5.2 Start Thinking

A store owner purchased 30 incandescent light bulbs and 20 compact fluorescent lamps (CFLs) for a total cost of $40.30. A second purchase at the same prices included 20 incandescent bulbs and 30 CFLs for a total cost of $43.20.

Define variables and write separate equations for each of the store owner's purchases. What would the equations look like if you solved each of them for the variable representing the cost of one CFL?

5.2 Warm Up

Solve. Check your solution.

1. $4x = 12$

2. $3 = 5x - 7$

3. $6 + 2w = -2$

4. $5a + 19 = -1$

5. $x - 4 = -6$

6. $1 = 9 + 4a$

5.2 Cumulative Review Warm Up

Write and solve an equation to answer the question.

1. The temperature at 6 A.M. was 19°F. The temperature at 2 P.M. was 25°F. How many degrees did the temperature rise?

2. The length of a garden is 2 times its width. If the length of the garden is 10.4 feet, what is its width?

3. The remaining amount in an account is $499 more than the balance was 3 years ago. The current balance of the account is $5697. What was the balance 3 years ago?

Name_____ Date _____

5.2 Practice A

In Exercises 1–3, tell which equation you would choose to solve for one of the variables. Explain.

1. $5x + y = 2$
$3x + y = 7$

2. $2x - 3y = 6$
$x + 7y = 2$

3. $4x - y = -3$
$3x + 3y = 7$

In Exercises 4–9, solve the system of linear equations by substitution. Check your solution.

4. $y = 10 - 2x$
$x = y - 4$

5. $4y + 1 = x$
$x = 5y$

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

7. $5y = 10$
$x - 3y = 4$

8. $x + y = -2$
$2x - y = 14$

9. $-x + y = 2$
$3x - 5y = -4$

10. Describe and correct the error in solving for one of the variables in the linear system $-x + 4y = -9$ and $3x - 2y = 7$.

> ✗ **Step 1** $-x + 4y = -9$
> $-x = -4y - 9$
>
> **Step 2** $3(-4y - 9) - 2y = 7$
> $-12y - 27 - 2y = 7$
> $-14y = 34$
> $y = -\dfrac{17}{7}$

In Exercises 11–13, write a system of linear equations that has the ordered pair as its solution.

11. $(1, 4)$

12. $(9, -3)$

13. $(-2, -1)$

14. A biology test is worth 100 points and has 36 questions.

　　a. Multiple-choice questions are worth 2 points each and essay questions are worth 6 points each. How many questions of each type are on the test?

　　b. Your friend says that it is possible for the multiple-choice questions to be worth 4 points each. Is your friend correct? Explain.

15. Find the values of a and b so that the solution of the linear system is $(5, 2)$.

$ax + by = 23$　　Equation 1
$ax - by = 7$　　Equation 2

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In Exercises 1–6, solve the system of linear equations by substitution. Check your solution.

1. $2x + 2y = 4$
$y = 12 - 3x$

2. $-2x + 9y = 15$
$x + 7 = 4$

3. $x - y = 4$
$2x - 3y = 3$

4. $4x + 3y = -1$
$3x + y = -7$

5. $5x + 5y = -10$
$3x - 7y = 4$

6. $-x + y = 7$
$6x - y = -7$

7. A humane society has 73 dogs and cats to be adopted. The number of cats is 10 more than twice the number of dogs. Write a system of linear equations that represents this situation. How many of each animal is up for adoption?

In Exercises 8–10, write a system of linear equations that has the ordered pair as its solution.

8. $(-6, -2)$

9. $(-12, 18)$

10. $(2, 0)$

11. A wedding planner purchased both small and large lanterns for a wedding reception. The planner purchased a total of 40 lanterns for a purchase price of $1180. How many of each size lantern did the planner purchase?
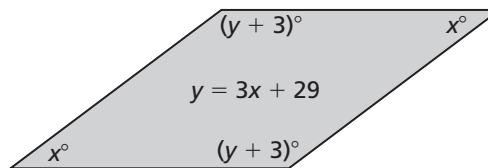
Lantern	Small	Large
Price	$25	$40

In Exercises 12 and 13, (a) write an equation that represents the sum of the angle measures of the parallelogram and (b) use your equation and the equation shown to find the values of *x* and *y*.

12.
$y°$ $x°$
$2x - y = 0$
$x°$ $y°$
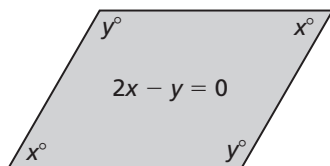
13.
$(y + 3)°$ $x°$
$y = 3x + 29$
$x°$ $(y + 3)°$

14. Write a system of linear equations in which $(2, -1)$ is a solution of Equation 1 but not a solution of Equation 2, and $(5, 5)$ is a solution of the system.

5.2 Enrichment and Extension

Systems of Three Equations

Example: Solve the system of equations. Check your solution.

Equation 1: $4r + 4s + 3t = 13$
Equation 2: $r + s - 5t = -14$
Equation 3: $-r + 3s - t = -24$

Add Equation 2 and Equation 3.

$$
\begin{array}{r}
r + s - 5t = -14 \\
\underline{-r + 3s - t = -24} \\
4s - 6t = -38 \\
2s - 3t = -19 \quad \text{New Equation 2}
\end{array}
$$

Add Equation 1 and 4 times Equation 3.

$$
\begin{array}{r}
4r + 4s + 3t = 13 \\
4(-r + 3s - t = -24) \\
\hline
4r + 4s + 3t = 13 \\
\underline{-4r + 12s - 4t = -96} \\
16s - t = -83 \quad \text{New Equation 1}
\end{array}
$$

Add New Equation 2 and
-3 times New Equation 1.

$$
\begin{array}{r}
2s - 3t = -19 \\
-3(16s - t = -83) \\
\hline
2s - 3t = -19 \\
\underline{-48s + 3t = 249} \\
-46s = 230 \\
s = -5
\end{array}
$$

Substitute $s = -5$
into New Equation 2.

$$
\begin{array}{r}
2s - 3t = -19 \\
2(-5) - 3t = -19 \\
-10 - 3t = -19 \\
-3t = -9 \\
t = 3
\end{array}
$$

Substitute $s = -5$ and $t = 3$
into Equation 2.

$$
\begin{array}{r}
r + s - 5t = -14 \\
r + (-5) - 5(3) = -14 \\
r - 20 = -14 \\
r = 6
\end{array}
$$

So, the solution of the system of equations is $(6, -5, 3)$.

In Exercises 1–4, solve the system of equations. Check your solution.

1. $6x + 3y + 2z = 23$
$-3x - y = -5$
$2x + 3y + z = 19$

2. $-5x - 3y + z = -4$
$-2x - 2y + 2z = 4$
$x = z - 5$

3. $3x + 5y + 4z = 18$
$6x + y + 3z = 21$
$-6x - 4z = -24$

4. $2x + y - 3z = 9$
$-2x + 4y - 2z = 16$
$x + 3y - 2z = 11$

5. The sum of three numbers is –3. The last number is three times the first. The last
number is 11 smaller than the second number. What are the three numbers?

5.2 Puzzle Time

Did You Hear About The Pig That Built Himself A Home?

A	B	C	D	E	F
G	H	I	J	K	L
M					

Complete each exercise. Find the answer in the answer column. Write the word under the answer in the box containing the exercise letter.

(−5, −4)
IN

(0, 0)
BRICK

(6, 0)
CALLED

(0, −2)
MADE

(1, 3)
TAIL

(−3, −3)
IT

(−4, −8)
KNOT

(8, 8)
THREE

(7, 2)
WOOD

Solve the system of linear equations by substitution. Check your solution.

A. $3x + 2y = 12$
  $y = x - 9$

B. $4x + y = -2$
  $y = 2x - 2$

C. $-3x + 5y = 5$
  $y = x - 1$

D. $2x + y = -16$
  $y = 2x$

E. $7x = -35$
  $-8x + 9y = 4$

F. $-4x + 3y = 20$
  $-14y = -56$

G. $13x - 6y = -5$
  $x + 10 = 11$

H. $9x - 2y = 12$
  $y + 4 = 16$

I. $x = 6 + 2y$
  $-3x + 14y = -18$

J. $5x - 9y = 12$
  $x + y = -6$

K. $x - y = -8$
  $6x + y = -6$

L. $7x - 3y = 17$
  $2x - y = 6$

M. The physical education instructor asked each student to do a total of 36 pull-ups and push-ups in 1 minute. The instructor wanted students to do 8 times as many push-ups as pull-ups. Write a system of linear equations that represents this situation. How many pull-ups and push-ups were required in 1 minute?

(5, 4)
A

(4, 12)
AND

(4, 32)
TIE

(6, −3)
HE

(−2, 6)
A

(−2, 4)
HIS

(−1, −8)
PIG'S

(12, 0)
NAILS

(0, 15)
YARD