

1-1**A Plan for Problem Solving** (pages 6–10)

You can use a four-step plan to solve a problem.

Explore	Determine what information is given in the problem and what you need to find. Do you have all of the information you need? Is there too much information?
Plan	Select a strategy for solving the problem. There may be several strategies that you could use. Estimate the answer.
Solve	Solve the problem by carrying out your plan. If your plan does not work, try another, and maybe even a third plan.
Examine	Examine the answer carefully. See if it fits the facts given in the problem. Compare it to your estimate. If your answer is not reasonable, make a new plan and start again.

EXAMPLE

Gwen must get to the airport in two hours. If she takes two busses that each take 75 minutes, will she make it in time?

Explore	You need to find out whether Gwen's bus trips will take two hours or less.
Plan	You need to find the number of hours Gwen's bus trips will take. Take the sum of the times of the bus trips and convert the minutes to hours. You estimate that the bus trips will take longer than two hours.
Solve	$75 \text{ minutes} + 75 \text{ minutes} = 150 \text{ minutes}$ $150 \text{ minutes} \div 60 \text{ minutes} = 2.5 \text{ hours}$
Examine	The bus trips will take 2.5 hours, so Gwen will not make it to the airport in time.

Try This Together

Use the four-step plan to solve each problem.

1. **Communication** A new telephone company is gaining an average of 75 new customers a day. How many new customers are they gaining each week?

HINT: Multiply the number of customers per day by the number of days in a week.

PRACTICE

2. **Recreation** Trejon plays basketball 4 days during the week after school and one day on the weekend. One week he played 2 fewer days than he normally would in the week. How many days did he play basketball that week?



3. **Standardized Test Practice** Coryn went to buy her textbooks for her college math course. One book was \$35, and a second book was \$64.50. She also bought a third math book. If she spent \$130.29, what is a reasonable estimate for the cost of the third book?

A \$30.00**B** \$35.00**C** \$40.00**D** \$25.00

Answers: 1. 525 2. 3 3. A

1-2**Variables, Expressions, and Properties**

(pages 11–15)

Variables, usually letters, are used to represent numbers in some expressions.

Algebraic expressions are combinations of variables, numbers, and at least one operation. A mathematical sentence that contains an “=” is called an

equation. An equation that contains a variable is an **open sentence**.

Properties are open sentences that are true for any numbers.

Order of Operations	<ol style="list-style-type: none"> 1. Do all operations within grouping symbols first; start with the innermost grouping symbols. 2. Evaluate all powers before other operations. 3. Multiply and divide in order from left to right. 4. Add and subtract in order from left to right.
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Property	Algebra	Arithmetic
Commutative	$a + b = b + a$ $a \cdot b = b \cdot a$	$6 + 1 = 1 + 6$ $7 \cdot 3 = 3 \cdot 7$
Associative	$a + (b + c) = (a + b) + c$ $a \cdot (b \cdot c) = (a \cdot b) \cdot c$	$2 + (3 + 8) = (2 + 3) + 8$ $3 \cdot (4 \cdot 5) = (3 \cdot 4) \cdot 5$
Distributive	$a(b + c) = ab + ac$ $a(b - c) = ab - ac$	$4(6 + 2) = 4 \cdot 6 + 4 \cdot 2$ $3(7 - 5) = 3 \cdot 7 - 3 \cdot 5$
Identity	$a + 0 = a$ $a \cdot 1 = a$	$9 + 0 = 9$ $5 \cdot 1 = 5$

EXAMPLES

A Evaluate $3(2ab)$ if $a = 3$ and $b = 5$.

$$\begin{aligned} 3(2ab) &= 3 \times (2 \times 3 \times 5) \\ &= 3 \times (30) \\ &= 90 \end{aligned}$$

B Name the property shown by the statement $4 + 8 = 8 + 4$.

The order of the numbers changed. This is the Commutative Property of Addition.

PRACTICE

Evaluate each expression if $a = 2$, $b = 8$, $c = 4$, and $d = 12$.

1. $2a + (bc - 12)$

2. $5a + 2b - 3c$

3. $(d \div c) + (2b - a)$

Name the property shown by each statement.

4. $1 \cdot 6xy = 6xy$

5. $12 + (3 + 7) = (12 + 3) + 7$

6. $5 \cdot 4 = 4 \cdot 5$



7. Standardized Test Practice Prathna needs to figure out how many people can watch the class play. There are 10 rows that each have 12 seats. Solve the equation $10 \times 12 = s$ to find the number of seats.

A 100**B** 120**C** 110**D** 90

Answers: 1. 24 2. 14 3. 17 4. Identity (\times) 5. Associative ($+$) 6. Commutative (\times) 7. B

1-3

Integers and Absolute Value (pages 17–21)

The set of **integers** consists of positive whole numbers, negative whole numbers, and zero: $\{\dots, -3, -2, -1, 0, +1, +2, +3, \dots\}$. You can write positive integers with or without the + sign.

<p>Graphing Integers on a Number Line</p>	<p>To graph an integer, locate the number and draw a dot at that point on a number line.</p> <p>The integer that corresponds to that point is called the coordinate of the point.</p> <p>The distance on the number line from a number to 0 is called the absolute value of the number.</p>
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EXAMPLES

A Find the absolute value of -5 .

*The absolute value of -5 is written $|-5|$.
 $|-5|$ is the distance of -5 from zero.
 The point -5 is 5 units from zero.
 So $|-5| = 5$.*

B Find the absolute value of 7.

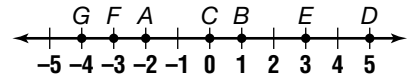
*The absolute value of 7 is written $|7|$ or $|+7|$.
 $|7|$ is the distance of 7 from zero.
 The point 7 is 7 units from zero.
 So $|7| = 7$.*

Try These Together

<p>1. Name the coordinate of point <i>A</i> graphed on the number line below. <i>HINT: What integer corresponds to A?</i></p>	<p>2. Find -10. <i>HINT: How far is -10 from 0?</i></p>
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PRACTICE

Name the coordinate of each point graphed on the number line.



- | | | | | | |
|-------------|-------------|-------------|-------------|-------------|-------------|
| 3. <i>G</i> | 4. <i>C</i> | 5. <i>B</i> | 6. <i>E</i> | 7. <i>F</i> | 8. <i>D</i> |
|-------------|-------------|-------------|-------------|-------------|-------------|

Graph each set of points on a number line.

- | | | |
|------------------------|----------------------|------------------------|
| 9. $\{3, 5, 8\}$ | 10. $\{-4, -1, 2\}$ | 11. $\{9, 4, -2, -6\}$ |
| 12. $\{-5, -2, 2, 5\}$ | 13. $\{-3, -7, -9\}$ | 14. $\{-1, 0, 5\}$ |

Evaluate each expression.

- | | | |
|-----------------|------------------|-------------------|
| 15. $ -8 $ | 16. $ 5 + -3 $ | 17. $ -22 $ |
| 18. $ 20 - 10 $ | 19. $ -12 $ | 20. $ 65 - 15 $ |

21. Travel Dixonville is 8 miles farther north than Huntland. Express 8 miles farther as an integer.



22. Standardized Test Practice Cherise and Audra both do the high jump in track and field. Audra jumps 5 inches lower than Cherise. Express 5 inches lower as an integer.

- | | | | |
|---------------|--------------|----------------|-----------------|
| A -5 | B 5 | C $ 5 $ | D $ -5 $ |
|---------------|--------------|----------------|-----------------|

Answers: 1. -2 2. 10 3. -4 4. 0 5. 1 6. 3 7. -3 8. 5 9–14. See Answer Key. 15. 8 16. 8 17. 22 18. 10 19. 12 20. 50 21. 8 22. A
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1-4**Adding Integers** (pages 23–27)

You can model adding integers with counters or on a number line.

Adding Integers	<ul style="list-style-type: none"> To add integers with the <i>same</i> sign, add their absolute values. Give the result the same sign as the integers. To add integers with <i>different</i> signs, subtract their absolute values. Give the result the same sign as the integer with the greater absolute value.
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EXAMPLES

A Solve $-3 + (-7) = p$.

The integers have the same sign. They are both negative so their sum will be negative. Add the absolute values (3 and 7) and give the result a negative sign.
 $-10 = p$

B Solve $q = -7 + 3$.

The integers have different signs. $|-7|$ is 7; $|3|$ is 3. The integer with the greater absolute value is -7 , so the result will be negative. Subtract the absolute values: $7 - 3 = 4$.
 $q = -4$

Try These Together

1. Find $5 + (-4)$.

HINT: Which integer has the greater absolute value?

2. Find $18 + 26$.

HINT: Are the signs of the integers the same?

PRACTICE**Add.**

3. $-12 + 5$

4. $(-25) + (-3)$

5. $15 + (-6) + (-4)$

6. $36 + (-29) + 10$

7. $7 + (-30)$

8. $49 + 11$

9. $(-14) + (-6)$

10. $17 + (-11)$

11. $(-3) + (-8) + (-5)$

12. What is the value of $10 + (-20)$?

13. Find the sum $-75 + (-25)$.

Evaluate each expression if $a = -5$, $b = -2$, and $c = 8$.

14. $a + b$

15. $|c + b|$

16. $|a| + c$

17. Games Mark got to move 13 spaces forward on a game board. Then on his next turn, he had to move 8 spaces back. Write an addition equation involving integers to show how far on the game board Mark actually moved in these two turns.



18. Standardized Test Practice A store that sells wooden chairs bought 25 chairs from the manufacturer. The next day they sold 8 of the chairs. Which addition equation shows how to find how many chairs they had left?

A $c = 25 + 8$

B $c = (-25) + (-8)$

C $c = -25 + 8$

D $c = 25 + (-8)$

Answers: 1. 1 2. 44 3. -7 4. -28 5. 5 6. 17 7. -23 8. 60 9. -20 10. 6 11. -16 12. -10 13. -100 14. -7 15. 6 16. 13 17. $x = 13 + (-8)$ 18. D

1-5**Subtracting Integers** (pages 28–31)

The **opposite** of an integer is the number that is the same distance from zero but in the opposite direction. The opposite of any number is called its **additive inverse**. The sum of a number and its additive inverse is zero.

$$a + (-a) = 0.$$

Subtracting Integers	To subtract an integer, add its additive inverse.
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EXAMPLES**A** Find $7 - (-3)$.

Subtracting -3 is the same as adding the inverse of -3 .

$$\begin{aligned} 7 - (-3) &= 7 + 3 \\ &= 10 \end{aligned}$$

You can think of this as “taking away a debt of \$3 is the same as adding \$3.”

B Find $-5 - 4$.

To subtract 4, add -4 .

$$\begin{aligned} -5 - 4 &= -5 + (-4) \\ &= -9 \end{aligned}$$

Try These Together1. What is the additive inverse of -5 ?

HINT: What number is the same distance from zero but on the opposite side of zero on a number line?

2. What is the additive inverse of 8?

HINT: What number added to 8 gives zero?

PRACTICE3. Write the additive inverse of -21 .**Subtract.**

4. $30 - (-5)$

5. $-20 - (-1)$

6. $-8 - 2$

7. $4 - 16$

8. $-16 - 8$

9. $12 - (-6)$

10. $10 - 2$

11. $120 - (-150)$

12. $62 - (-3)$

13. $0 - 18$

14. $-26 - 15$

15. $-14 - (-2)$

16. Find the value of y for $y = -6 - (-15)$.17. Find the value of x for $15 - 30 = x$.18. Evaluate $-10 - b - c$ if $b = 5$ and $c = -5$.

19. **Money Matters** In 1999, an Internet company had a balance for the year of $-\$200,000$. In 2000, they lost another $\$150,000$. Write a subtraction equation to show how to find the total amount of money they lost in 1999 and 2000.

20. **Standardized Test Practice** Solve the equation $x = -91 - (-102)$.**A** -11 **B** -193 **C** 11 **D** 193

Answers: 1. 5 2. -8 3. 21 4. 35 5. -19 6. -10 7. -12 8. -24 9. 18 10. 8 11. 270 12. 65 13. -18 14. -41 15. -12 16. 9 17. -15 18. -10 19. $-\$200,000 - \$150,000 = -\$350,000$ 20. C

1-6**Multiplying and Dividing Integers** (pages 34–38)**Multiplying Integers**

The product of two integers with the same sign is positive.
The product of two integers with different signs is negative.

Since division is the inverse operation for multiplication, the rules for dividing integers are the same as for multiplying integers.

Dividing Integers

The quotient of two integers with the same sign is positive.
The quotient of two integers with different signs is negative.

EXAMPLES

- A**
- Find the product of
- -5
- and
- -8
- .

The signs of the two factors are the same.

The sign of the product is positive.

$$(-5)(-8) = 40$$

- B**
- Find
- $-36 \div (-12)$
- .

The two integers have the same sign.

The quotient is positive.

$$-36 \div (-12) = 3$$

Try These Together

1. Find
- $3(-2)$
- .

HINT: Are the signs of the integers the same or different?

2. Find
- $20 \div (-2)$

HINT: Will the solution be positive or negative?

PRACTICE**Multiply or divide.**

3. $-36 \div 3$

4. $56 \div 8$

5. $-3(4)(9)$

6. $-5(9)$

7. $\frac{-16}{8}$

8. $-11(-15)(5)$

9. $-42 \div (-6)$

10. $-6(-5)$

11. $16(2)$

12. $\frac{30}{5}$

Evaluate each expression if $a = -3$, $b = 2$, and $c = -5$.

13. $\frac{ab}{b}$

14. $-2c \div b$

15. $6abc$

16. $-3bc$

- 17. Taxes** In 1995, the Albanos owed \$2,000 in taxes. For 2000, they only owed \$1,500 in taxes. What was the average change in the amount of taxes they owed each of these 5 years?



- 18. Standardized Test Practice** The value of Mr. Herrera's stock changed by $-\$55.00$ a day for 5 days. What was the total change in the value of his stock?

A \$50.00

B $-\$275.00$

C $-\$50.00$

D \$275.00

Answers: 1. -6 2. -10 3. -12 4. 7 5. -108 6. -45 7. -2 8. 825 9. 7 10. 30 11. 32 12. 6 13. -3 14. 5
15. 180 16. 30 17. $-\$100$ 18. B

1-8**Solving Addition and Subtraction Equations**

(pages 45–49)

You can use the properties of algebra to find the solution to an equation.

Addition Property of Equality	<p>If you add the same number to each side of an equation, the two sides remain equal.</p> <table style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Arithmetic</th> <th style="text-align: center;">Algebra</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$3 = 3$</td> <td style="text-align: center;">$x - 8 = 2$</td> </tr> <tr> <td style="text-align: center;">$3 + 5 = 3 + 5$</td> <td style="text-align: center;">$x - 8 + 8 = 2 + 8$</td> </tr> <tr> <td style="text-align: center;">$8 = 8$</td> <td style="text-align: center;">$x = 10$</td> </tr> </tbody> </table>	Arithmetic	Algebra	$3 = 3$	$x - 8 = 2$	$3 + 5 = 3 + 5$	$x - 8 + 8 = 2 + 8$	$8 = 8$	$x = 10$
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$3 + 5 = 3 + 5$	$x - 8 + 8 = 2 + 8$								
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Subtraction Property of Equality	<p>If you subtract the same number from each side of an equation, the two sides remain equal.</p> <table style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Arithmetic</th> <th style="text-align: center;">Algebra</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$3 = 3$</td> <td style="text-align: center;">$x + 2 = 8$</td> </tr> <tr> <td style="text-align: center;">$3 - 2 = 3 - 2$</td> <td style="text-align: center;">$x + 2 - 2 = 8 - 2$</td> </tr> <tr> <td style="text-align: center;">$1 = 1$</td> <td style="text-align: center;">$x = 6$</td> </tr> </tbody> </table>	Arithmetic	Algebra	$3 = 3$	$x + 2 = 8$	$3 - 2 = 3 - 2$	$x + 2 - 2 = 8 - 2$	$1 = 1$	$x = 6$
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$1 = 1$	$x = 6$								

To solve an equation in which a number is added to or subtracted from the variable, you can use the opposite, or **inverse**, operation. Addition and subtraction are **inverse operations**.

EXAMPLES**A** Solve $y + 5 = 13$.

$$y + 5 = 13$$

$$y + 5 - 5 = 13 - 5 \quad \text{Use the subtraction property of equality.}$$

$$y = 8 \quad \text{Then check your solution.}$$

The solution to the equation is 8.

B Solve $b - 6 = 72$.

$$b - 6 = 72$$

$$b - 6 + 6 = 72 + 6 \quad \text{Use the addition property of equality.}$$

$$b = 78 \quad \text{Then check your solution.}$$

The solution to the equation is 78.

Try These Together

Solve each equation. Check your solution.

1. $15 + z = 26$

2. $x - 12 = 7$

3. $y = 34 + 8$

4. $39 = 25 + w$

HINT: Remember to use the inverse operation.

PRACTICE

Solve each equation. Check your solution.

5. $36 = 24 + r$

6. $q - 8 = 17$

7. $p + 5 = 18$

8. $10 + s = 26$

9. $120 = t - 65$

10. $j - 64 = 50$

11. $1.5 + h = 3$

12. $k - 0.7 = 0.3$

13. $45 = \ell + 2$

14. $41 + 5 = m$

15. $n - 8.1 = 3.1$

16. $a = 1.6 + 1.3$

17. Standardized Test Practice Solve the equation $48.2 = z + 25.1$.

A 23.1**B** 24.3**C** 23.5**D** 24.8

Answers: 1. 11 2. 19 3. 42 4. 14 5. 12 6. 25 7. 13 8. 16 9. 185 10. 114 11. 1.5 12. 1 13. 43 14. 46 15. 11.2 16. 2.9 17. A

1-9**Solving Multiplication and Division Equations**

(pages 50–53)

You can use the properties of algebra to find the solution to an equation.

Division Property of Equality	<p>If you divide each side of an equation by the same nonzero number, the two sides remain equal.</p> <table> <thead> <tr> <th>Arithmetic</th> <th>Algebra</th> </tr> </thead> <tbody> <tr> <td>$8 = 8$</td> <td>$3x = -18$</td> </tr> <tr> <td>$8 \div 2 = 8 \div 2$</td> <td>$\frac{3x}{3} = \frac{-18}{3}$</td> </tr> <tr> <td>$4 = 4$</td> <td>$x = -6$</td> </tr> </tbody> </table>	Arithmetic	Algebra	$8 = 8$	$3x = -18$	$8 \div 2 = 8 \div 2$	$\frac{3x}{3} = \frac{-18}{3}$	$4 = 4$	$x = -6$
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Multiplication Property of Equality	<p>If you multiply each side of an equation by the same number, the two sides remain equal.</p> <table> <thead> <tr> <th>Arithmetic</th> <th>Algebra</th> </tr> </thead> <tbody> <tr> <td>$8 = 8$</td> <td>$\frac{x}{4} = 5$</td> </tr> <tr> <td>$8 \cdot 2 = 8 \cdot 2$</td> <td>$\frac{x}{4}(4) = 5(4)$</td> </tr> <tr> <td>$16 = 16$</td> <td>$x = 20$</td> </tr> </tbody> </table>	Arithmetic	Algebra	$8 = 8$	$\frac{x}{4} = 5$	$8 \cdot 2 = 8 \cdot 2$	$\frac{x}{4}(4) = 5(4)$	$16 = 16$	$x = 20$
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$16 = 16$	$x = 20$								

To solve a multiplication or division equation, you can use the opposite, or **inverse**, operation. Multiplication and division are **inverse operations**.

EXAMPLES

A Solve $4x = -20$.

$$4x = -20$$

$$\frac{4x}{4} = \frac{-20}{4}$$

$$x = -5$$

Use the division property of equality. Then check your solution.

The solution to the equation is -5 .

B Solve $\frac{z}{9} = 5$.

$$\frac{z}{9} = 5$$

$$\frac{z}{9} \cdot 9 = 5 \cdot 9$$

$$z = 45$$

Use the multiplication property of equality. Then check your solution.

The solution to the equation is 45 .

Try These Together

Solve each equation. Check your solution.

1. $56 = 8y$

2. $-30 = 6p$

3. $m \div 9 = -4$

4. $14x = 126$

HINT: Use the inverse operation to solve each equation.

PRACTICE

Solve each equation. Check your solution.

5. $r \div 9 = 9$

6. $54 = -6s$

7. $13f = 65$

8. $\frac{n}{3} = -25$

9. $\frac{j}{50} = 5$

10. $\frac{k}{-8} = 9$

11. Standardized Test Practice Jeremiah's family pays \$35.00 a month for 70 cable television channels. Use the equation $\$35.00 = 70y$ to find out how much they pay per channel.

A \$0.55

B \$0.45

C \$0.60

D \$0.50

Answers: 1. 7 2. -5 3. -36 4. 9 5. 81 6. -9 7. 5 8. -75 9. 250 10. -72 11. D

1

Chapter 1 Review

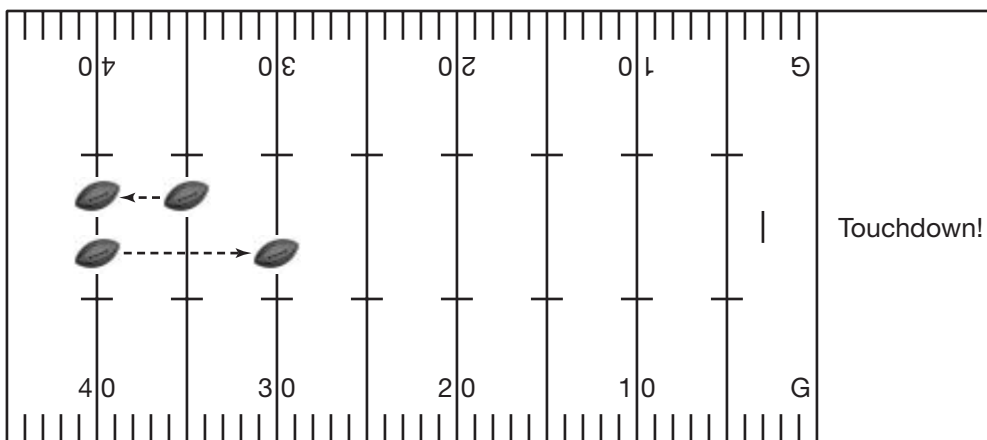
Equation Football

Solve each equation. Then use your solutions to move the team across the football field. Positive solutions move the team in the direction of a touchdown. Negative solutions move the team away from a touchdown. The goal is to reach the goal line in order to score a touchdown.

Example: Suppose the team starts on the 35-yard line.

1st Play: $x = 5 + (-10)$ $x = \underline{-5}$ The team moves back 5 yards to the 40-yard line.

2nd Play: $x = -2 \cdot (-5)$ $x = \underline{10}$ The team moves forward 10 yards to the 30-yard line.



Go!

After an interception, Team A starts on the 40-yard line.

1st Play: $a = (-3)(2)(-2)$ $a = \underline{\hspace{2cm}}$ What yard line is the team on now? $\underline{\hspace{2cm}}$

2nd Play: $b = 35 \div (-7)$ $b = \underline{\hspace{2cm}}$ What yard line is the team on now? $\underline{\hspace{2cm}}$

3rd Play: $c - (-29) = 12$ $c = \underline{\hspace{2cm}}$ What yard line is the team on now? $\underline{\hspace{2cm}}$

4th Play: $-3d = -48$ $d = \underline{\hspace{2cm}}$ What yard line is the team on now? $\underline{\hspace{2cm}}$

Did Team A score a touchdown? Justify your answer.

Answers are located on page 108.