CHAPTER 3

Study Guide and Review

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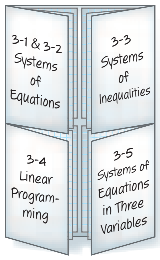
Be sure the following Key Concepts are noted in your Foldable.



Key Concepts

Systems of Equations (Lessons 3-1 and 3-2)

- The solution of a system of equations can be found by graphing the two equations and determining at what point they intersect.
- In the substitution method, one equation is solved for a variable and substituted to find the value of another variable.
- In the elimination method, one variable is eliminated by adding or subtracting the equations.

Systems of Inequalities (Lesson 3-3)

- The solution of a system of inequalities is found by graphing the inequalities and determining the intersection of the graphs.

Linear Programming (Lesson 3-4)

- The maximum and minimum values of a function are determined by linear programming techniques.

Systems of Three Equations (Lesson 3-5)

- A system of equations in three variables can be solved algebraically by using the substitution method or the elimination method.

Key Vocabulary

bounded region (p. 138)
consistent system (p. 118)
constraints (p. 138)
dependent system (p. 118)
elimination method (p. 125)
feasible region (p. 138)
inconsistent system (p. 118)
independent system (p. 118)
linear programming (p. 140)
ordered triple (p. 146)
substitution method (p. 123)
system of equations (p. 116)
system of inequalities (p. 130)
unbounded region (p. 139)
vertex (p. 138)

Vocabulary Check

Choose the term from the list above that best matches each phrase.

1. the inequalities of a linear programming problem
2. a system of equations that has an infinite number of solutions
3. the region of a graph where every constraint is met
4. a method of solving equations in which one equation is solved for one variable in terms of the other variable
5. a system of equations that has at least one solution
6. a system of equations that has exactly one solution
7. a method of solving equations in which one variable is eliminated when the two equations are combined
8. the solution of a system of equations in three variables (x, y, z)
9. two or more equations with the same variables
10. two or more inequalities with the same variables

Study Guide and Review

Lesson-by-Lesson Review

3–1 Solving Systems of Equations by Graphing (pp. 116–122)

Solve each system of linear equations by graphing.

11. $3x + 2y = 12$
$x - 2y = 4$

12. $8x - 10y = 7$
$4x - 5y = 7$

13. $y - 2x = 8$
$y = \frac{1}{2}x - 4$

14. $20y + 13x = 10$
$0.65x + y = 0.5$

15. PLUMBING Two plumbers offer competitive services. The first charges a \$35 house-call fee and \$28 per hour. The second plumber charges a \$42 house-call fee and \$21 per hour. After how many hours do the two plumbers charge the same amount?

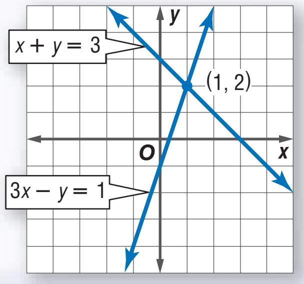
Example 1 **Solve the system of equations by graphing.**

$x + y = 3$

$3x - y = 1$

Graph both equations on the same coordinate plane.

The solution of the system is (1, 2).



3–2 Solving Systems of Equations Algebraically (pp. 123–129)

Solve each system of equations by using either substitution or elimination.

16. $x + y = 5$
$2x - y = 4$

17. $2x - 3y = 9$
$4x + 2y = -22$

18. $7y - 2x = 10$
$-3y + x = -3$

19. $x + y = 4$
$x - y = 8.5$

20. $-6y - 2x = 0$
$11y + 3x = 4$

21. $3x - 5y = -13$
$4x + 2y = 0$

22. CLOTHING Colleen bought 15 used and lightly used T-shirts at a thrift store. The used shirts cost \$0.70 less than the lightly used shirts. Her total, minus tax, was \$16.15. If Colleen bought 8 used shirts and paid \$0.70 less per shirt than for a lightly used shirt, how much does each type of shirt cost?

Example 2 **Solve the system of equations by using either substitution or elimination.**

$x = 4y + 7$

$y = -3 - x$

Substitute $-3 - x$ for y in the first equation.

$x = 4y + 7$	First equation
$x = 4(-3 - x) + 7$	Substitute $-3 - x$ for y.
$x = -12 - 4x + 7$	Distributive Property
$5x = -5$	Add $4x$ to each side.
$x = -1$	Divide each side by 5.

Now substitute the value for x in either original equation.

$y = -3 - x$	Second equation
$= -3 - (-1)$ or -2	Replace x with -1 and simplify.

The solution of the system is (–1, –2).

Mixed Problem Solving
For mixed problem-solving practice, see page 928.

3–3 Solving Systems of Inequalities by Graphing (pp. 130–135)

Solve each system of inequalities by graphing. Use a table to analyze the possible solutions.

23. $y \leq 4$
$y > -3$

24. $|y| > 3$
$x \leq 1$

25. $y < x + 1$
$x > 5$

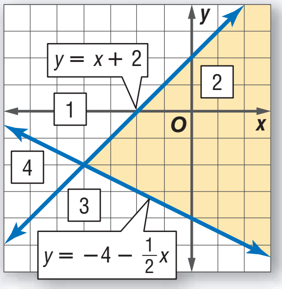
26. $y \leq x + 4$
$2y \geq x - 3$

27. JOBS Tamara spends no more than 5 hours working at a local manufacturing plant. It takes her 25 minutes to set up her equipment and at least 45 minutes for each unit she constructs. Draw a diagram that represents this information.

Example 3 **Solve the system of inequalities by graphing.**

$y \leq x + 2$

$y \geq -4 - \frac{1}{2}x$



The solution of the system is the region that satisfies both inequalities. The solution of this system is region 2.

3–4 Linear Programming (pp. 138–144)

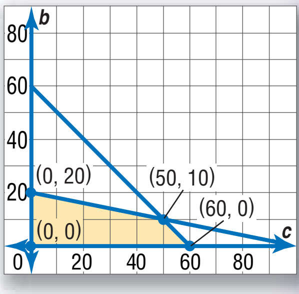
28. MANUFACTURING A toy manufacturer is introducing two new dolls to their customers: My First Baby, which talks, laughs, and cries, and My Real Baby, which simulates using a bottle and crawls. In one hour the company can produce 8 First Babies or 20 Real Babies. Because of the demand, the company must produce at least twice as many First Babies as Real Babies. The company spends no more than 48 hours per week making these two dolls. The profit on each First Baby is \$3.00 and the profit on each Real Baby is \$7.50. Find the number and type of dolls that should be produced to maximize the profit.

Example 4 **The area of a parking lot is 600 square meters. A car requires 6 square meters of space, and a bus requires 30 square meters of space. The attendant can handle no more than 60 vehicles. If a car is charged \$3 to park and a bus is charged \$8, how many of each should the attendant accept to maximize income?**

Let c = the number of cars and b = the number of buses.

$c \geq 0$, $b \geq 0$, $6c + 30b \leq 600$, and $c + b \leq 60$

Graph the inequalities. The vertices of the feasible region are (0, 0), (0, 20), (50, 10), and (60, 0).



The profit function is $f(c, b) = 3c + 8b$. The maximum value of \$230 occurs at (50, 10). So the attendant should accept 50 cars and 10 buses.

Study Guide and Review

3-5 Solving Systems of Equations in Three Variables (pp. 145–152)

Solve each system of equations.

29. $x + 4y - z = 6$
$3x + 2y + 3z = 16$
$2x - y + z = 3$

30. $2a + b - c = 5$
$a - b + 3c = 9$
$3a - 6c = 6$

31. $e + f = 4$
$2d + 4e - f = -3$
$3e = -3$

32. SUBS Ryan, Tyee, and Jaleel are ordering subs from a shop that lets them choose the number of meats, cheeses, and veggies that they want. Their sandwiches and how much they paid are displayed in the table. How much does each topping cost?

Name	Meat	Cheese	Veggie	Price
Ryan	1	2	5	\$5.70
Tyee	3	2	2	\$7.85
Jaleel	2	1	4	\$6.15

Example 5 **Solve the system of equations.**

$\mathbf{x + 3y + 2z = 1}$
$\mathbf{2x + y - z = 2}$
$\mathbf{x + y + z = 2}$

Use elimination to make a system of two equations in two variables.

$$\begin{array}{rll} & 2x + 6y + 4z = 2 & \text{First equation} \times 2 \\ (-) & 2x + y - z = 2 & \text{Second equation} \\ \hline & 5y + 5z = 0 & \text{Subtract.} \end{array}$$

Do the same with the first and third equations to get $2y + z = -1$.

Solve the system of two equations.

$$\begin{array}{rll} & 5y + 5z = 0 & \\ (-) & 10y + 5z = -5 & \\ \hline & -5y = 5 & \text{Subtract to eliminate } z. \\ & y = -1 & \text{Divide each side by } -5. \end{array}$$

Substitute -1 for y in one of the equations with two variables and solve for z.

Then, substitute -1 for y and the value you received for z into an equation from the original system to solve for x.

The solution is $(2, -1, 1)$.