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Prepping for the Robot Challenge

Solving Linear Systems Graphically and Algebraically

Vocabulary

Match each term to its corresponding definition.

1. a process of solving a system of equations by substituting a variable in one equation with an equivalent expression
2. systems with no solutions
3. the point when the cost and the income are equal
4. systems with one or many solutions
5. two or more linear equations that define a relationship between quantities

a. system of linear equations

b. break-even point

c. substitution method

d. consistent systems

e. inconsistent systems

Problem Set

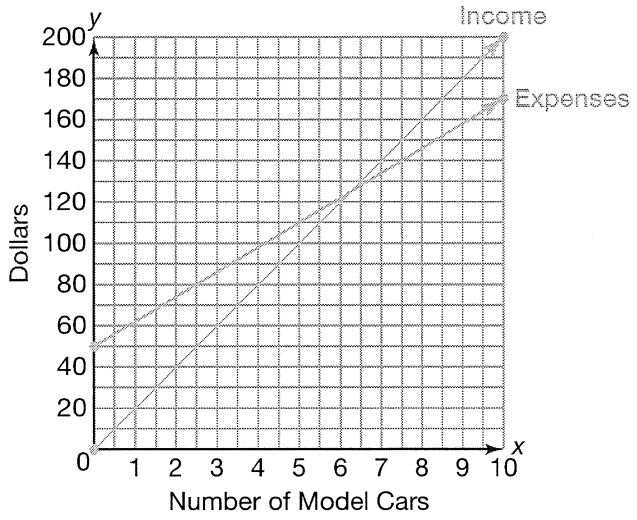
Write a system of linear equations to represent each problem situation. Define each variable. Then, graph the system of equations and estimate the break-even point. Explain what the break-even point represents with respect to the given problem situation.

1. Eric sells model cars from a booth at a local flea market. He purchases each model car from a distributor for \$12, and the flea market charges him a booth fee of \$50. Eric sells each model car for \$20.

   Eric's income can be modeled by the equation $y = 20x$, where y represents the income (in dollars) and x represents the number of model cars he sells.

   Eric's expenses can be modeled by the equation $y = 12x + 50$, where y represents the expenses (in dollars) and x represents the number of model cars he purchases from the distributor.

   $\begin{cases} y = 20x \\ y = 12x + 50 \end{cases}$



   The break-even point is between 6 and 7 model cars. Eric must sell more than 6 model cars to make a profit.

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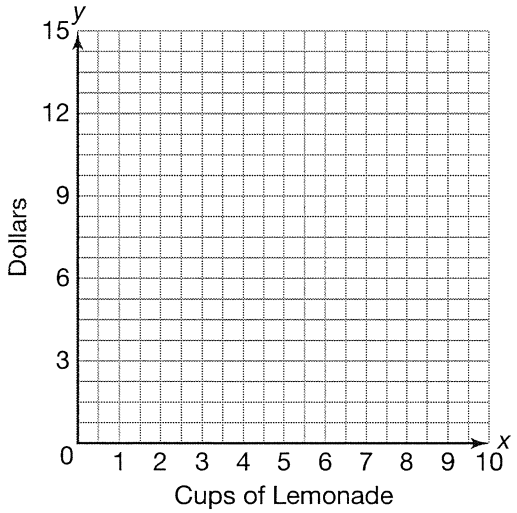
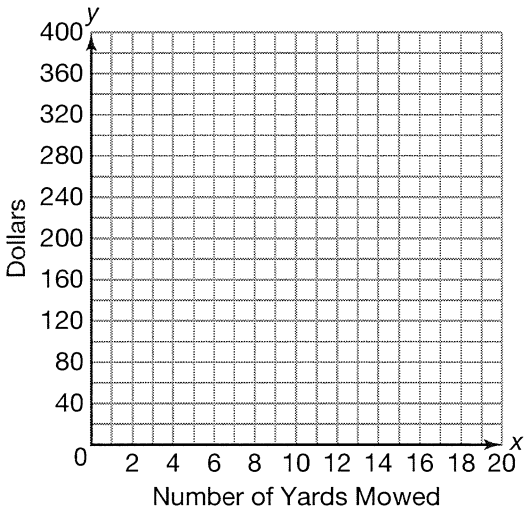
2. Ramona sets up a lemonade stand in front of her house. Each cup of lemonade costs Ramona $0.30 to make, and she spends $6 on the advertising signs she puts up around her neighborhood. She sells each cup of lemonade for $1.50.



3. Chen starts his own lawn mowing business. He initially spends $180 on a new lawnmower. For each yard he mows, he receives $20 and spends $4 on gas.



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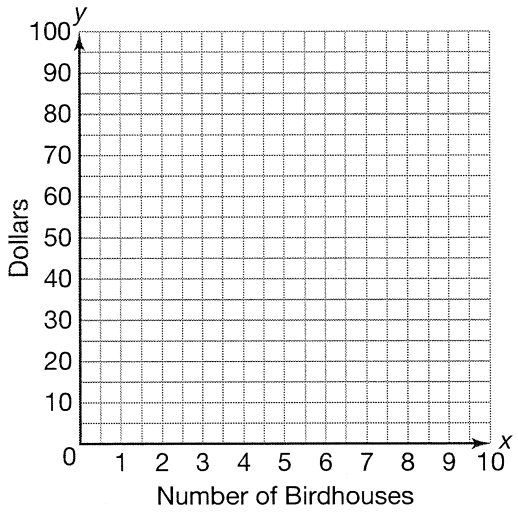
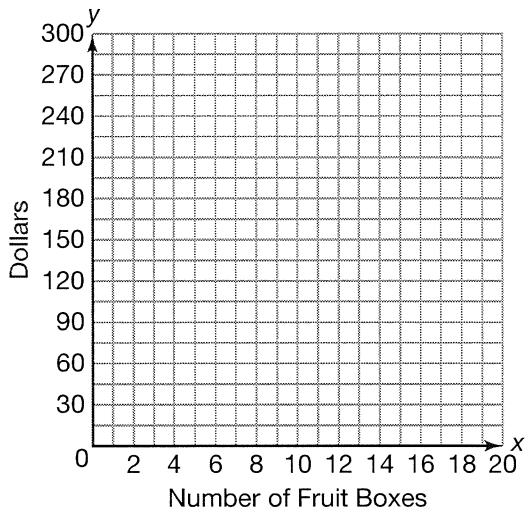
4. Olivia is building birdhouses to raise money for a trip to Hawaii. She spends a total of $30 on the tools needed to build the houses. The material to build each birdhouse costs $3.25. Olivia sells each birdhouse for $10.



5. The Spanish Club is selling boxes of fruit as a fundraiser. The fruit company charges the Spanish Club $7.50 for each box of fruit and a shipping and handling fee of $100 for the entire order. The Spanish Club sells each box of fruit for $15.



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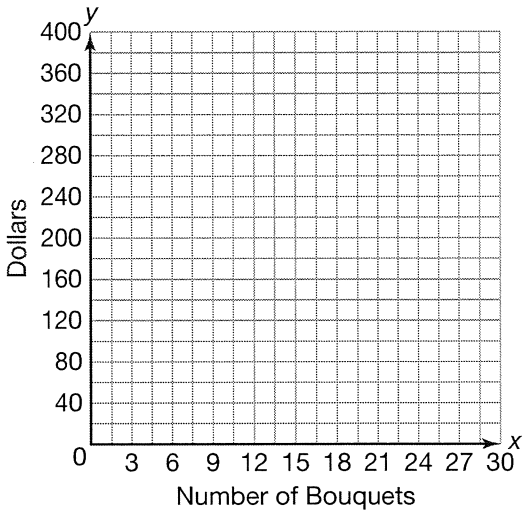
6. Jerome sells flowers for $12 per bouquet through his Internet flower site. Each bouquet costs him $5.70 to make. Jerome also paid a one-time fee of $150 for an Internet marketing firm to advertise his company.



Transform both equations in each system of equations so that each coefficient is an integer.

7. $\begin{cases} \frac{1}{2}x + \frac{3}{2}y = 4 \\ \frac{2}{3}x - \frac{1}{3}y = 7 \end{cases}$

$\frac{1}{2}x + \frac{3}{2}y = 4$ $\qquad$ $\frac{2}{3}x - \frac{1}{3}y = 7$

$2\left(\frac{1}{2}x + \frac{3}{2}y = 4\right)$ $\qquad$ $3\left(\frac{2}{3}x - \frac{1}{3}y = 7\right)$

$x + 3y = 8$ $\qquad$ $2x - y = 21$

8. $\begin{cases} -\frac{1}{3}x + \frac{1}{2}y = 5 \\ \frac{3}{4}x - \frac{1}{4}y = 10 \end{cases}$

9. $\begin{cases} \frac{5}{4}x - 3 = \frac{1}{6}y \\ \frac{2}{5}x + \frac{1}{5}y = \frac{9}{5} \end{cases}$

10. $\begin{cases} 0.5x + 1.2y = 2 \\ 3.3x - 0.7y = 3 \end{cases}$

11. $\begin{cases} 0.2x - 0.4y = 2 \\ -0.1x - 0.5y = 1.1 \end{cases}$

12. $\begin{cases} 0.3y = 2 - 0.8x \\ 1.1x = 3y - 0.4 \end{cases}$

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Solve each system of equations by substitution. Determine whether the system is consistent or inconsistent.

13. $\begin{cases} y = 2x - 3 \\ x = 4 \end{cases}$

$y = 2(4) - 3$

$y = 8 - 3$

$y = 5$

The solution is (4, 5).

The system is consistent.

14. $\begin{cases} 2x + y = 9 \\ y = 5x + 2 \end{cases}$

15. $\begin{cases} y = 3x - 2 \\ y - 3x = 4 \end{cases}$

16. $\begin{cases} \frac{1}{2}x + \frac{3}{2}y = -7 \\ \frac{1}{3}y = 2x - 10 \end{cases}$

17. $\begin{cases} 0.8x - 0.2y = 1.5 \\ 0.1x + 1.2y = 0.8 \end{cases}$

18. $\begin{cases} 0.3y = 0.6x + 0.3 \\ 1.2x + 0.6 = 0.6y \end{cases}$