_\_

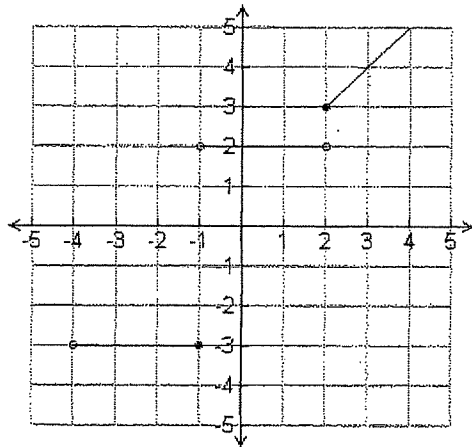
Date: \_\_\_\_\_ Hour: \_\_\_\_\_

1. Graph the following function.

$$f(x) = \begin{cases} x+3 & \text{if } x < 0 \\ 5 & \text{if } x = 0 \\ 2x-1 & \text{if } x > 0 \end{cases}$$

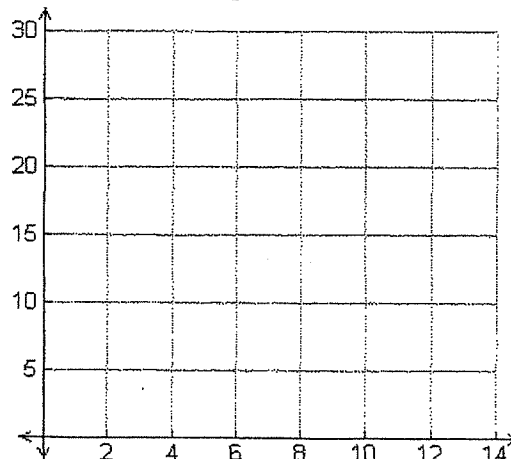


2. Write a piecewise function for the graph.



3. Erin buys gas at a self service station for \$2.75 a gallon. The gas station has a promotion going on that anyone who buys more than 10 gallons of gas, only has to pay \$2.50 per gallon. Erin's tank will hold 12 gallons of gas.

a. Write a rule for the total cost,  $C(g)$ , as a function of  $g$  gallons of gas.



b. Graph the piecewise function.

c. What is the domain and range of the function in part a?