

Chapter
5**Algebra****Practice 1 Using Letters as Numbers****Write an expression for each situation.**

- 1.** Susan has 10 apples and 6 oranges. How many fruits does she have?
- 2.** Juan has x apples and 8 oranges. How many fruits does he have?
Give your answer in terms of x .
- 3.** Henry has \$18. He spends \$2. How much does he have left?
- 4.** Katie has m dollars. She spends \$5. How much does she have left?
Give your answer in terms of m .

Write an expression for the situation.

5. Hugo has \$20. He spends n dollars. How much does he have left?
Give your answer in terms of n .

Write an algebraic expression for each of the following.

Example

Add 9 to y .

$y + 9$ or $9 + y$

6. Add b to 11.

7. Subtract 6 from c .

8. Subtract p from 15.

9. 12 more than d .

10. 15 less than g .

Evaluate each expression for the given values of y .

	Expression	Value of the Expression	
		$y = 25$	$y = 16$
<i>Example</i>	$y + 5$	30	21
11.	$y - 12$		
12.	$18 + y$		
13.	$35 - y$		

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Write each of the following in at least three other ways.

Example

$6n$ $6 \times n, n \times 6, 6$ groups of n

14. $18 \times m$ _____

15. 75 groups of y _____

16. y groups of 12 _____

Write an expression for each situation.

17. Julio has 4 boxes of pencils. There are 12 pencils in each box. How many pencils does Julio have?

18. Tara has k boxes of pencils. There are 10 pencils in each box. How many pencils does Tara have? Give your answer in terms of k .

Write an expression for each situation.

19. A restaurant divided 20 gallons of lemonade among 4 tanks. How much lemonade does each tank contain?

20. m gallons of lemonade is distributed equally among 3 people. How much lemonade does each person get? Give your answer in terms of m .

Write an expression for each situation.

Example

Multiply 4 and g .

$$4 \times g = 4g \text{ or } g \times 4 = 4g$$

21. Multiply f and 6.

22. Divide m by 3.

23. Divide 22 by p .

Evaluate each expression for $t = 156$.

Example

$$\begin{aligned} 2t &= 2 \times t \\ &= 2 \times 156 \\ &= 312 \end{aligned}$$

24. $\frac{t}{6} =$

25. $16t =$

26. $\frac{t}{13} =$

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Write an algebraic expression for each situation.

27. A tank has x gallons of water. Ted adds 3 gallons of water into the tank. He pours the water equally into 4 smaller containers. How much water is in each container?

28. Jenny has 15 dollars. She buys 2 books that cost $\$m$ each. How much does she have left?

Write an algebraic expression for each situation.

- 29.** Betty collected 400 food packages for charity. She gave g packages to an orphanage, and distributed the rest equally among 4 charities. How many packages did each charity get?
- 30.** To bake muffins, Matt needs x eggs for every 200 grams of flour. If he used 900 grams of flour, how many eggs did he use?

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Write an expression for each situation.

Example

Subtract 12 from the product of 8 and a .

$$8 \times a - 12 = 8a - 12$$

31. Add 14 to the product of 3 and b .

32. Divide the product of 7 and d by 5.

Evaluate each expression for $x = 5$.

Example

$$\begin{aligned} 13x - 4 &= 13 \times 5 - 4 \\ &= 65 - 4 \\ &= 61 \end{aligned}$$

33. $5x + 12 =$

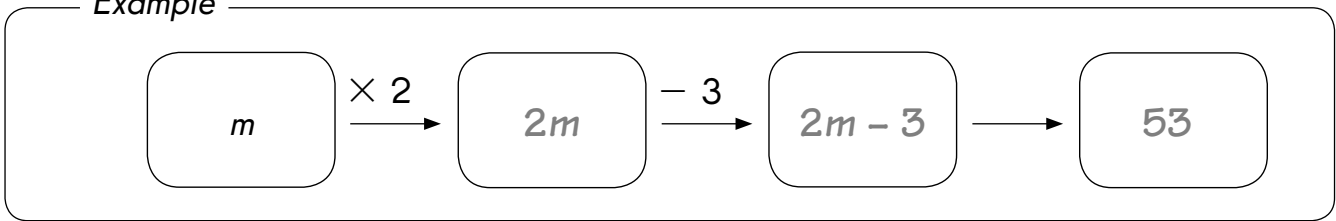
34. $20 - 2x =$

35. $\frac{x}{10} + 2 =$

36. $\frac{6x}{5} + 12 =$

Fill in the boxes with the correct expressions. In the last box on the right, evaluate each expression for $m = 28$.

Example



37. $3 \xrightarrow{\times m} \boxed{} \xrightarrow{+ 5} \boxed{} \longrightarrow \boxed{}$

38. $76 \xrightarrow{- m} \boxed{} \xrightarrow{\div 2} \boxed{} \longrightarrow \boxed{}$

39. $m \xrightarrow{+ 5} \boxed{} \xrightarrow{\div 11} \boxed{} \longrightarrow \boxed{}$

40. $m \xrightarrow{\div 14} \boxed{} \xrightarrow{+ 1} \boxed{} \longrightarrow \boxed{}$

41. $m \xrightarrow{\times 4} \boxed{} \xrightarrow{\div 16} \boxed{} \longrightarrow \boxed{}$



Evaluate each expression for $z = 1,256$.

42. $41z - 39$

43. $\frac{18,661 - z}{5}$

44. $\frac{13z}{8} + 7,389$

45. $\frac{9z - 1,476}{42}$

Practice 2 Simplifying Algebraic Expressions

Simplify each expression.

Example

$$c + c + c + c = 4c$$

1. $6p + 3p =$

2. $b + 3b + 5b =$

3. $10k - 3k =$

4. $12p - 12p =$

5. $6p - 2p - 3p =$

6. $10a - a + 2a =$

7. $4c + c - 5c =$

8. $10f - 4f + f =$

Simplify each expression.

Example

$$5x + 2x + 4 = 7x + 4$$

9. $x + 5x - 9 =$

10. $2m + 4 + 6m =$

11. $10p - 4p - 5 =$

12. $4 + 5k - 4k =$

13. $2 + 6b - 1 + 4b =$

14. $5c + 3 - 2c + 5 =$

15. $9e - 2e + 3 + 5e =$

16. $6h + 12 + 2h - 6 =$

Write an algebraic expression for each situation.

- 17.** The length of a piece of fabric is $8y$ yards. Landon cuts 7 yards from it to make some cushion covers. He then cuts another $3y$ yards to make a curtain. The remaining material is cut into 4 equal pieces. How long is each piece?
- 18.** Ling has $4m$ pounds of flour. She buys another 2 packages of flour, each weighing m pounds. How much flour does Ling have now in terms of m ?

Write an algebraic expression for each situation.

- 19.** On Monday, Linus made $5k$ paper cranes and gave $2k$ paper cranes to his friends. On Tuesday, he made another $4k$ paper cranes. His friend gave him 5 paper cranes. How many paper cranes does he have now in terms of k ?
- 20.** At the market, a pear costs b cents and an apple costs 7 cents less than a pear. Randy buys 4 pears and an apple. How much does Randy pay in terms of b ?

Practice 3 Inequalities and Equations

Complete with $>$, $<$, or $=$.

1. For $y = 3$, $6y$ 11 .

2. For $y = 6$, $6y$ 36 .

3. For $y = 4$, $6y$ 26 .

4. For $y = 5$, $6y$ 24 .

Complete with $>$, $<$, or $=$ for $x = 8$.

5. $3x$ 20

6. $5x + 5$ 45

7. $2x - 9$ $x - 1$

8. $12 - x$ $x \div 2$

Solve each equation.

Example

$$x - 5 = 5$$

$$x - 5 + 5 = 5 + 5$$

$$x = 10$$

$$x = \underline{\quad 10 \quad}$$

9. $2a + 4 = 10$

$$a = \underline{\hspace{2cm}}$$

10. $5b - 13 = 17$

$$b = \underline{\hspace{2cm}}$$

11. $2m - 3 = m$

$$m = \underline{\hspace{2cm}}$$

12. $12n + 7 = 8n + 15$

$$n = \underline{\hspace{2cm}}$$

13. $2s + 16 = 4s - 6$

$$s = \underline{\hspace{2cm}}$$

Practice 4 Real-World Problems: Algebra

Solve. Show your work.

- 1.** Raul has 5 boxes of golf balls. Each box contains y golf balls. His father gives him another 8 golf balls.
 - a.** Find the total number of golf balls Raul has in terms of y .

 - b.** If $y = 4$, how many golf balls does Raul have altogether?

- 2.** Glenda bought z containers of laundry detergent at \$9 each. She gave the cashier \$50.
 - a.** Find the change Glenda received in terms of z .

 - b.** If $z = 3$, how much change did Glenda receive?

Solve. Show your work.

- 3.** Garrett is w years old. His mother is 4 times his age.
His father is 3 years older than his mother.
- a.** How old is Garrett's father in terms of w ?
- b.** If $w = 9$, how old is Garrett's father?
- 4.** An office manager bought 16 boxes of pens, each containing m pens. Workers took 10 pens from the supply room.
- a.** How many pens were left? Give your answer in terms of m .
- b.** If $m = 5$, how many pens were left in the supply room?

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Solve. Show your work.

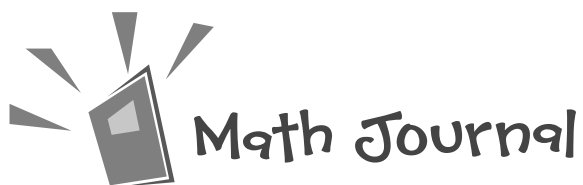
- 5.** Sarah has a box containing x ribbons and 4 extra ribbons.
Jill has 12 ribbons.
- a.** Express the number of ribbons that Sarah has in terms of x .

 - b.** For what value of x will Sarah and Jill have the same number of ribbons?
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- 6.** Henry made $(2y + 4)$ paper cranes. Elise made $(3y - 9)$ paper cranes.
- a.** If $y = 6$, who would have made more paper cranes?

 - b.** For what value of y will they have made the same number of paper cranes?

Solve. Show your work.

- 7.** Mary has y yards of fabric. She used 2 yards to sew a skirt. She used the remaining fabric to make 5 jackets.
- a.** Find the amount of material that was used to make each jacket in terms of y .
- b.** If she has 17 yards of fabric, how much material was used for each jacket?
- 8.** A magazine costs half as much as a book. The book costs p dollars. A pen costs \$2 more than the magazine.
- a.** How much does the pen cost in terms of p ?
- b.** If the book costs \$5, how much does the pen cost?



John's solutions to the following problems are as shown. Identify and explain the mistakes John has made. Then give the correct solution.

1.
$$4w + 12w - 10 = 16w - 10$$
$$= 6w$$

2.
$$20p - 2p + 4p = 20p - 6p$$
$$= 14p$$

3.
$$6 \div q = \frac{q}{6}$$

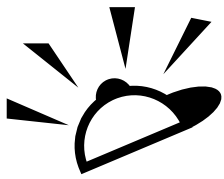
- 4.** Clarissa bought 3 cartons of milk for y cents each. She gave the cashier \$10. How much change did she receive? Express your answer in terms of y .

$$3 \times y = 3y$$

3 cartons of milk cost $3y$ cents.

$$10 - 3y$$

Clarissa received $(10 - 3y)$ dollars as change.



Put On Your Thinking Cap!



Challenging Practice

Wendy bought 7 bags. Each bag costs the same amount. She paid the cashier \$100 and received g dollars as change.

- a. What was the cost of each bag in terms of g ?

- b. If the price of each bag was more than \$10, what is the least possible value of g ? (Assume that the cost of each bag is a whole number.)



Put On Your Thinking Cap!



Problem Solving

There are 40 pupils in a class. There are x more girls than boys.

a. How many boys are there in terms of x ?

b. If $x = 4$, how many boys are there?