

Practice

Rewrite each equation to isolate the indicated variable.

- $12ab = c$ for a $a = c/12b$
 - $y = 9x + 2$ for x $x = \frac{y-2}{9}$
 - $df = g - 10$ for d $d = \frac{g-10}{f}$
 - $\frac{1}{3}s - 8 = t$ for s $s = 3(t+8)$
- $\frac{1}{3}s - 8 = t$
 $\frac{1}{3}s + 8 = t$
 $\frac{1}{3}s = t + 8$
 $s = 3(t + 8)$

Choose the best answer.

- Which of the following is equivalent to the equation $4r + 7s = q$?
 A. $r = 4q - 28s$ C. $s = 7q + 28r$
 B. $r = \frac{q-7s}{4}$ D. $s = \frac{q+4r}{7}$
- Which of the following is not equivalent to the equation $a - 3b = 5c + 9$?
 A. $a = 3b + 5c + 9$ C. $a - 3b - 5c = 9$
 B. $b = \frac{1}{3}(a - 5c - 9)$ D. $c = \frac{a - 3b + 9}{5}$

Write the desired equivalent equations. Then find the desired values.

- Ohm's law of electricity states that $V = IR$, where V = voltage, I = current, and R = resistance.
 Rewrite the equation to isolate R . $R = V/I$
 If $V = 9$ volts and $I = 0.5$ amperes, what is the value of R ? 18 ohms
 Rewrite the equation to isolate I . $I = V/R$
 If $V = 110$ volts and $R = 2,200$ ohms, what is the value of I ? 0.05 amps
- A contractor charges \$150 plus \$75 per hour for a job. The equation $c = 75h + 150$ describes the cost, c , for a job that takes h hours.
 Rewrite the equation to isolate h . $h = \frac{c-150}{75}$ or $\frac{c}{75} - 2$
 If a job cost \$825, how many hours did it take? 9
- At a baseball game, hot dogs cost \$2.25 and sodas cost \$1.75. The total cost, t , for h hot dogs and s sodas can be described by the equation $t = 2.25h + 1.75s$.
 Rewrite the equation to isolate s . $s = \frac{t - 2.25h}{1.75}$
 If Costas spent \$18.25 and bought 5 hot dogs, how many sodas did he buy? 4

Write the desired equivalent equations. Then find the desired values.

- The weight, in newtons, of an object in a particular location is equal to its mass, in kilograms, times the gravitational acceleration in that location. As a formula, this is written $w = mg$, where w = weight, m = mass, and g = the gravitational acceleration.
 An astronaut has a mass of 80 kg on Earth. On Earth's surface, the gravitational acceleration is $g = 10$ newtons per kilogram. What is the astronaut's weight on Earth? 800 newtons
 Rewrite the equation to isolate g . $g = w/m$
 On the surface of the moon, the astronaut's weight is 128 newtons. What is the gravitational acceleration on the moon? 1.6 newtons per kilogram 128/80
- Recall the distance formula $d = rt$, where d = distance, r = rate, and t = time.
 Rewrite the equation to isolate r . $r = d/t$
 Dana drove from Atlanta to Athens, 70 miles away, in 1 hour 15 minutes. What was her rate of speed in miles per hour? 56 70/1.25
- DEMONSTRATE** Solve the equation $\frac{1}{4}p - 5n = 12$ for n . Then choose values for p and n , and show that the equations are equivalent.
 $n = \frac{12 - 1/4p}{-5}$
 $n = 2$ $p = 8$ $-2 = 12 - 1/4(8)$
 $-2 = 12 - 2$
 $-5 = -5$
choose any #'s

- APPLY** A hairdresser charges \$25 for a man's haircut, \$35 for a woman's haircut, and \$15 for a child's haircut. Her total income, t , can be described by the following equation, where m = the number of men's haircuts, w = the number of women's haircuts, and c = the number of children's haircuts.
 $t = 25m + 35w + 15c$
 Last week, the hairdresser's total income was \$385. Her customers included 8 women and 2 children. If she wants to find how many customers were men, which variable should she solve the equation for? Solve the equation for that variable and find the number of men who got haircuts.
solve for m ; $m = t - 35w - 15c$
 $m = 385 - 35(8) - 15(2)$
 $m = 25$
 $m = 3$

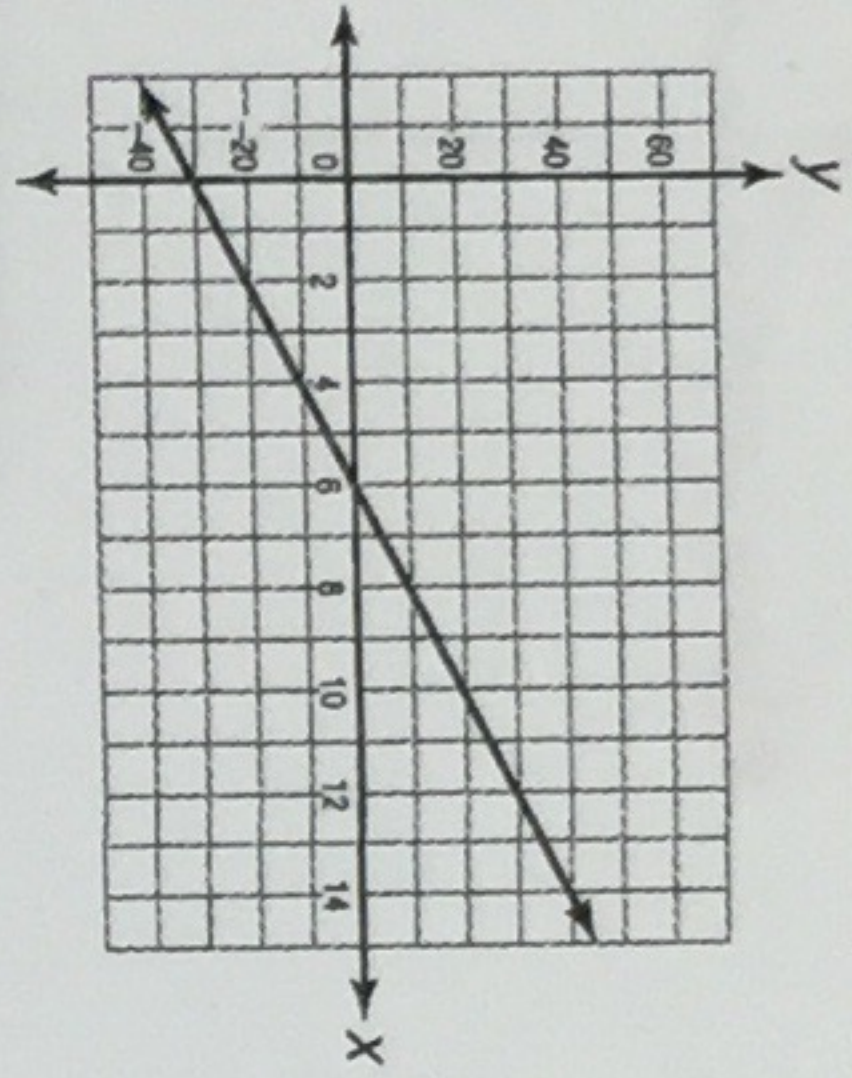
Practice

Write an equation to describe each situation.

1. A number y is 6 less than twice a number x . $y = 2x - 6$
2. Dorothy's age, d , is 1 more than half of Matthew's age, m . $d = \frac{1}{2}m + 1$
3. The number of boys, b , in the class is 3 times the number of girls, g , in the class. $b = 3g$

Choose the best answer.

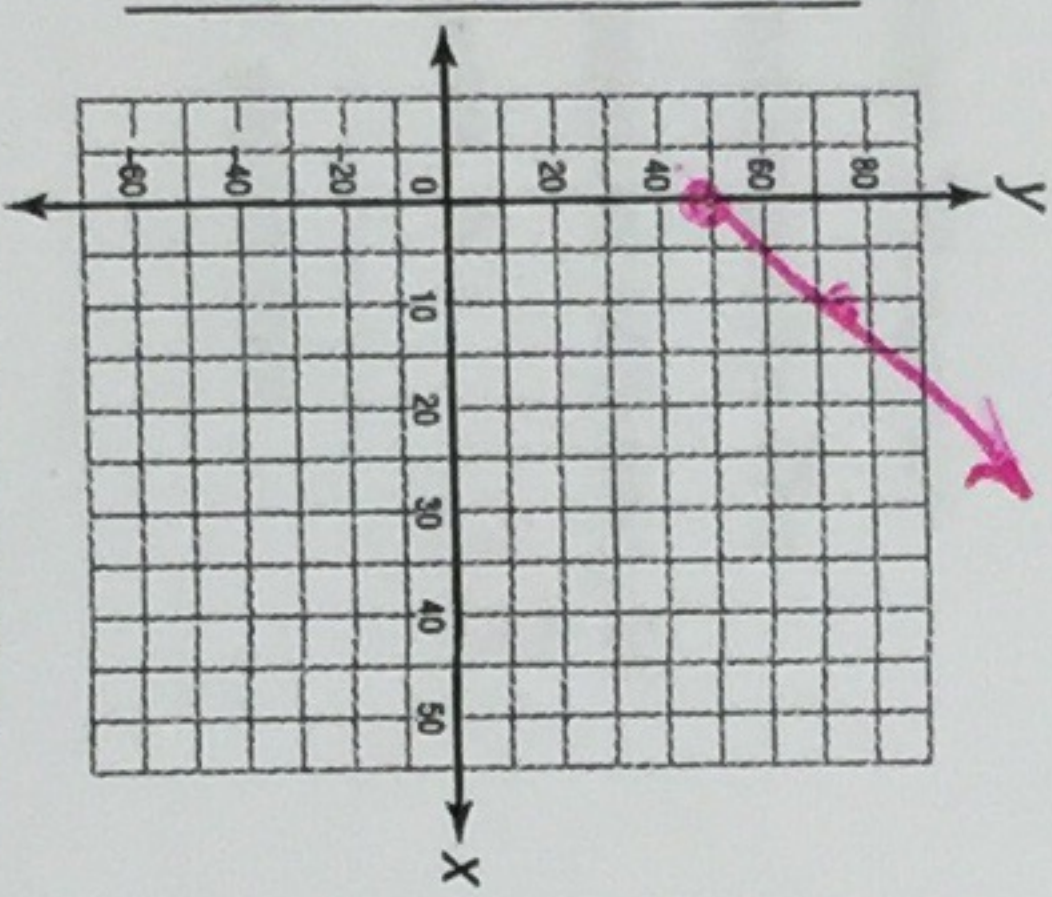
4. A beekeeper pays \$30 to rent a booth at a farmers' market. She charges \$5 for each jar of honey. The graph shows this situation, which is modeled by the equation $y = 5x - 30$. Which of the following is true?
 - A. The value of x can be negative. \leftarrow can't sell neg. jars of honey
 - B. The value of y can be negative. \leftarrow can't sell half jars
 - C. The value of x can be fractional.
 - D. The value of y cannot be zero.



Identify the dependent and independent variables and the y -intercept. Write and graph an equation for the situation, providing labels for the axes of the graph.

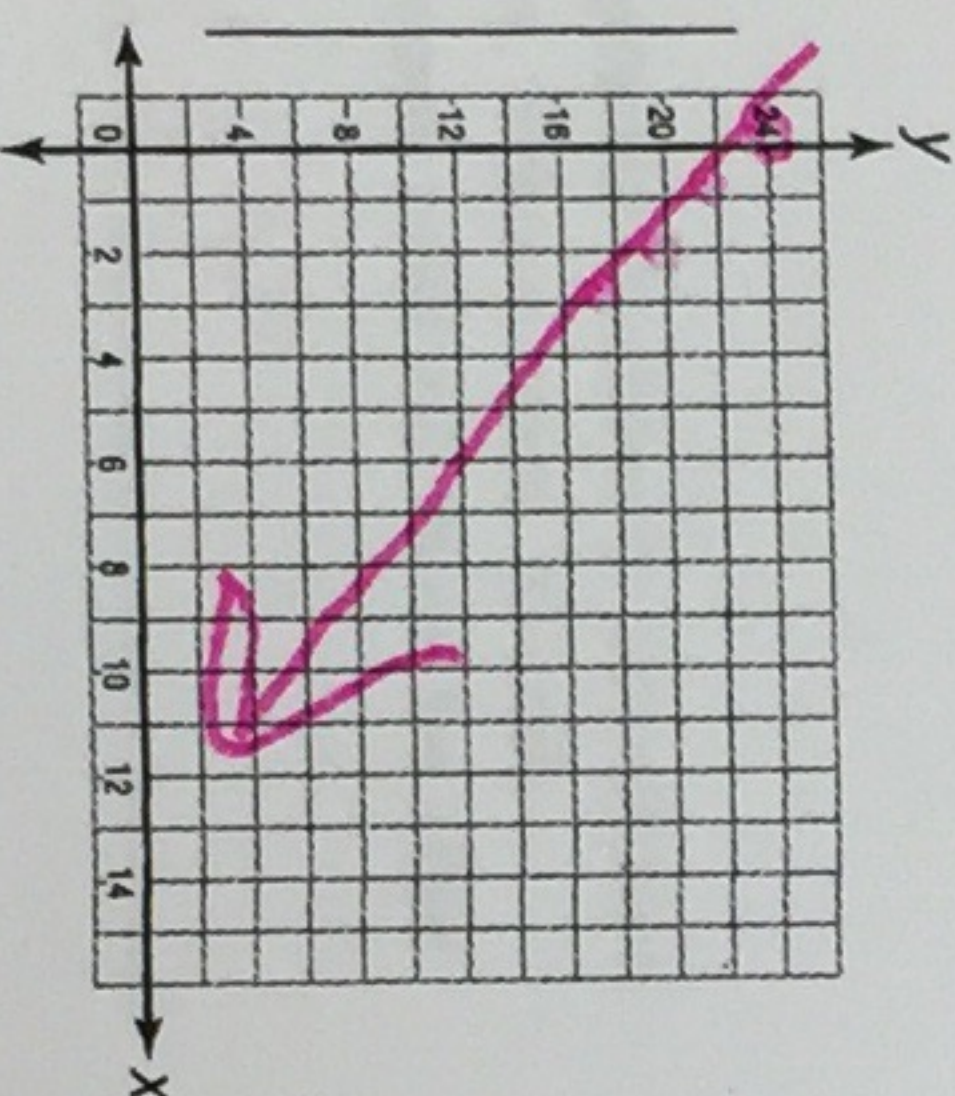
5. A baker sells cupcakes at a local festival. He pays \$50 to rent a booth, and he charges \$2.50 for each cupcake. Graph his profit or loss, in dollars, against the number of cupcakes he sells.

independent variable: total (y)
 dependent variable: # of cupcakes (x)
 y -intercept: (0, 50)
 equation: $y = 2.50x + 50$



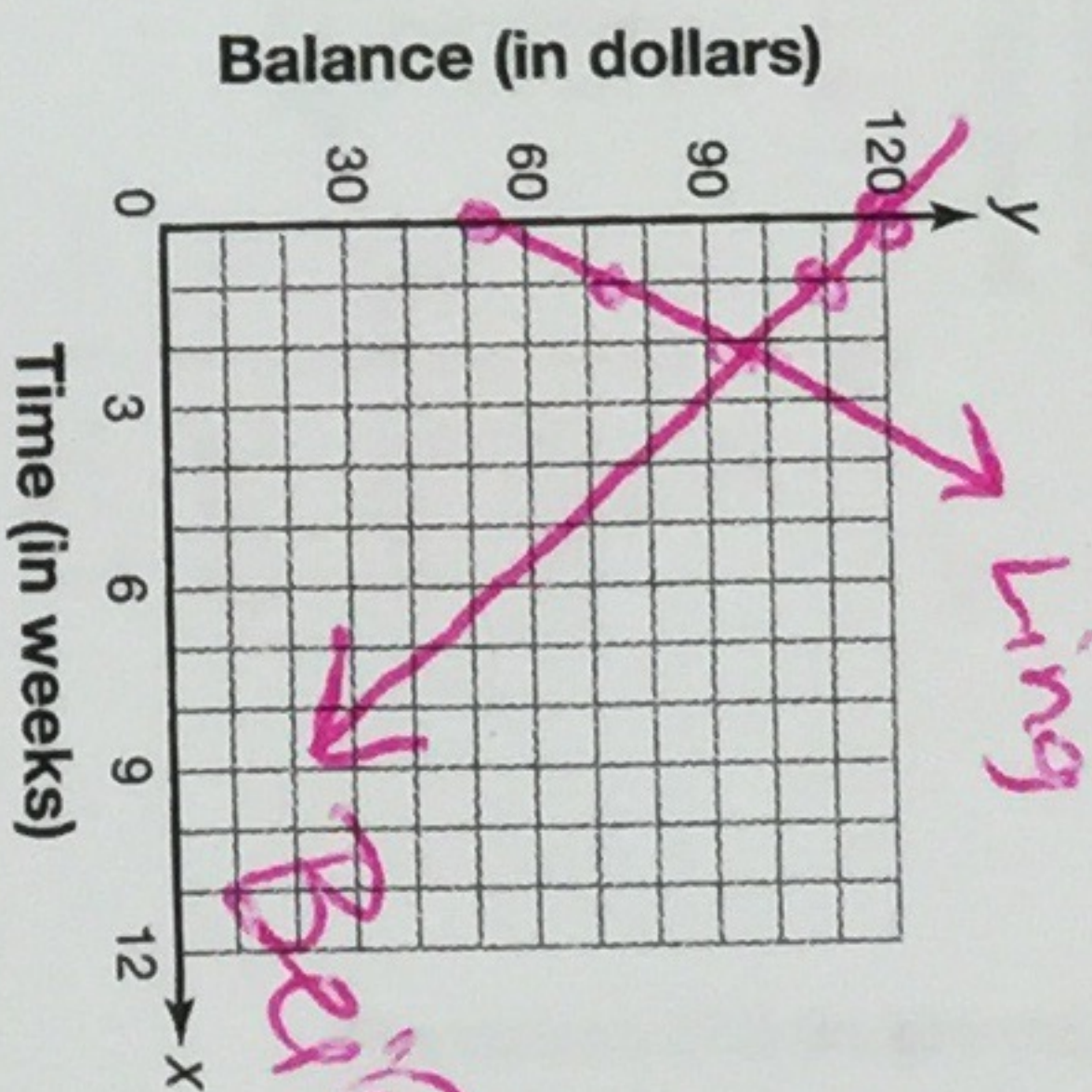
6. A cookie jar contains two dozen cookies. Every day, Nikki eats 2 cookies. Graph the number of cookies in the jar against the number of days since it was filled.

independent variable: total (y)
 dependent variable: # of cookies (x)
 y -intercept: (0, 24)
 equation: $y = -2x + 24$



Solve.

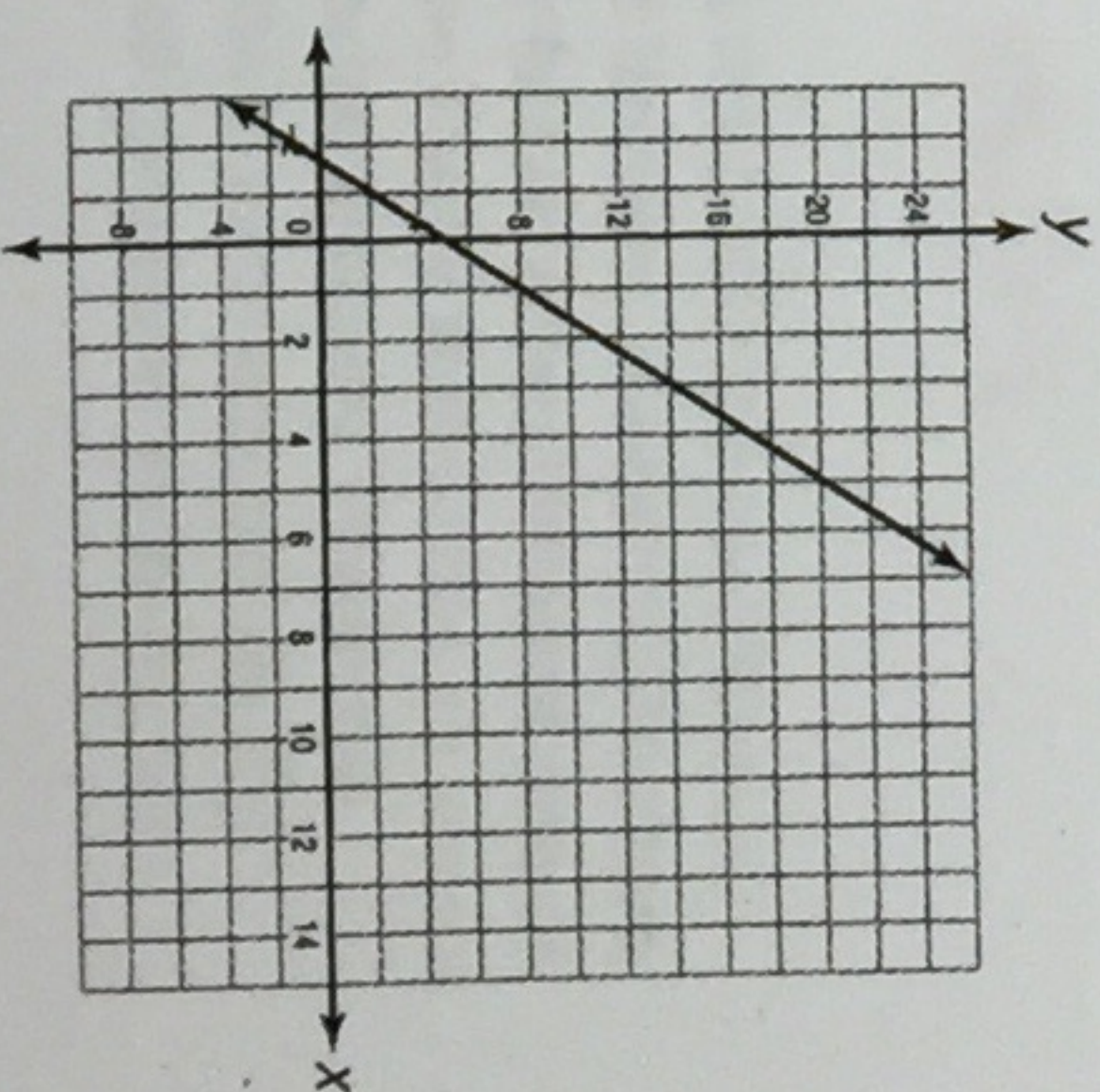
7. **COMPARE** Ling's bank account has a balance of \$55. Every week, she adds \$20 to it. Bei Bei's bank account has a balance of \$120. Every week, she withdraws \$10 from it. Write and graph an equation to describe each girl's bank account. Compare the equations and their graphs.



Ling $\Rightarrow y = 20x + 55$
 Bei Bei $\Rightarrow y = -10x + 120$
 Ling \rightarrow increasing line, Bei Bei - decreasing

Ling \Rightarrow lower y -int than Bei Bei

8. **DESCRIBE** A puppy weighed 5 ounces (oz) at birth and gained 3 oz each week for the first 10 weeks. The equation that describes the puppy's weight after x weeks is $y = 3x + 5$, as graphed below.



Describe the limitations of the variable x in this situation. Which points on the graph are not solutions for the given situation?

$\rightarrow x$ cannot be negative (weeks)
 $\rightarrow y$ cannot be negative (weight)
 \rightarrow entire graph should be in first quadrant

Practice

Determine whether each equation is an exponential equation.

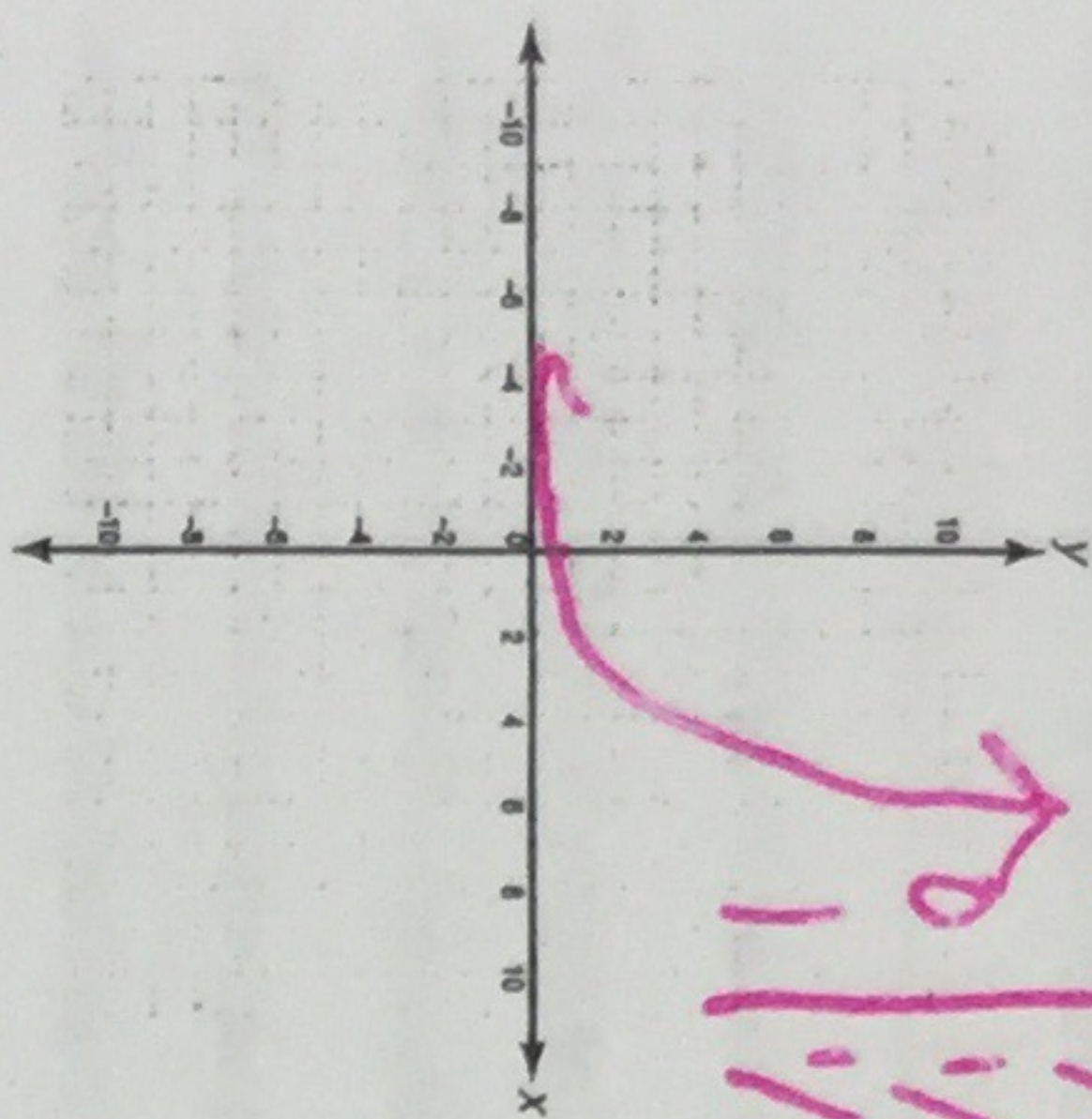
1. $y = 6 \cdot \left(\frac{1}{8}\right)^x$ Y

2. $y = \pi^x$ N

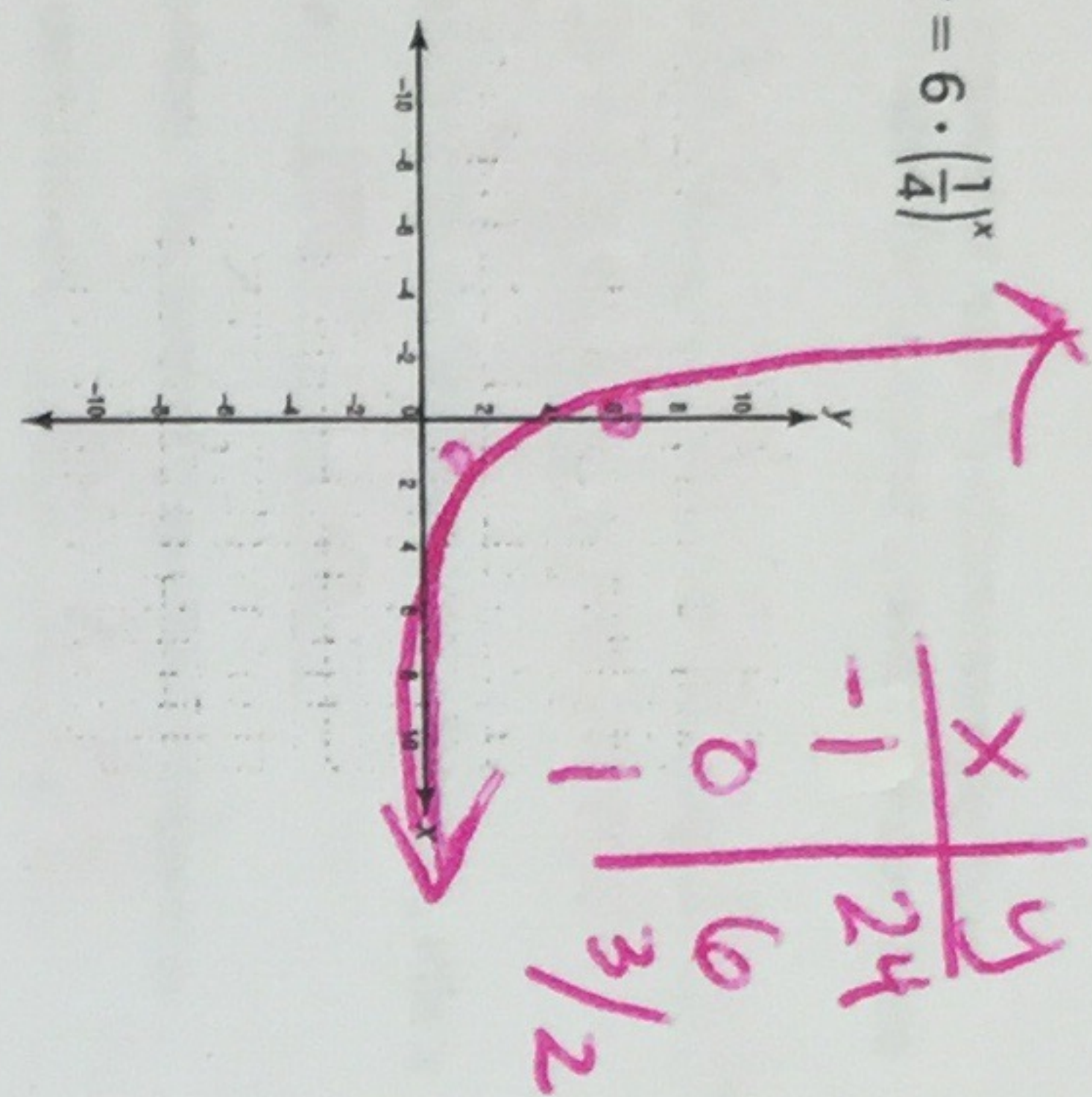
3. $y = -12 \cdot x^{10}$ Y

Graph the following exponential equations.

4. $y = \frac{1}{6} \cdot 3^x$



5. $y = 6 \cdot \left(\frac{1}{4}\right)^x$



Find the base, b , for the exponential equation of the form $y = a \cdot b^x$ that describes each situation.

6. A colony of fruit flies doubles in population every day. The variable y gives the number of fruit flies after x days. $b = 2$

7. Enrollment at a preschool has dropped by 4.5% each year. The variable y gives the number of students at the school after x years. $b = (1 - 0.045) = .955$

HINT
The base is equal to $1 - r$, where r is the percent decrease expressed as a decimal.

8. A savings account earns 3% annual interest, compounded annually. The variable y gives the amount of money in the account after x years. $b = 1.003$

"Annually" means once per year.

Write an equation for each situation.

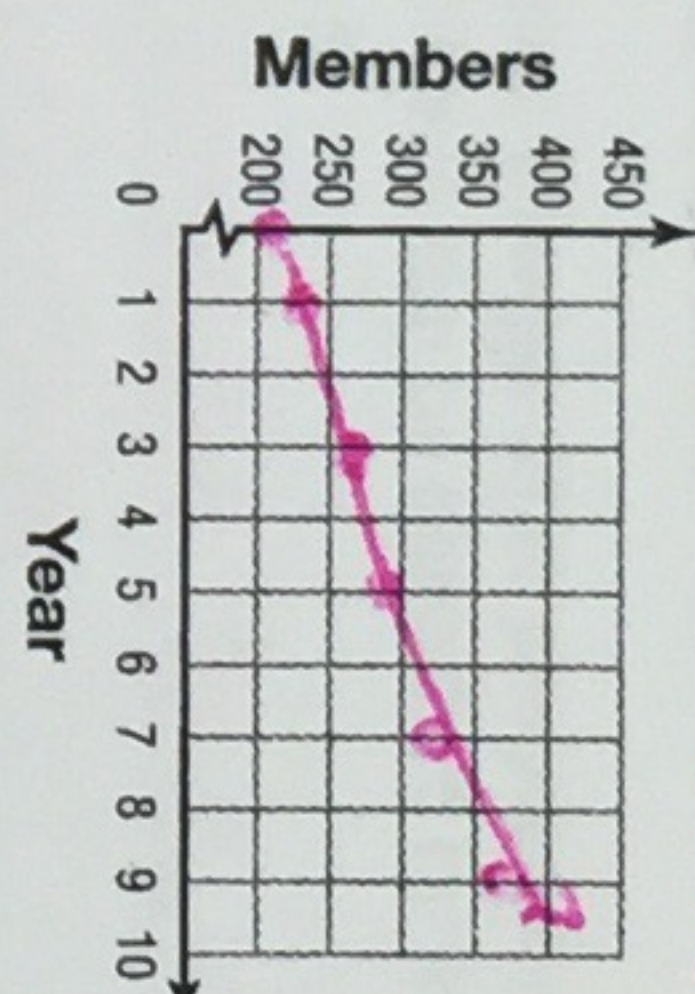
9. Sanjay bought a car for \$18,500. According to his insurance company, the value of the car depreciates 5% each year. What will the value of the car be x years after Sanjay purchased it?
 $18500(1 - 0.05)^x$

10. A colony of bacteria doubles in population every 24 hours. If there were 20 cells initially, how many cells will there be after x days?
 $20(2)^x$

Duplicating any part of this book is prohibited by law. © 2014 Triumph Learning, LLC

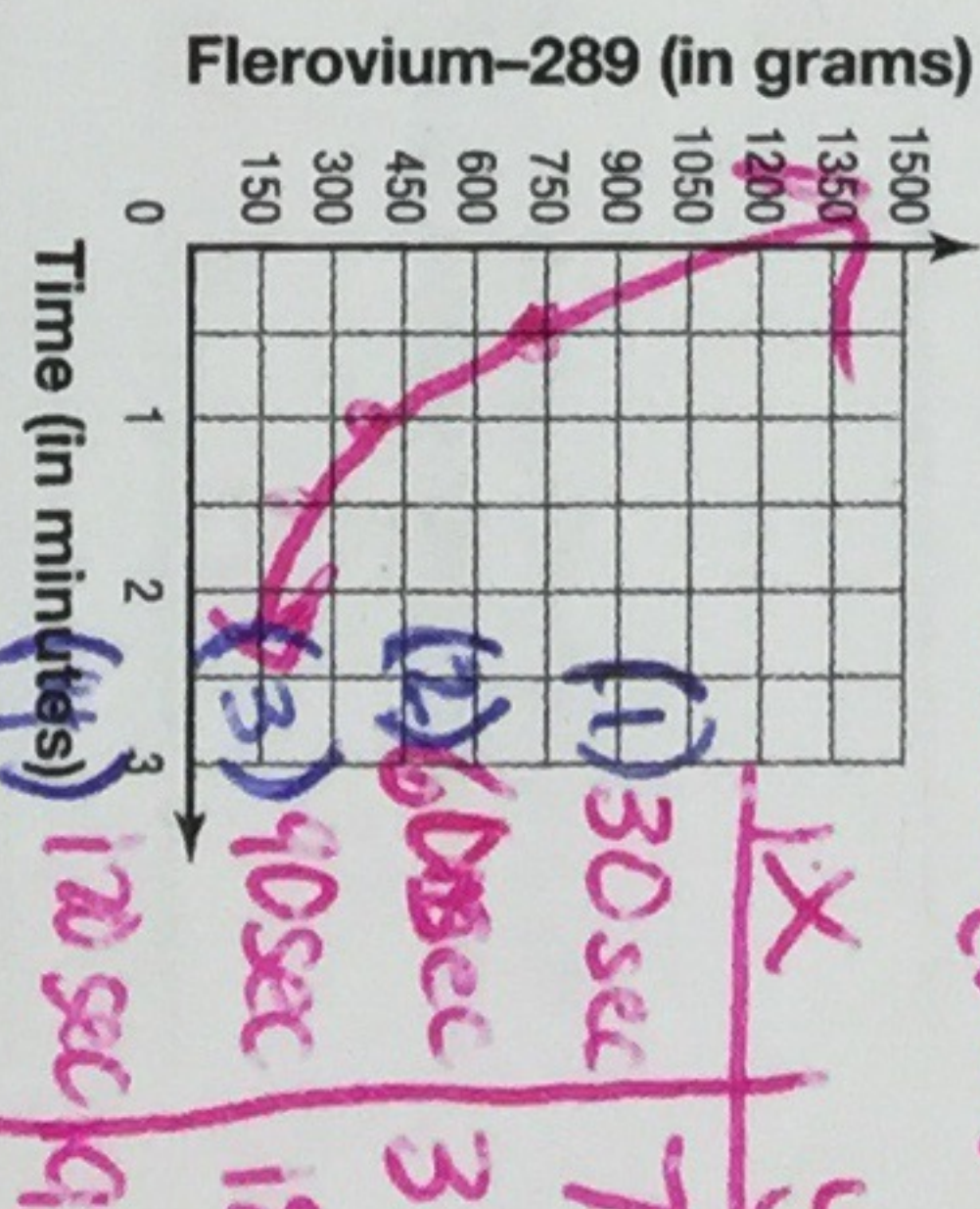
Graph the relationship in each situation.

11. Membership in the Parents' Association at an elementary school has increased each year for the past 5 years by an average of 6%. This year, there were 211 members. Make a graph to represent the number of people in the Parents' Association over the next 10 years, assuming this trend continues.



$211(1 + 0.06)^x$

12. A scientist has a sample of 1,500 grams of Flerovium-289, a radioisotope with a half-life of 30 seconds. Graph the amount of Flerovium-289 in the sample over the next 3 minutes.



$1500(0.5)^x$

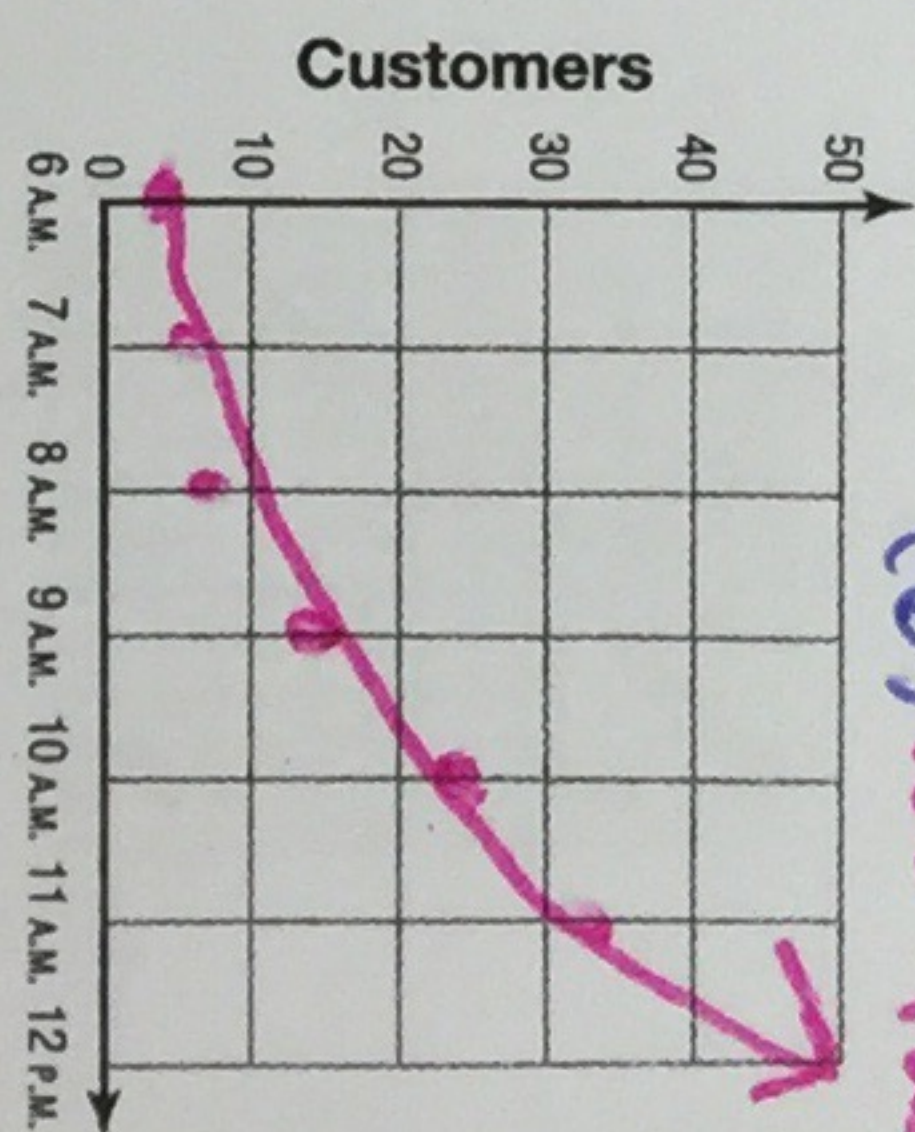
half-life = # of times

Solve.

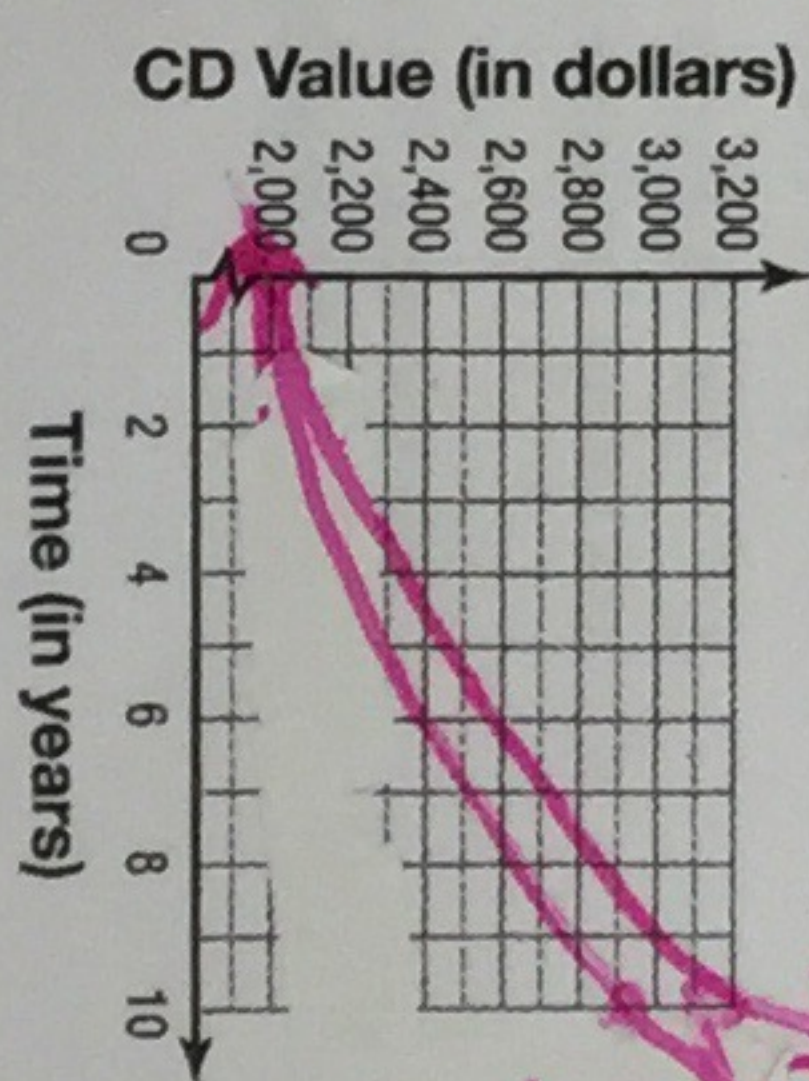
13. **PREDICT** When a coffee shop opened at 6 a.m., there were 4 customers. At 7 a.m. there were 6 customers, and at 8 a.m. there were 9 customers. The number of customers continues to increase exponentially. Graph the number of customers in the coffee shop from 6 a.m. to noon. When will there be more than 30 customers in the coffee shop?

$4(1.5)^x$

11am



14. **COMPARE** Javier plans to invest \$2,000 in a certificate of deposit, or CD, for a period of 10 years. His bank offers two types of CDs. The Super Saver has an annual interest rate of 4% compounded quarterly. The Thrifty Thriver has an annual interest rate of 4.5% compounded annually. Graph the amount of money that would be in each account for the next 10 years. Which option will give Javier more for his investment?



$2000(1 + \frac{0.04}{4})^{40} > 2000(1 + 0.045)^{10} = 2977.73$

$2000(1 + \frac{0.045}{1})^{10} = 3105.94$

Review

Solve.

- To qualify for a race, a runner must be able to run at a pace of at least 15 kilometers per hour. Noah ran 5 miles in 30 minutes. Does he qualify for the race? Explain your answer. (Note: There are approximately 1.6 kilometers in a mile.)
10 miles in 1 hr → 10 x 1.6 = 16 so yeah
- Find three consecutive numbers whose sum is 156. $x + (x+1) + (x+2) = 156$
51, 52, 53
- The force of an object is equal to the product of its mass and its acceleration. As a formula, this is written $f = m \cdot a$. Rewrite the equation by solving for m . $m = f/a$
- One unknown number is double another unknown number. The sum of these two numbers is less than 58. Find the largest two integers that fit this description. 19 & 38

Choose the best answer.

- A team of scientists is studying the effects of a plant disease on a forest. In a population of 100 trees, they found that 12 of the trees contracted the disease in one month. They need to predict the effects of the disease over the next decade. Which of the following units should the answer be given in?
A. years per tree
 B. trees per year
C. trees per week
D. weeks per tree
- Gerardo is riding his bike to the movie theater. His distance in miles from the theater after t minutes can be described by the equation $9 - 0.2t$. Which of the following is true?
A. Gerardo is riding his bike at a rate of 0.2 miles per hour. X
B. Gerardo is riding his bike at a rate of 9 miles per minute.
C. When he started, Gerardo was 0.2 mile from the theater.
 D. When he started, Gerardo was 9 miles from the theater.

For questions 7 and 8, interpret parts of the expressions given.

- A population of wild hares doubles in size each month. The number of hares after m months can be described by the expression $23 \cdot 2^m$. Interpret the meaning of the constant 23.
Started w/ 23 rabbits

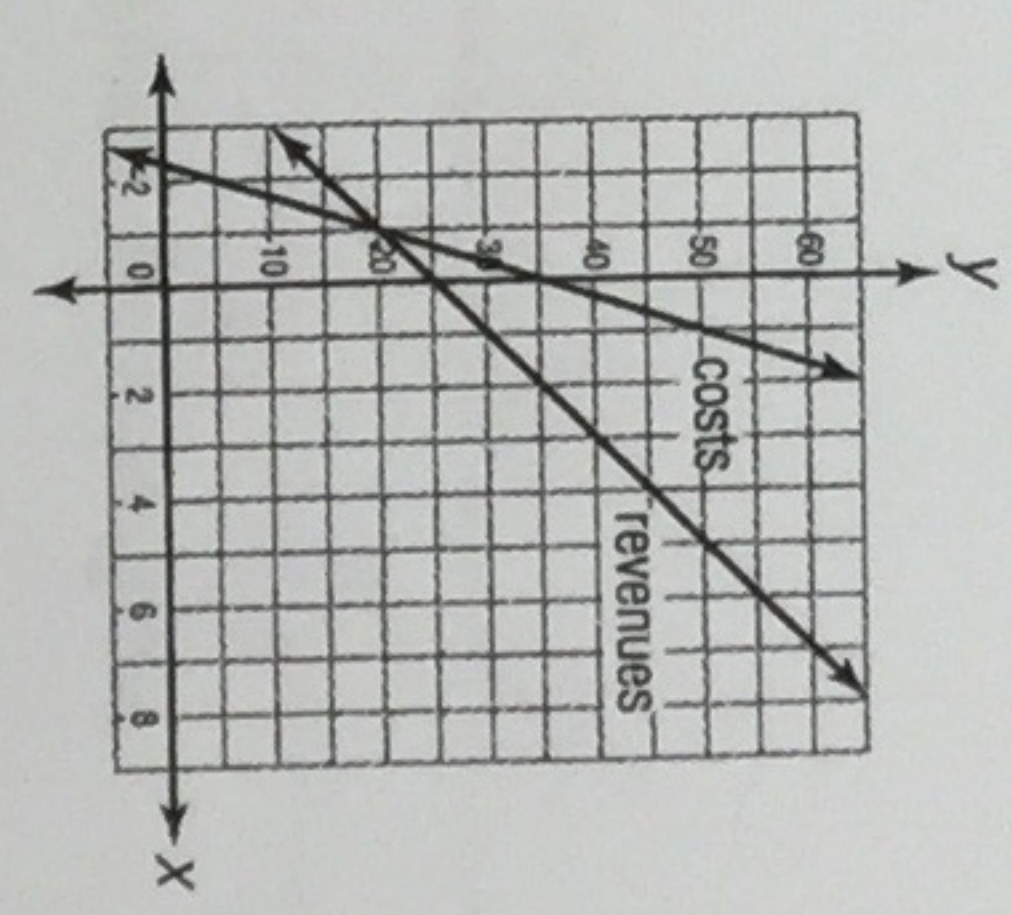
- Jean is opening a bank account with money that she got for her birthday. She will deposit money into the account each month. Her bank balance can be described by the expression $250 + 35m$. Explain what the quantities 250, 35, and m represent in the expression. Then explain what the quantity $35m$ represents.
250 - starting amount
35 - money she deposits each month
 $m = \#$ of months
 $35m = 35 \times \#$ of mths

Describe any constraints on the variable.

- A carpenter charges \$120 per job plus \$60 for each hour or portion of an hour. His fee for a job lasting h hours can be described by the equation $f = 120 + 60h$. What are the constraints on the variable h ?
cannot be negative #s or fractions

Choose the best answer.

- The graph on the right shows the costs and revenues for a small quilting business.
The x -values represent the number of quilts sold. The y -values represent the amount of money collected or spent, in dollars. The point of intersection is $(-1, 20)$.
Which of the following is true?
A. If the business sells 1 quilt, it will break even.
B. If the business sells 20 quilts, it will break even.
 C. The point of intersection is not a solution because the value of x cannot be negative. The costs are always higher than the revenues, so the business will never break even.
D. The point of intersection is not a solution because the value of x cannot be negative. The revenues are always higher than the costs, so the business will always make a profit.
- Gina is adding a lace border to a circular pillow. The radius of the pillow is approximately 8 inches, and she needs to decide how much lace to buy. Which length should she buy?
 A. 16π inches
B. 50 inches
C. 51 inches
D. 100 inches
circumference



Write an equation to model each situation.

12. The number of cells in a sample quadruples every 24 hours. There were 20 bacteria in the sample initially. Write an equation to find b , the number of bacteria in the sample after d days.

$b = 20 \cdot 4^d$

13. A bathtub holds 40 gallons of water and is draining at a rate of 4 gallons per minute.

Write an equation that gives the amount of water in gallons, w , after m minutes.

$w = 40 - 4m$

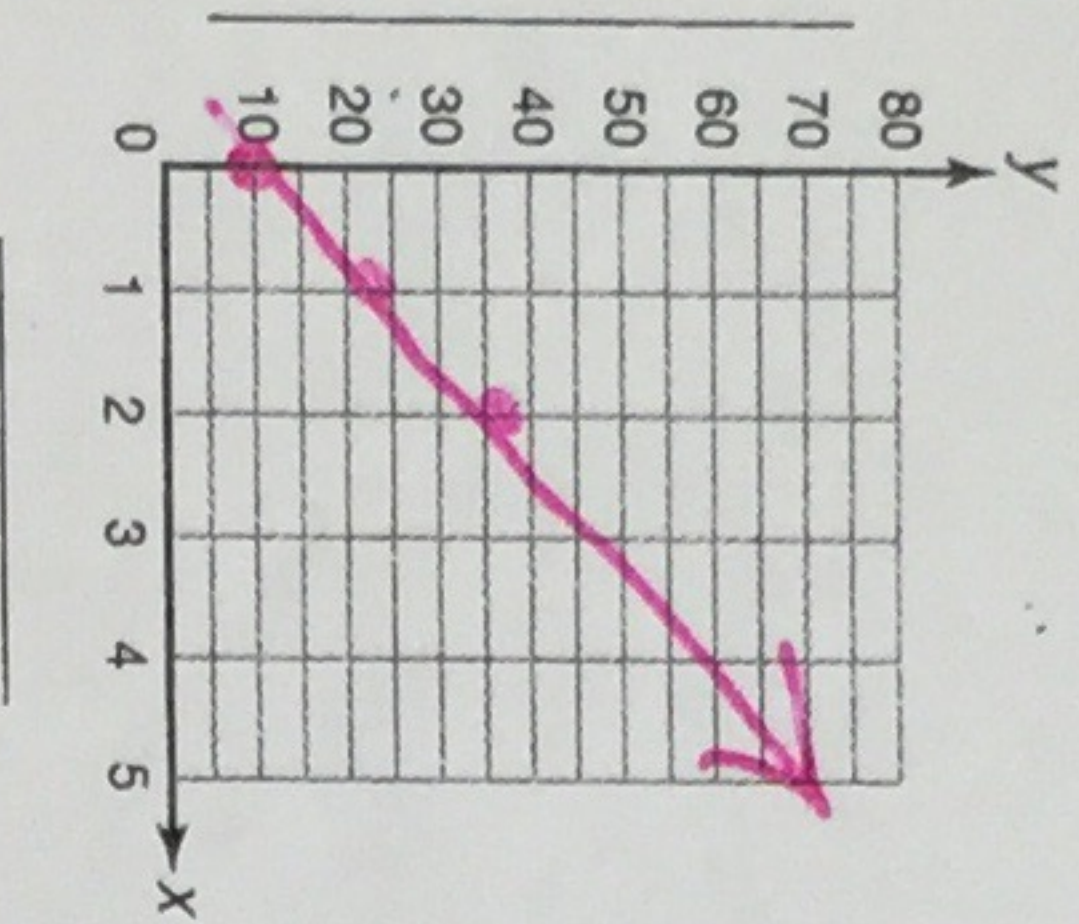
Describe the constraints on variables in the equations.

14. Padma works as a babysitter. She charges a \$10 fee to cover her transportation costs plus

\$13 per hour to watch one child. Write an equation that gives her total pay, y , for a job lasting

x hours. $y = 10 + 13x$

Graph your equation on the coordinate grid below. Be sure to label the axes.



15. As a grocery packer, Jason makes \$8 per hour. He also gets occasional tips from customers. After working a shift of h hours, Jason's pay, P , is described by the inequality $P \geq 8h$. What are the constraints of the variable P ?

cannot be negative

16. Purple pens come in small packages and large packages. Tabitha bought 1 small package and 3 large packages, and she now has a total of 85 pens. Rob bought 2 large packages and 6 small packages, and he now has a total of 110 pens. The following set of equations describes this situation.

$s + 3l = 85$
 $6s + 2l = 110$

What are the constraints on s and l ?

cannot be negative or fractions

Solve.

17. Atsuo works as a salesman. He makes \$550 per week plus a commission of 10% on anything he sells. His pay each week, P , can be described by the equation $P = 550 + 0.1S$, where S is the total amount of his sales. He wants to figure out how much he needs to sell in order to make \$1,000 next week. Rewrite the equation to isolate S . Then, find the amount of sales he needs.

$P - 550 = S$
 $S = 4500$

18. Mrs. Chu owns a used car dealership. For the past 2 years, she has kept track of the number of cars sold during each quarter. She needs to create a bar graph for the following information.

Quarter	Number of Cars Sold
1	131
2	112
3	87
4	95
5	109
6	145
7	102
8	97

What variable should go on each axis? What scale should she use?

X - quarter

Y = # of cars sold

Scale of 1 on X

19. A kitten was born weighing 90 grams and gained 10 grams each day during the first week.

Define variables and write an equation to describe the kitten's weight over time.

$y = 10 \text{ total weight}$ $x = \text{days}$ $y = 90 + 10x$

Graph your equation on the coordinate grid.

Do all of the points on your graph apply to the situation? Explain.

yes b/c I did not use negatives

