

"Now" means  $x=0$   
 "Today"

II.

Practice

Solve.  $x=1$  means "1 day in the future."

x	0	1	2
y	5	6.5	8

1. Lin is tracking the progress of her plant's growth. Today the plant is 5 cm high. The plant grows 1.5 cm per day.

a. Write a linear model that represents the height of the plant after  $d$  days.

$$y = 1.5x + 5, \quad x = \text{day?}, \quad y = \text{height?}$$

b. What will the height of the plant be after 20 days?

$$y = 1.5(20) + 5 = 30 + 5 = 35.$$

The plant is 35 cm tall

2. Mr. Thompson is on a diet. He currently weighs 260 pounds. He loses 4 pounds per month.

x	0	1	2
y	260	256	252

a. Write a linear model that represents Mr. Thompson's weight after  $m$  months.

$$y = -4x + 260 \quad \begin{matrix} x = \text{months} \\ y = \text{pounds} \end{matrix}$$

b. After how many months will Mr. Thompson reach his goal weight of 220 pounds?

$$220 = -4x + 260$$

$$-260 \quad -40 = -4x \quad \rightarrow \quad \frac{-40}{-4} = \frac{-4x}{-4}$$

$$10 = x$$

3. Paul opens a savings account with \$350. He saves \$150 per month.

Assume that he does not withdraw money or make any additional deposits.

x	0	1	2
y	350	500	650

a. Write a linear model that represents the total amount of money Paul deposits into his account after  $m$  months.

$$y = 150x + 350$$

b. After how many months will Paul have more than \$2,000?

$$2000 = 150x + 350$$

$$\frac{1650}{150} = \frac{150x}{150}, \quad x = 11$$

He is 220 lbs after 10 months

4. The population of Bay Village is 35,000 today. Every year the population of Bay Village increases by 750 people.

a. Write a linear model that represents the population of Bay Village  $x$  years from today.

$$y = 750x + 35000$$

b. In approximately many years will the population of Bay Village exceed 50,000 people?

$$50,000 = 750x + 35,000$$

$$15,000 = 750x$$

$$\frac{15,000}{750} = \frac{750x}{750}$$

$$20 = x$$

After 20 years the population will exceed 50,000

After 11 months he will have more than \$2000

5. Conner has \$25,000 in his bank account. Every month he spends \$1,500. He does not add money to the account.

- a. Write a linear model that shows how much money will be in the account after  $x$  months.  $y = -1500x + 25000$   $y = \$, x = \text{months}$
- b. How much money will Conner have in his account after 8 months?  $y = -1500(8) + 25000$   
 $-12000 + 25000 = 13000$  After 8 months, Conner has \$13,000

6. A cell phone plan costs \$30 per month for unlimited calling plus \$0.15 per text message.  $y = \$ \text{ cost}, x = \# \text{ of texts}$

- a. Write a linear model that represents the monthly cost of this cell phone plan if the user sends  $t$  text messages.  $y = 0.15x + 30$
- b. If you send 200 text messages, how much would you pay according to this cell phone plan?  $y = 0.15(200) + 30$   
 $30 + 30 = 60$  You pay \$60 for 200 texts

7. Ben walks at a rate of 3 miles per hour. He runs at a rate of 6 miles per hour. In one week, the combined distance that he walks and runs is 210 miles.  $x = \text{walk hours}, y = \text{run hours}$

- a. Write a linear model that relates the number of hours that Ben walks to the number of hours Ben runs.  $3x + 6y = 210$   
 $-3x \quad -3x$
- b. Ben runs for 25 hours. For how many hours does he walk?  $6y = -3x + 210$   
 $\frac{6y}{6} = \frac{-3x + 210}{6}$   
 $y = -\frac{1}{2}x + 35$

8. A salesperson receives a base salary of \$35,000 and a commission of 10% of the total sales for the year.

- a. Write a linear model that shows the salesperson's total income based on total sales of  $k$  dollars.  $y = .10x + 35000$
- b. If the salesperson sells \$250,000 worth of merchandise, what is her total income for the year, including her base salary?  
 $y = .10(250,000) + 35,000 = 25,000 + 35,000 = 60,000$

9. Amery has  $x$  books that weigh 2 pounds each and  $y$  books that weigh 3 books each. The total weight of his books is 60 pounds.  $2x + 3y = 60$

- a. Write a linear model that relates the number of 2 pound books to the number of 3 pound books Amery has.  $2x + 3y = 60$   
 $-2x \quad -2x$
- b. If Amery has 10 3-pound books, how many 2-pound books does he have?  $3y = -2x + 60$   
 $\frac{3y}{3} = \frac{-2x + 60}{3}$   
 $y = -\frac{2}{3}x + 20$

$$\begin{array}{r} 10 = -\frac{2}{3}x + 20 \\ -20 \quad -20 \\ \hline -10 = -\frac{2}{3}x \\ \hline 15 = x \end{array}$$

$$2x + 1.5y = 425$$

10. Max sells lemonade for \$2 per cup and candy for \$1.50 per bar. He earns \$425 selling lemonade and candy.  $x = \text{lemonade}$ ,  $y = \text{candy}$

a. Write a linear model that relates the number of cups of lemonade he sold to the number of bars of candy he sold.

$$1.5y = -2x + 425$$

b. If Max sold 90 bars of candy, how many cups of lemonade did he sell?

$$y = -3x + 283.3$$

$$90 = -3x + 283.3$$

$$-193.3 = -3x, x = 64.4$$

III. Challenge Problems

He sold either 64 or 65 candy bars. Can't be exact.

11. A bacteria population doubles every minute. Explain why this population growth cannot be modeled using a linear equation.

x	0	1	3	4	5
y	1	2	4	8	16

Doubling adds different amounts each time. Linear is constant.

12. Kara used the linear model  $y = 20,000 + 0.3x$  to predict her total salary from achieving total sales of  $x$ . What is her base salary? What percent commission does she earn?

(move decimal twice for percents)

Base = 20,000, Commission = 0.3 = 30%

13. Correct the Error

Question: The model  $2x + 5y = 85$  can be used to model how much money Tim spent on  $x$  sodas and  $y$  sandwiches. If he bought 15 sodas, how many sandwiches did he purchase?

Solution:

$$2x + 5(15) = 85$$

$$2x + 75 = 85$$

$$2x = 10 \text{ or } x = 2$$

Tim bought 2 sandwiches.

$$\frac{2x}{2} = \frac{10}{2}$$

$$x = 5$$

What is the error? Explain how to solve the problem.

Divided wrong.