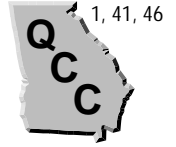


A Plan for Problem Solving

(pages 4–7)



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

Explore	Read the problem carefully. Ask yourself questions like, “What facts do I know?”
Plan	See how the facts relate to each other. Make a plan for solving the problem. Estimate the answer.
Solve	Use your plan to solve the problem. If your plan does not work, revise it or make a new one.
Examine	Reread the problem. Ask, “Is my answer close to my estimate and does my answer make sense?” If not, solve the problem another way.

EXAMPLE

Efrain wants to buy a used book that costs 99 cents. He has three quarters and four dimes in his pocket. Does he have enough money to buy the book?

Explore	You need to find out if Efrain has enough money to buy the book. With the coins he has, you estimate that he has enough money.
Plan	Multiply the number of quarters he has by 25, and the number of dimes he has by 10. Add the two products to find out how much money he has.
Solve	$3 \times 25 + 4 \times 10 = 115$ cents, and $115 > 99$
Examine	Since Efrain has 115 cents, or \$1.15, he can buy the book.

Try This Together

- Lawanda sells candy bars for \$2 each to help her Spanish club raise money for a trip to Mexico. If she hopes to raise \$60, how many bars must she sell? *HINT: What must you multiply by \$2 to get a product of \$60?*

PRACTICE

Use the four-step plan to solve each problem.

- Food** Erika is making cookies. The recipe she has makes 20 cookies, but she wants to make 60 cookies. If she needs 2 cups of flour for 20 cookies, how many cups of flour will she need for 60 cookies?



- Standardized Test Practice** Miguel rode his bike to swimming practice and home again every day for 80 days over the summer. The ride was 3 miles to practice and 3 miles back home. Altogether, how many miles did Miguel ride his bike to and from swimming practice?

A 560 miles

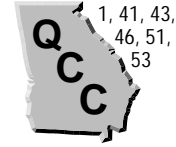
B 240 miles

C 480 miles

D 125 miles

Answers: 1. 30 candy bars 2. 6 3. C

Using Patterns (pages 8–11)



Use the following steps to find missing numbers in a pattern.

Study the numbers that are shown in the pattern.	3, 6, 9, 12, <u> ?</u> , <u> ?</u> , <u> ?</u>
How do you get each succeeding number?	$\begin{array}{ccccccc} 3, & 6, & 9, & 12, & \underline{?}, & \underline{?}, & \underline{?} \\ \uparrow & \uparrow & \uparrow & & & & \\ +3 & +3 & +3 & & & & \end{array}$ <i>Each number is 3 more than the one before it.</i>
Find the next three numbers.	$12 + 3 = 15$ $15 + 3 = 18$ $18 + 3 = 21$

EXAMPLES

Find the next three numbers in the patterns.

A 3, 7, 11, 15, ?, ?, ?

$$\begin{array}{ccccccc} 3, & 7, & 11, & 15, & \underline{?}, & \underline{?}, & \underline{?} \\ \uparrow & \uparrow & \uparrow & & & & \\ +4 & +4 & +4 & & & & \end{array}$$

Each number is 4 more than the one before it.

$15 + 4 = 19$ $19 + 4 = 23$ $23 + 4 = 27$

B 20, 17, 14, 11, ?, ?, ?

$$\begin{array}{ccccccc} 20, & 17, & 14, & 11, & \underline{?}, & \underline{?}, & \underline{?} \\ \downarrow & \downarrow & \downarrow & & & & \\ -3 & -3 & -3 & & & & \end{array}$$

Each number is 3 less than the one before it.

$11 - 3 = 8$ $8 - 3 = 5$ $5 - 3 = 2$

Try These Together

Find the next three numbers in the patterns.

1. 3, 6, 12, 24, ?, ?, ?

HINT: Multiply.

2. 45, 40, 35, 30, ?, ?, ?

HINT: Subtract.

PRACTICE

Find the next two numbers in each pattern.

3. 2, 4, 6, 8, ?, ?

4. 2, 6, 10, 14, ?, ?

5. 50, 40, 30, 20, ?, ?

6. 1, 3, 5, 7, ?, ?

7. 4, 7, 10, 13, ?, ?

8. 18, 15, 12, 9, ?, ?

9. 4, 5, 4, 5, ?, ?

10. 8, 16, 8, 16, ?, ?

11. 5, 7, 9, 11, ?, ?

12. Find the next three numbers in the pattern 2, 3, 5, 8, ?, ?, ?.

13. **Health** Jamail’s baby brother just started eating cereal. He had 2 spoonfuls on Monday, 3 on Tuesday, 4 on Wednesday, and 5 on Thursday. If this pattern continues, how many spoonfuls of cereal will he eat on Friday?

14. **Sports** Connie’s basketball team won their first basketball game by 2 points, their second by 4 points, and their third by 8 points. If this pattern continues, by how many points will they win their fourth game?



15. **Standardized Test Practice** A store is having a sale on shirts. Each day, the price of the shirt goes down \$1 until all of the shirts are sold. If the shirts cost \$15 on Monday, how much will they cost on Wednesday?

A \$10

B \$11

C \$12

D \$13

Answers: 1. 48, 96, 192 2. 25, 20, 15 3. 10, 12 4. 18, 22 5. 10, 0 6. 9, 11 7. 16, 19 8. 6, 3 9. 4, 5 10. 8, 16 11. 13, 15 12. 12, 17, 23 13. 6 14. 16 15. D

Estimation by Rounding

(pages 12–15)



The rules for rounding are given below.

Rounding Whole Numbers	Look at the digit to the right of the place being rounded. <ul style="list-style-type: none"> The digit remains the same if the digit to the right is 0, 1, 2, 3, or 4 (less than 5). Round up if the digit to the right is 5, 6, 7, 8, or 9 (greater than or equal to 5).
-------------------------------	--

EXAMPLES

A Round 56 to the nearest ten.

Look at the digit to the right of the tens place. The digit is 6. The rules for rounding whole numbers say to round up if the digit to the right is 5, 6, 7, 8, or 9. So, round 56 up to the nearest ten, which is 60.

B Estimate the product of 52 and 5.

Round 52 to the nearest ten. The digit to the right of the tens place is less than 5 so round down to 50. Then, multiply 50×5 to get the estimate, 250.

Try These Together

1. Round 243 to the nearest hundred

HINT: 4 is less than 5. Round down.

2. Estimate the product of 97 and 4.

HINT: 7 is greater than 5. Round up.

PRACTICE

Round each number to the underlined place-value position.

- | | | |
|------------------|--------------------|--------------------|
| 3. <u>5</u> 67 | 4. <u>4</u> 3 | 5. <u>8</u> 7 |
| 6. <u>3</u> 54 | 7. <u>2</u> 78 | 8. 1, <u>2</u> 69 |
| 9. <u>3</u> ,352 | 10. 9, <u>6</u> 84 | 11. <u>1</u> 51 |
| 12. <u>1</u> 34 | 13. <u>6</u> ,453 | 14. <u>5</u> ,123 |
| 15. <u>2</u> 4 | 16. <u>6</u> 8 | 17. 4, <u>5</u> 60 |

Estimate. State whether the answer shown is reasonable.

18. $12 \times 5 = 80$ 19. $77 - 11 = 66$ 20. $84 \div 2 = 42$

21. **Entertainment** Elise is going to a movie that costs \$5.25. She is planning to buy a snack for \$1.60. Estimate to the nearest dollar how much money she should bring with her.



22. **Standardized Test Practice** A male African elephant weighs about 15,400 pounds. A male Asian elephant weighs about 5,100 pounds. To the nearest thousand pounds, how much more does an African elephant weigh than an Asian elephant?

A 10,000

B 11,000

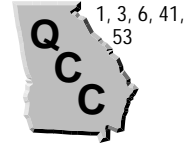
C 9,000

D 8,000

Answers: 1. 200 2. 400 3. 570 4. 40 5. 90 6. 400 7. 280 8. 1,300 9. 3,000 10. 9,680 11. 1,150 12. 100 13. 6,000 14. 5,000 15. 20 16. 70 17. 4,560 18. no 19. yes 20. yes 21. \$7 22. A

Order of Operations

(pages 16–19)



When you have more than one operation, the order of operations tells you which operation to use first.

Order of Operations

1. Multiply and divide in order from left to right.
2. Add and subtract in order from left to right.

EXAMPLES

Find the value of each expression.

A $15 - 2 \times 6$

$$15 - 2 \times 6 = 15 - 12 \quad \text{First multiply 2 by 6.}$$

$$= 3 \quad \text{Subtract 12 from 15.}$$

B $2 + 10 \div 5$

$$2 + 10 \div 5 = 2 + 2 \quad \text{First divide 10 by 5.}$$

$$= 4 \quad \text{Add 2 and 2.}$$

Try These Together

Find the value of each expression.

1. $8 - 5 + 13$

HINT: Add and subtract from left to right.

2. $3 + 7 \times 4$

HINT: Multiply first.

PRACTICE

Find the value of each expression.

3. $10 - 5 + 3$

4. $8 \times 2 - 16$

5. $15 - 3 \times 2$

6. $12 + 4 \times 3$

7. $1 + 4 - 3$

8. $2 \times 3 - 1$

9. $5 \times 5 + 5$

10. $6 \times 10 - 40$

11. $24 \div 3 - 6$

12. $50 \div 5 + 15$

13. $27 \div 9 \times 4$

14. $18 - 3 \times 5$

15. Find the value of $3 \times 5 - 4 \times 2$.

16. Find the value of $2 + 8 \times 3 - 6$.

17. What is the value of 10 times 3 divided by 6?

18. **Money Matters** Cassie makes \$2 for taking out the trash and \$1 for making her bed. If she took out the trash 3 times, and made her bed 2 times, how much money did she make?



19. **Standardized Test Practice** Jackson had 10 baseball cards. He bought 10 more. Then he divided the cards evenly between 5 people. How many baseball cards did each person receive?

A 3

B 6

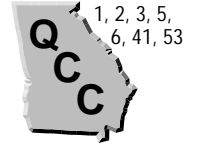
C 5

D 4

Answers: 1. 16 2. 31 3. 8 4. 0 5. 9 6. 24 7. 2 8. 5 9. 30 10. 20 11. 2 12. 25 13. 12 14. 3 15. 7 16. 20 17. 5 18. \$8 19. D

Variables and Expressions

(pages 22–25)



In algebra, **variables**, usually letters, are used to represent numbers.

Algebraic expressions are combinations of variables, numbers, and at least one operation. If you replace variables with numbers, you can **evaluate**, or find the value of, an algebraic expression.

Showing Multiplication in Algebra	$2 \cdot n$ means $2 \times n$ $2n$ means $2 \times n$ np means $n \times p$
--	--

EXAMPLES

Evaluate each expression if $h = 9$.

A $26 - h$

$$\begin{aligned} 26 - h &= 26 - 9 && \text{Replace } h \text{ with } 9. \\ &= 17 && \text{Subtract } 9 \text{ from } 26. \end{aligned}$$

B $4h + 8$

$$\begin{aligned} 4h + 8 &= 4 \times 9 + 8 && \text{Replace } h \text{ with } 9. \\ &= 36 + 8 && \text{Multiply } 4 \text{ by } 9. \\ &= 44 && \text{Add } 36 \text{ and } 8. \end{aligned}$$

Try These Together

Evaluate each expression if $q = 7$ and $r = 4$.

1. $q + r - 1$

HINT: Replace the variables.

2. $3q + r$

HINT: Replace the variables, then multiply first.

PRACTICE

Evaluate each expression if $x = 4$ and $y = 9$.

3. $x + 7$

4. $18 - y$

5. $6x - 10$

6. $6 + y$

7. $2xy$

8. $y \div 1$

9. $x + 3x$

10. $x \times y$

11. $40 \div 5x$

Evaluate each expression if $a = 9$, $b = 18$, and $c = 3$.

12. $b \div 6$

13. $b - c$

14. ca

15. $a + b + c$

16. $ab - c$

17. $54 \div a$

18. $cb + 2a$

19. $b - 2a$

20. $b - 3a \div c$

21. **Architecture** To find the perimeter of a rectangle, you can use the expression $2\ell + 2w$ where ℓ and w represent the length and width of the rectangle. Find the perimeter of a rectangle with length 4 m and width 7 m.



22. **Standardized Test Practice** Evaluate $15 - st$ if $s = 2$ and $t = 3$.

A 23

B 10

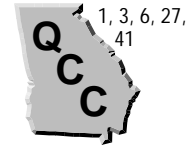
C 9

D 21

Answers: 1. 10 2. 25 3. 11 4. 9 5. 14 6. 15 7. 72 8. 9 9. 16 10. 36 11. 32 12. 3 13. 15 14. 27 15. 30 16. 159 17. 6 18. 72 19. 0 20. 9 21. 22 m 22. C

Powers and Exponents

(pages 28–31)



When you multiply two or more numbers, each number is called a **factor** of the product. When the same factor is repeated, you can use an exponent to simplify your writing. An **exponent** tells you how many times a number, called the **base**, is used as a factor. A **power** is a number that is expressed using exponents.

Order of Operations with Powers	<ol style="list-style-type: none"> 1. Do all powers before other operations. 2. Multiply and divide in order from left to right. 3. Add and subtract in order from left to right.
--	--

EXAMPLES

A Write $7 \cdot 7 \cdot 7$ using exponents.

The base is 7. Since 7 is a factor three times, the exponent is 3.

$$7 \cdot 7 \cdot 7 = 7^3$$

B Write 9^2 as a product, then evaluate.

The base is 9. The exponent 2 means that 9 is a factor two times.

$$\begin{aligned} 9^2 &= 9 \cdot 9 \\ &= 81 \end{aligned}$$

C Evaluate $2 \cdot 3^3$.

$$\begin{aligned} 2 \cdot 3^3 &= 2 \cdot 27 && \text{Evaluate } 3^3 \text{ first. } 3^3 = 3 \cdot 3 \cdot 3 \text{ or } 27 \\ &= 54 && \text{Multiply 2 and 27.} \end{aligned}$$

Try These Together

1. Write $21 \cdot 21 \cdot 21$ using exponents.

HINT: How many factors are there?

2. Evaluate $12 - 2^3$.

HINT: Do the power first.

PRACTICE

Write each product using exponents.

3. $12 \cdot 12$

4. $5 \cdot 5 \cdot 5 \cdot 5$

5. $q \cdot q \cdot q \cdot q \cdot q$

6. $2 \cdot 2 \cdot 2 \cdot 7 \cdot 7$

7. $13 \cdot 13 \cdot 8 \cdot 8 \cdot 8 \cdot 8$

8. $y \cdot z \cdot z \cdot z$

Write each power as a product.

9. 6^4

10. 36^2

11. $s^4 \cdot t^5$

12. $a^2 \cdot b^2 \cdot c^3$

Evaluate each expression.

13. 10^3

14. 2^4

15. 13^2

16. 5 cubed

17. $3^5 - 10$

18. $6 \cdot 4^2 + 4$

19. Population The U.S. Census Bureau estimated in 1999 that there were about 10^7 60 to 64-year-olds living in the United States. About how many people is this?



20. Standardized Test Practice Evaluate $2^3 \cdot 10 + 6$.

A 86

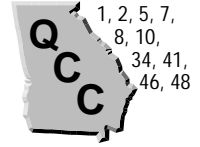
B 128

C 236

D 46

Answers: 1. $2 \cdot 13$ 2. 4 3. 12^2 4. 5^4 5. q^5 6. $2 \cdot 3^2$ 7. $13 \cdot 28^4$ 8. yz^3 9. $6 \cdot 6 \cdot 6 \cdot 6 \cdot 6$ 10. $36 \cdot 36$ 11. $s \cdot s \cdot s \cdot s \cdot s \cdot t \cdot t \cdot t \cdot t$ 12. $a \cdot a \cdot b \cdot b \cdot c \cdot c \cdot c$ 13. 1,000 14. 16 15. 169 16. 125 17. 233 18. 100 19. 10,000,000 20. A
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Solving Equations

 (pages 34–37)


In mathematics, an **equation** is a sentence that contains an equals sign, =. Equations can be either true or false. An equation with a variable is neither true nor false until the variable is replaced with a number.

$y + 2 = 9$ Replace y with 5. Is $5 + 2 = 9$ a true sentence? $7 = 9$ No, the sentence is false.	$y + 2 = 9$ Replace y with 7. Is $7 + 2 = 9$ a true sentence? $9 = 9$ Yes, the sentence is true.
--	--

EXAMPLES

A Is $12 - z = 10$ true if $z = 3$?

$12 - 3 \stackrel{?}{=} 10$ Replace z with 3.
 $9 = 10$ Subtract 3 from 12.
 No, the sentence is false.

B Is $3a + 1 = 13$ true if $a = 4$?

$3 \cdot 4 + 1 \stackrel{?}{=} 13$ Replace a with 4.
 $12 + 1 \stackrel{?}{=} 13$ Multiply 3 by 4.
 $13 = 13$ Add 12 and 1.
 Yes, the sentence is true.

Try These Together

Tell whether the equation is true or false by replacing the variable with the given value.

1. $s + 15 = 19$; $s = 6$

HINT: Replace the variable, then evaluate.

2. $8 + n - 7 = 2$; $n = 1$

HINT: Replace the variable, then evaluate.

PRACTICE

Tell whether the equation is true or false by replacing the variable with the given value.

3. $75 + s = 120$; $s = 45$

4. $95 \div x = 5$; $x = 17$

5. $y - 22 = 56$; $y = 78$

6. $6m = 48$; $m = 7$

Identify the solution to each equation from the list given.

7. $j + 4 = 21$; 17, 18, 19

8. $b - 77 = 32$; 107, 109, 111

9. $45 = 15r$; 3, 4, 5

10. $27 + w = 45$; 17, 18, 19

Solve each equation mentally.

11. $6 + p = 14$

12. $75 = 3t$

13. $18v = 36$



14. Standardized Test Practice Solve $39 \div s = 3$.

A 3

B 6

C 11

D 13

Answers: 1. false 2. true 3. true 4. false 5. true 6. false 7. 17 8. 109 9. 3 10. 18 11. 8 12. 25 13. 2 14. D

Chapter 1 Review

Password Search

The Middle School Math Club has just started their web site. For fun, they put a password on their site. You can find the password using the clues.

Clue 1: Write the second step in the four-step problem solving plan here.
Write the first letter of this word in blank 1 in the box at the bottom of the page.

Clue 2: The sixth number of the following pattern.
71, 62, 53, ____, ____, ?

Find the value of each expression. Use the chart to translate each solution to a letter. Write the letter in the blank that matches the number of the clue.

Clue 3: $15 + 8 \div 2 \times 3 - 3$

Clue 4: $a^3 - 5b$ if $a = 3$ and $b = 5$

Clue 5: Use mental math to solve
 $42 \div w = 7$.

Number	Letter	Number	Letter
1	X	14	U
2	E	15	L
3	C	16	I
4	A	17	D
5	Z	18	G
6	R	19	K
7	Y	20	N
8	S	21	Q
9	M	22	V
10	T	23	P
11	B	24	W
12	F	25	H
13	J	26	O

What is the password?

Password

When you enter the Middle School Math Club web site, you will gain math . . .

 1 2 3 4 5

Answers are located on p. 108.