

Lesson 16.1 Skills Practice

NAME _____

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Producing and Selling T-Shirts Using a Graph to Solve a Linear System

Vocabulary

Match each key term to its definition.

- | | |
|--------------------------|--|
| 1. point of intersection | A. The amount of money made after paying all of the bills |
| 2. income | B. The x -coordinate of the point of intersection when one line represents the production cost of an item and the other line represents the income from selling the item |
| 3. profit | C. The money earned from sales |
| 4. break-even point | D. The point at which two lines cross on a coordinate plane |

Problem Set

Write an equation that represents the production cost and an equation that represents the income made from sales for each situation. Use the variables x and y to represent the independent and dependent variables.

1. The cost for the marching band to run a car wash as a fundraiser is \$20 to use the parking lot and \$2 per car. The marching band plans to charge \$7 per car.

Production cost: $y = 20 + 2x$

Income: $y = 7x$

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2. The cost to print tote bags to sell to faculty and staff is \$150 for the printer fee and \$6 per bag. The school plans to sell the tote bags for \$15 each.

3. The cost to make lemonade for a fair is \$10 to rent the table and \$0.10 per cup. You plan to sell the lemonade for \$1 per cup.

4. The cost to take pictures at a school dance is \$200 for the photographer and \$3 per print. The dance committee plans to charge \$5 per print.

5. The cost to make cupcakes for the bake sale is \$25 for a new pan and mixer and \$0.50 per cupcake. You plan to sell the cupcakes for \$3.50 each.

6. The cost to produce mascot seat cushions to sell at football games is \$80 for the logo design and \$8.50 per cushion. The athletic boosters plan to sell the cushions for \$23.50.

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Complete each table of values. Then, calculate the profit for the indicated number of items.

7. Profit for selling 50 mugs = $250 - 145 = 105$

Number of Mugs	Production Cost	Income
Mugs	Dollars	Dollars
x	$45 + 2x$	$5x$
0	45	0
5	55	25
15	75	75
25	95	125
50	145	250
100	245	500

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8. Profit for selling 10 lunches =

Number of Box Lunches	Production Cost	Income
Box Lunches	Dollars	Dollars
x	$10 + 3x$	$4x$
0		
2		
5		
10		
20		
50		

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9. Profit for mowing 30 lawns =

Number of Lawns Mowed	Production Cost	Income
Lawns Mowed	Dollars	Dollars
x	$400 + 4x$	$25x$
0		
5		
10		
15		
20		
30		

10. Profit for selling 10 scarves =

Number of Scarves	Production Cost	Income
Scarves	Dollars	Dollars
x	$30 + 3.5x$	$7x$
0		
2		
4		
6		
8		
10		

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11. Profit for selling 14 wreaths =

Number of Flower Wreaths	Production Cost	Income
Flower Wreaths	Dollars	Dollars
x	$500 + 12x$	$50x$
0		
10		
12		
14		
20		
100		

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12. Profit for selling 200 games =

Number of Video Games	Production Cost	Income
Video Games	Dollars	Dollars
x	$1500 + 10x$	$35x$
0		
25		
50		
100		
200		
300		

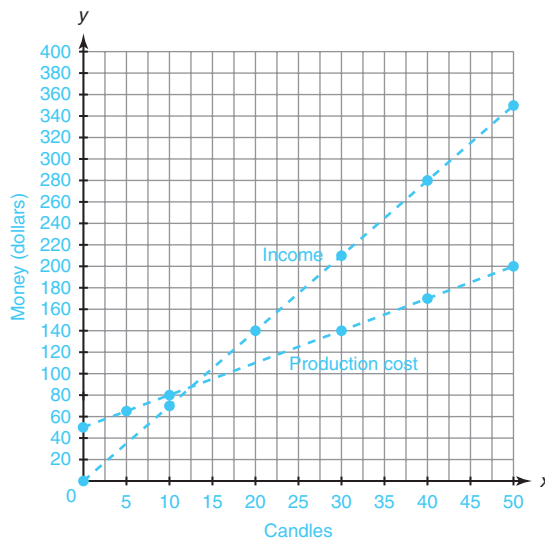
Use the given bounds and intervals to graph each pair of equations. Label the equations on the graph.

13. Production cost: $y = 50 + 3x$

Income: $y = 7x$

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Variable Quantity	Lower Bound	Upper Bound	Interval
Candles	0	50	5
Dollars	0	400	20

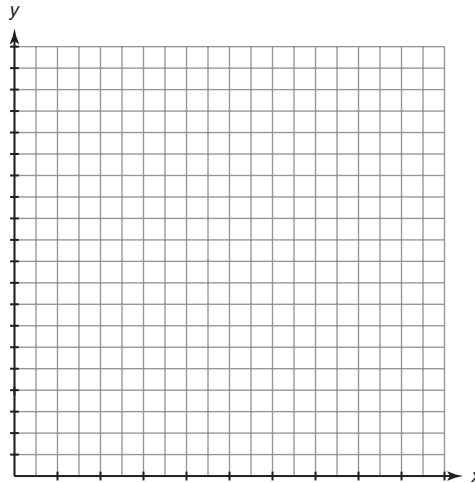


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14. Production cost: $y = 300 + 14x$
 Income: $y = 26x$

Variable Quantity	Lower Bound	Upper Bound	Interval
Gift Baskets	0	50	5
Money	0	1000	50

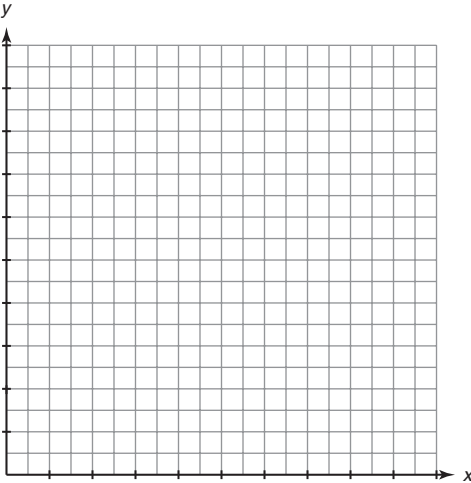
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15. Production cost: $y = 100 + 2x$
Income: $y = 5x$

Variable Quantity	Lower Bound	Upper Bound	Interval
Souvenir Cups	0	100	10
Money	0	500	50

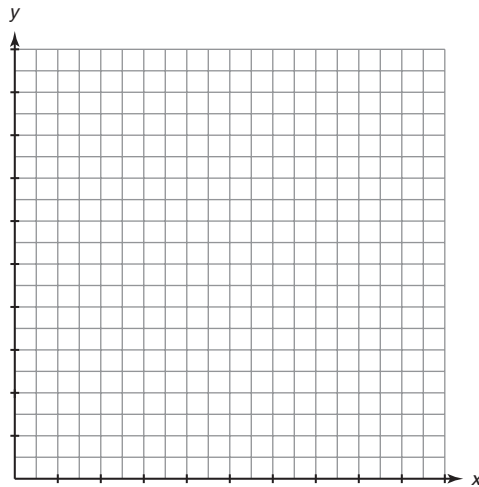


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16. Production cost: $y = 130 + 0.5x$
 Income: $y = 3x$

Variable Quantity	Lower Bound	Upper Bound	Interval
Textbook Covers	0	100	10
Money	0	300	30

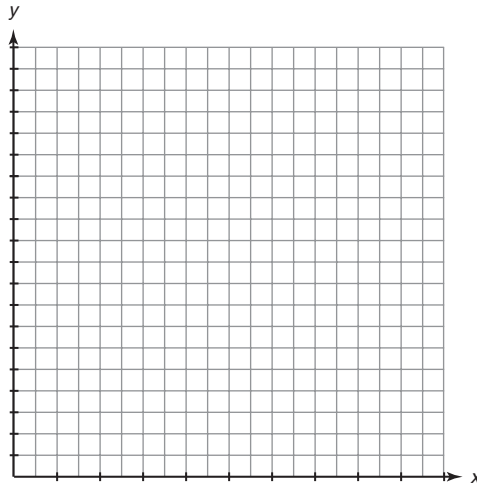
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17. Production cost: $y = 165 + 35x$
 Income: $y = 80x$

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Variable Quantity	Lower Bound	Upper Bound	Interval
Memory Quilts	0	10	1
Money	0	1000	50

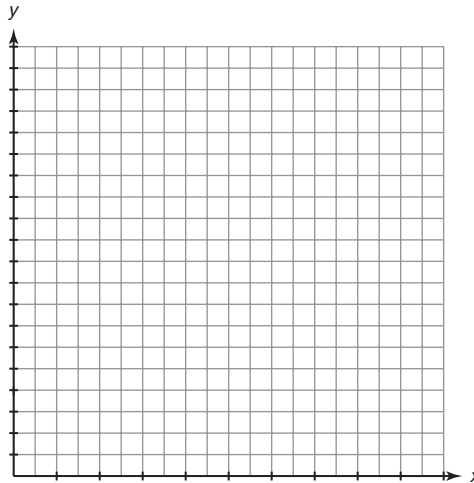


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18. Production cost: $y = 75 + 2.5x$
 Income: $y = 7.5x$

Variable Quantity	Lower Bound	Upper Bound	Interval
Custom Hats	0	50	5
Money	0	400	20

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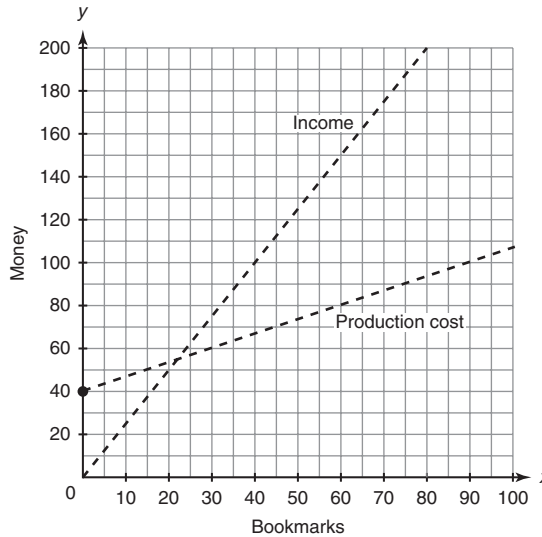
Determine the point of intersection and the break-even point for each graph. Then, state the least number of items that must be sold in order to make a profit.

19. Point of intersection: (22, 55)

Break-even point: 22 bookmarks

At least 23 bookmarks must be sold to make a profit.

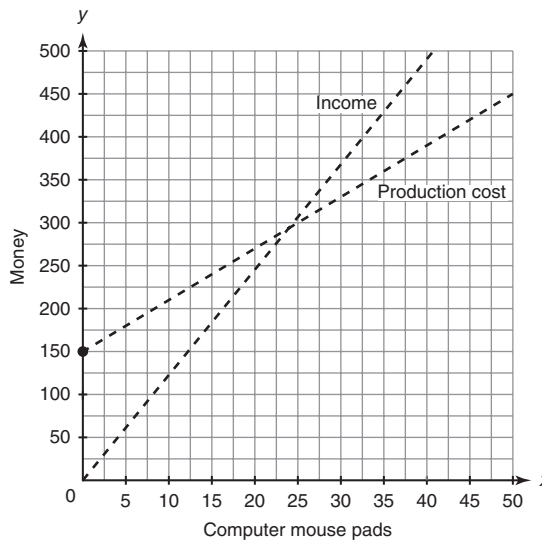
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20. Point of intersection:

Break-even point:

At least _____ computer mouse pads must be sold to make a profit.



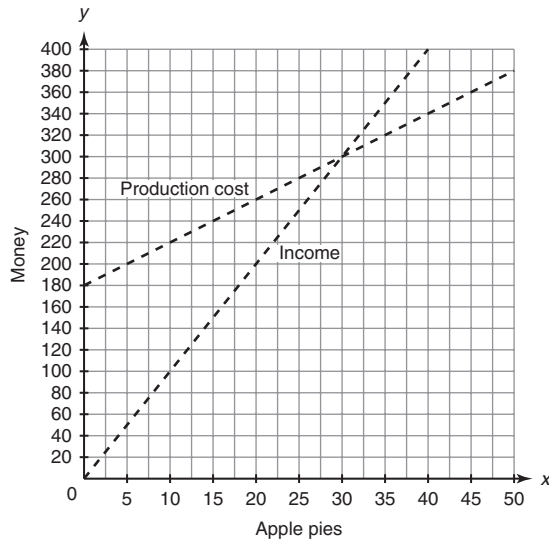
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21. Point of intersection:

Break-even point:

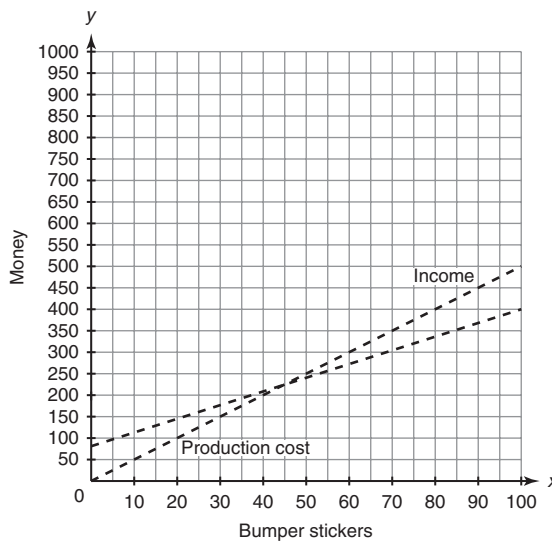
At least _____ apple pies must be sold to make a profit.



22. Point of intersection:

Break-even point:

At least _____ bumper stickers must be sold to make a profit.

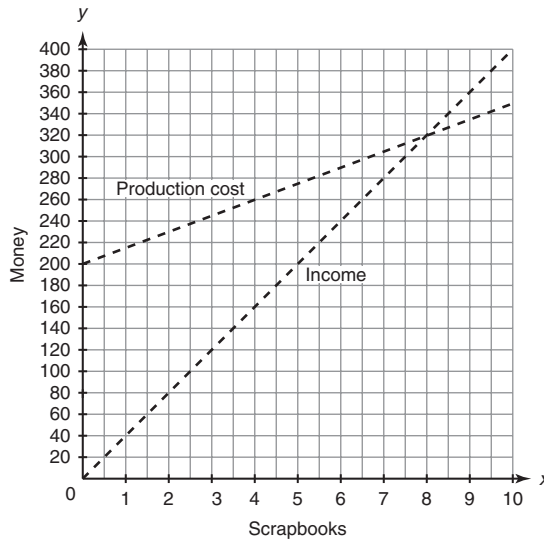


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23. Point of intersection:

Break-even point:

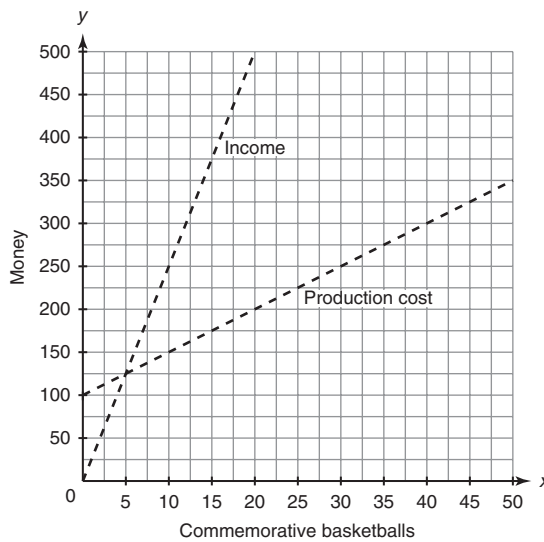
At least _____ scrapbooks must be sold to make a profit.



24. Point of intersection:

Break-even point:

At least _____ commemorative basketballs must be sold to make a profit.



Lesson 16.2 Skills Practice

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Saving Money Graphs and Solutions of Linear Systems

Vocabulary

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Write the term from the box that best completes each sentence.

system of linear equations	reciprocal	consistent system
parallel	inconsistent system	solution of a linear system
dependent system	perpendicular	independent system

1. A(n) _____ is formed when the equations or graphs of two or more linear equations define a relationship between quantities.
2. A(n) _____ is an ordered pair (x, y) that is the point of intersection, the point at which two or more lines cross.
3. The product of a number times its _____ is one.
4. _____ lines have the same slope.
5. The slopes of _____ lines have opposite signs and must be reciprocals of each other.
6. A(n) _____ has one or many solutions.
7. A(n) _____ has no solution.
8. A(n) _____ has only one solution.
9. A(n) _____ has infinitely many solutions.

Problem Set

Write a system of equations that represents each situation. Let y represent the total amount of money, in dollars, in each person's savings account in terms of the number of weeks, x , that he or she places money in the account. Then solve for the indicated amounts.

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1. Susan has \$65 in her savings account. Her friend CiCi has \$119 in her savings account. Susan plans to add \$23 per week to her account. CiCi plans to add \$14 per week. How much money will each friend have after 6 weeks? 10 weeks?

$$\text{Susan: } y = 65 + 23x$$

$$\text{CiCi: } y = 119 + 14x$$

$$65 + (23)(6) = 203$$

$$119 + (14)(6) = 203$$

After 6 weeks, Susan and CiCi will both have \$203 in their accounts.

$$65 + 23(10) = 295$$

$$119 + (14)(10) = 259$$

After 10 weeks, Susan will have \$295 and CiCi will have \$259.

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2. Hiro and his brother each received \$100 to open their own savings accounts. Hiro tutors two students after school and is able to save \$30 per week. Hiro's brother can only save \$12 per week. How much will each brother have after 4 weeks? 12 weeks?

3. Ryan and Carla make \$50 per week helping a neighbor, and they split the money evenly and add it to their savings accounts. Ryan already has \$150 in his account and Carla has \$40 in her account from babysitting. How much will each person have saved after 3 weeks? 13 weeks?

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4. Damien has saved all of his allowance for a year to pay for guitar lessons and has a total of \$550 in savings. His friend Kira is just starting to save and has \$50 so far. Each week Damien will pay Kira \$25 for a guitar lesson and Kira will save the money in her savings account. How much will each person have in their accounts after 10 weeks? 20 weeks?

5. Pedro has \$160 in his savings account and Derek has \$142 in his savings account. Derek saves \$2 per week and Pedro spends a quarter every week for a gumball. How much will each person have after 4 weeks? 8 weeks?

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6. At her job, Avery earns \$120 per week plus a one-time \$300 bonus. Janelle teaches art lessons and charges each student \$24 per week plus a \$60 art supply fee. If Janelle has 5 students, how much money will each person have after 5 weeks? 15 weeks?

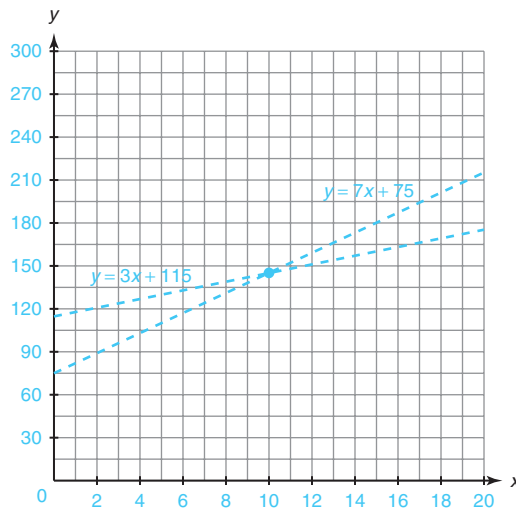
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Graph each system of equations using the bounds and intervals given. Use your graph to determine the solution of the system.

7. $y = 7x + 75$ and $y = 3x + 115$

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Variable Quantity	Lower Bound	Upper Bound	Interval
x	0	20	2
y	0	300	30



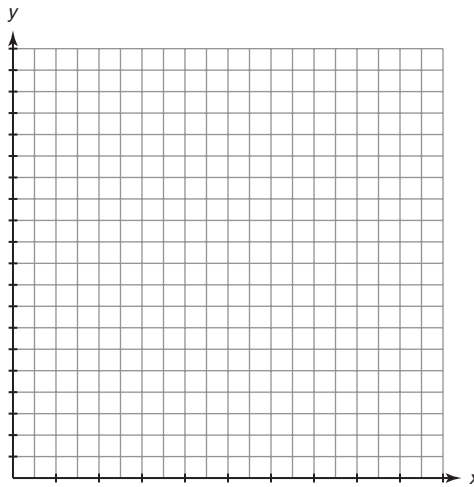
The solution is (10, 145).

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8. $y = 58 + 2x$ and $y = 5x + 58$

Variable Quantity	Lower Bound	Upper Bound	Interval
x	0	20	2
y	0	200	10

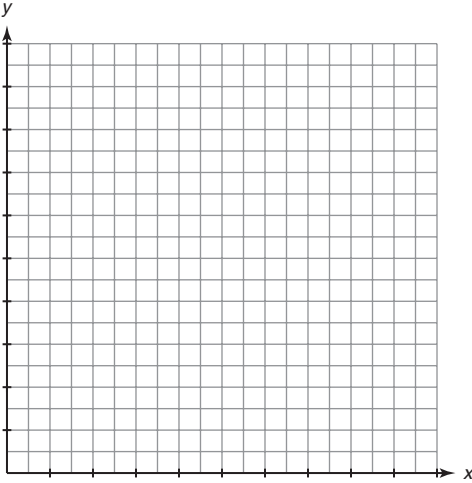
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9. $y = 172 + 30x$ and $y = 99 + 30x$

Variable Quantity	Lower Bound	Upper Bound	Interval
x	0	20	2
y	0	500	50

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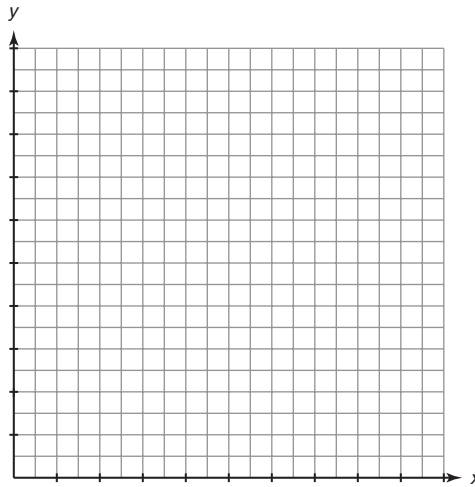


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10. $y = 34 - \frac{5}{2}x$ and $y = \frac{2}{5}x + 5$

Variable Quantity	Lower Bound	Upper Bound	Interval
x	0	40	4
y	0	40	4

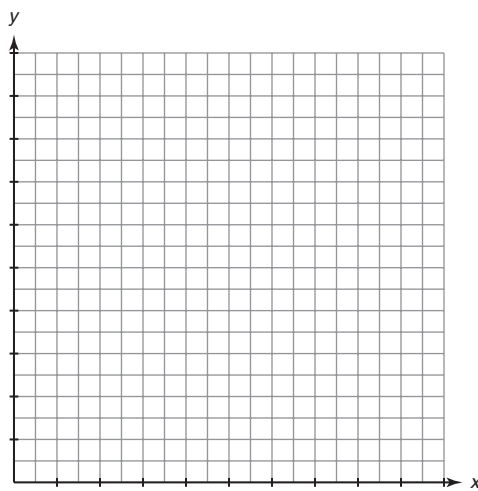
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11. $y = 21x + 144$ and $y = 3(7x + 48)$

Variable Quantity	Lower Bound	Upper Bound	Interval
x	0	20	2
y	0	500	25

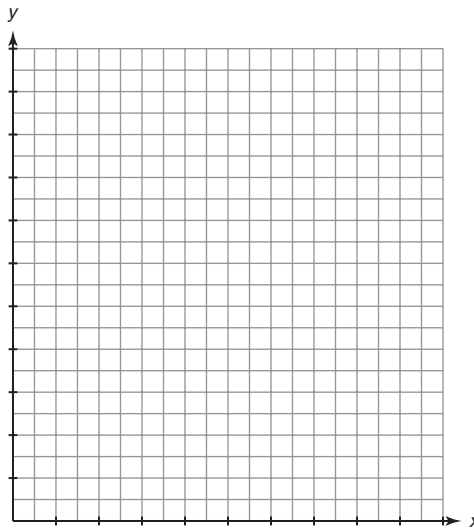


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12. $y = 125 + 15x$ and $y = 425 - 15x$

Variable Quantity	Lower Bound	Upper Bound	Interval
x	0	20	2
y	0	550	25

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Determine whether the graphs of each pair of equations are parallel, perpendicular, or neither. Explain your reasoning.

13. $y = \frac{1}{3}x + 8$ and $y = -3x + 8$

$$\left(\frac{1}{3}\right)(-3) = -1$$

The lines are perpendicular. The slopes are opposite reciprocals of each other.

14. $y = \frac{4}{9}x + 21$ and $y = \frac{9}{4}x - 27$

15. $y = 17x$ and $y = -17x$

16. $y = 156 + 5.7x$ and $y = 5.7x + 256$

17. $y = 43 - 3x$ and $y = \frac{6}{18}x + 43$

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18. $y = 38 + \frac{5}{11}x$ and $y = 38 - \frac{5}{11}x$

19. $y = -29x + 52$ and $y = 66 - 29x$

20. $y = 0.75x + 6$ and $y = -\frac{4}{3}x - 6$

Lesson 16.3 Skills Practice

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The County Fair Using Substitution to Solve a Linear System, Part 1

Vocabulary

Define the term in your own words.

1. substitution method

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Problem Set

Write a system of equations to represent each situation. Without solving the system, interpret what the solution will mean in the context of the problem.

1. You want to make your grandmother's recipe for fudge. You have all the ingredients except sugar and chocolate. You have \$10.50 to spend on the sugar and chocolate. Sugar costs \$1.40 per pound and chocolate costs \$8.40 per pound. Your grandmother's recipe calls for 4 times as much sugar as chocolate.

$$\begin{cases} 1.4s + 8.4c = 10.5 \\ s = 4c \end{cases}$$

The solution will tell the number of pounds of sugar (s) and the number of pounds of chocolate (c) that can be purchased for the amount you have to spend.

2. Tanya and Keisha volunteer at the hospital after school. A local company has promised to donate one quarter to the hospital for every hour a student volunteers during the year. By the end of the year, Tanya and Keisha together have earned \$58.50 for the hospital. Keisha volunteered twice as many hours as Tanya.

3. Your piggy bank contains 68 coins, made up of quarters and dimes. The piggy bank gives a digital readout of the total amount of money that it contains. The display reads \$13.10.

4. An adventure group of 54 people are traveling to a national park. They all want to ride the train, but seats are limited. A few people have to ride the bus. The number of people who ride the train is 2 less than 3 times the number of people who ride the bus.

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5. Caroline works at the movie theater. Her job involves keeping track of the number of matinee and full-price tickets that are sold each day. The matinee price is \$4.75 per ticket and the full-price ticket is \$8.75. Caroline sees that the total ticket sales for the day are \$13,325. The sales data also tells her that the number of full-price tickets is 4.5 times the number of matinee price tickets plus 10.

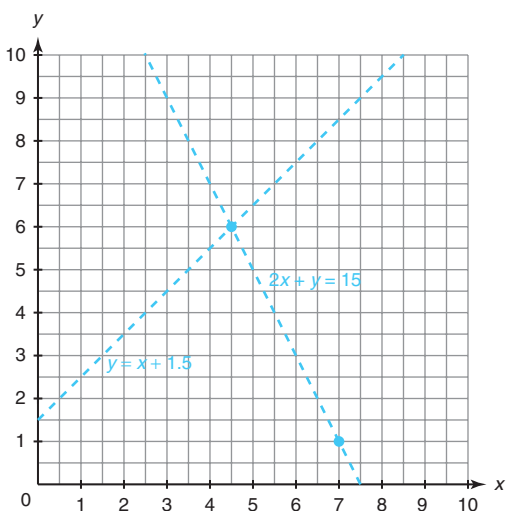
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6. An aunt is 28 years older than her nephew. In 6 years, the aunt will be 10 less than 3 times her nephew's age.

Determine the solution to each system of equations. Use the graph to estimate the solution and confirm by using the substitution method. Or, use the substitution method to calculate the solution and confirm by graphing the system.

7. $2x + y = 15$ and $y = x + 1.5$

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$$2x + (x + 1.5) = 15$$

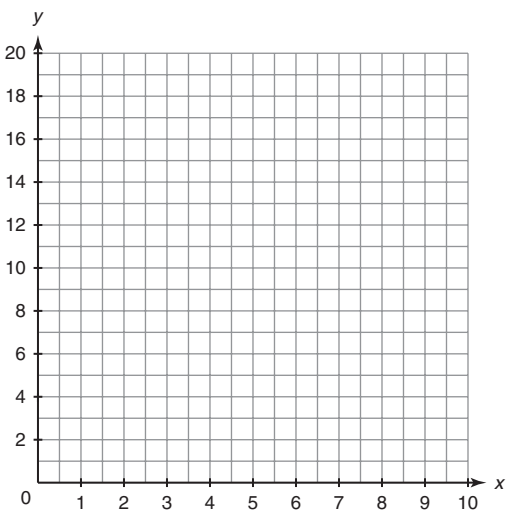
$$3x + 1.5 = 15 \quad y = 4.5 + 1.5$$

$$3x = 13.5 \quad y = 6$$

$$x = 4.5$$

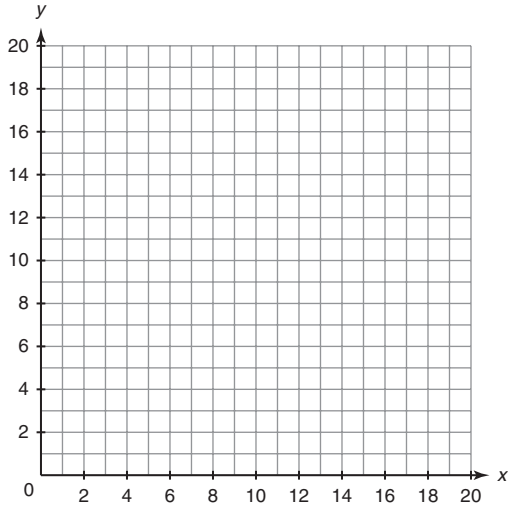
The solution is (4.5, 6).

8. $5x + 2y = 27.7$ and $y = 3x - 1$



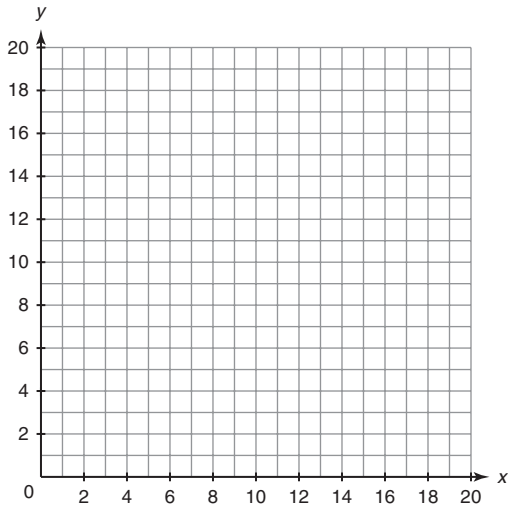
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9. $-1.2x + 2y = -4$ and $y = 0.6x + 8$



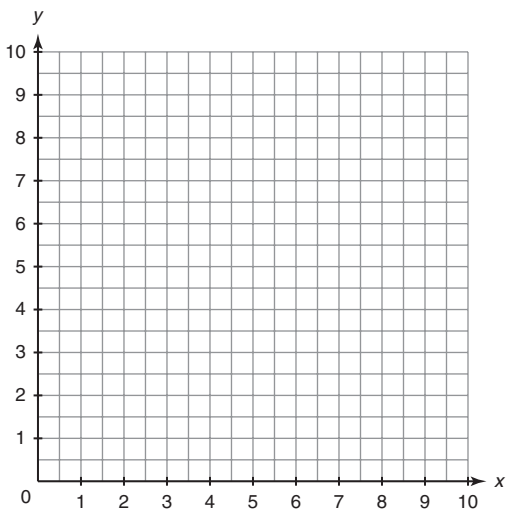
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10. $y = -\frac{1}{4}x + 11$ and $\frac{1}{8}x + \frac{1}{2}y = 5\frac{1}{2}$

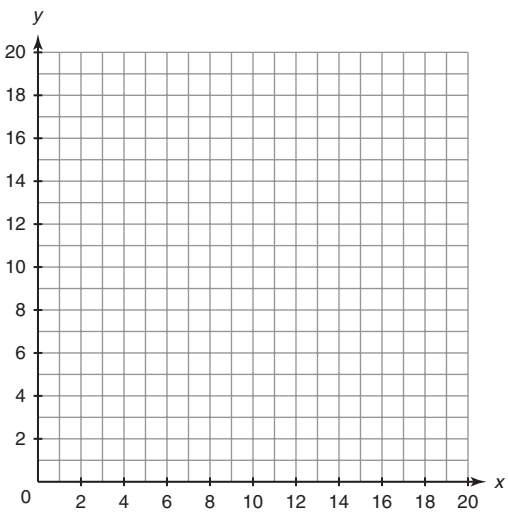


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11. $-8x + 4y = 12$ and $0.5x + y = 7$



12. $x + \frac{1}{3}y = 4$ and $2y + 6x = 36$



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Use the substitution method to determine the solution of each system of equations. Check your solution by substituting the values for x and y into the original equations.

13. $9x + y = 16$ and $y = 7x$

$$9x + 7x = 16$$

$$16x = 16$$

$$9(1) + y = 16$$

$$x = 1$$

$$y = 7$$

The solution is $(1, 7)$.

Check:

$$9(1) + 7 \stackrel{?}{=} 16$$

$$7 \stackrel{?}{=} 7(1)$$

$$16 = 16$$

$$7 = 7$$

14. $-4x + y = 24$ and $-14x + 2y = -30$

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15. $-3x + \frac{1}{2}y = -3.5$ and $y = 6x + 11$

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16. $y = -5x$ and $21x - 7y = 28$

17. $2x + 4y = -32$ and $6x - 2y = -12$

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18. $6y = -12x - 18$ and $2x + y = 9$

19. $9x + 3y = 15$ and $-2x - y = 6$

20. $x - 5y = -40$ and $1.2x - 3y = -19.5$

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Lesson 16.4 Skills Practice

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Tickets, Please

Using Substitution to Solve a Linear System, Part 2

Problem Set

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Write and solve a system of equations for each problem situation. Interpret the solution of the system in terms of the problem situation.

1. Jevon downloaded 8 songs and 3 movies from a website on Friday and was charged \$30.10. The next day he downloaded 12 songs and 1 movie and was charged \$18.90. How much does the website charge for song and movie downloads?

Let x represent the cost of a song download and y represent the cost of a movie download.

$$8x + 3y = 30.10$$

$$12x + y = 18.90$$

$$8x + 3(-12x + 18.90) = 30.10$$

$$y = -12(0.95) + 18.90$$

$$8x - 36x + 56.70 = 30.10$$

$$y = -11.40 + 18.90$$

$$-28x = -26.60$$

$$y = 7.5$$

$$x = 0.95$$

The solution is $(0.95, 7.5)$. The website charges \$0.95 per song download and \$7.50 per movie download.

2. Geneva has a \$350 budget for her wedding photo album. She can choose a combination of 3×5 photos, which are \$0.50 each, and 8×10 photos, which are \$1.75 each. The flat fee for the photographer is \$200. Geneva wants to have four 3×5 photos for every 8×10 photo in the album. How many of each size photo can Geneva get in her photo album, if she spends the exact amount of her budget?

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3. Kylie is selling gift bags and wrapping paper for a school fundraiser. Mrs. Jones orders 4 gift bags and 3 rolls of wrapping paper for \$47.50. Mrs. Kim orders 7 gift bags and 1 roll of wrapping paper for \$47.00. Mr. Burnett wants to order 3 gift bags and 5 rolls of wrapping paper. How much is Mr. Burnett's order?

4. Ty is playing a video game. He must accomplish 18 tasks to complete the level. The level includes easy tasks that are worth 30 points each and hard tasks that are worth 115 points each. Ty's score at the end of the level is 1475. How many of each task did Ty complete in this level of the game?

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5. On a trivia game show, a contestant will answer 21 questions. A maximum of 200 points can be earned. Some questions are worth 10 points and some are worth 8 points. How many of each point-value question must the contestant answer to earn the maximum number of points?

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6. A group of 4 adults and 6 children paid \$76 for admission to the zoo. Another group of 5 adults and 3 children paid \$68. How much should a group of 3 adults and 7 children pay for zoo admission?

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Solve each linear system of equations using the substitution method. Show your work.

7. $y = 4x + 17$ and $-5x + y = 12$

$$-5x + (4x + 17) = 12 \quad y = 4(5) + 17$$

$$-x = -5 \quad y = 37$$

$$x = 5$$

The solution is (5, 37).

Check:

$$37 \stackrel{?}{=} 4(5) + 17 \quad -5(5) + 37 \stackrel{?}{=} 12$$

$$37 \stackrel{?}{=} 20 + 17 \quad -25 + 37 \stackrel{?}{=} 12$$

$$37 = 37 \quad 12 = 12$$

8. $-11x = -y - 25$ and $y - 4 = 11x$

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9. $5x + 2y = 8$ and $4y - 4x = 30$

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10. $y + 9 = \frac{1}{5}x$ and $45 - 3y = -15x$

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11. $10 - 0.5y = -1.5x$ and $y = 0.5(6x + 40)$

12. $\frac{1}{2}y - 6x = 3$ and $-y + 24x = -6$

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13. $3y - 2x = -24$ and $y = \frac{2}{3}x + 11$

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14. $y + 3 = -0.25x$ and $-12x + 3y = 42$

