Facts to Know

Many basic word problems can be expressed in an equation format, which makes it easy to understand and solve.

Using Algebraic Symbols

- You can use a letter of the alphabet to represent the unknown number in a problem.
- The equation is written so that the values on the left side of the equal sign equal the values on the right side of the equal sign.
- Solve the equation so that the unknown value represented by a letter is alone on one side of the equal sign and the value of the unknown is on the other side of the equal sign.

Sample A

Jennifer has $25.00. She needs $49.00 to buy a new school outfit. How much more money does she need?

Write an equation this way: n (money needed) + 25 (money she has) = 49 (cost of outfit)

Solve the equation by subtracting 25 from each side.

$$n + 25 = 49$$
$$n + 25 - 25 = 49 - 25$$
$$n = 24$$

Jennifer needs $24.00 more.

Axiom of Equality

- The axioms of equality were used to help solve the basic equation above.
- Any value added, subtracted, multiplied, or divided to one side of the equal sign must be added, subtracted, multiplied, or divided respectively to the other side.

Sample B

A group of 5 girls decided to split evenly the $18.75 cost of a CD album by their favorite group. How much money did each girl spend?

Write an equation.

Solve for n (the amount each girl spent) by dividing each side of the equation by 5.

$$5n = \$18.75$$
$$5n \div 5 = \$18.75 \div 5$$
$$n = \$3.75$$

Each girl spent $3.75.

Working with Two Unknown Quantities

You can use the same letter with an added or subtracted amount to represent two unknown quantities. Simplify and combine terms whenever possible.

Sample C

Sammy's mother is 2 years more than 3 times as old as Sammy. Their combined age is 42. How old are Sammy's mother and Sammy?

Equation: Let n equal Sammy's age. Let $3n + 2$ = Sammy's mother's age.

Since the total of their ages equals 42, then $n + 3n + 2 = 42$

Combine terms: $4n + 2 = 42$

Use the axioms of equality by subtracting 2 and then dividing by 4.

$$4n + 2 = 42$$
$$4n + 2 - 2 = 42 - 2$$
$$4n = 40$$
$$4n \div 4 = 40 \div 4$$
$$n = 10$$

Sammy is 10 years old. His mother is 32 years old.

Alex has $13.00 to buy a stereo that costs $24.00. How much more money does he need?
Write the equation. Let n = the amount of money.

$$n + 13 = 24$$

Use the axioms $\qquad n + 13 = 24$ $\qquad$ Alex needs $11.00 more.
of equality: $\qquad n + 13 - 13 = 24 - 13$

$$n = 11$$

Directions: Use the information on page 33 to help you solve these problems. Write an equation for each word problem using n and solve it.

1. Jimmy is 23 years younger than his mom who is 36 years old. How old is Jimmy?

    Write the equation: _____

    Solve for n: _____

    Answer: _____

2. Albert has 15 CDs. Dianne has 2 more than 4 times as many CDs. How many CDs does Dianne have?

    Write the equation: _____

    Solve for n: _____

    Answer: _____

3. Joe's dad weighs 216 pounds. Joe weighs 122 pounds less than his dad. How much does Joe weigh?

    Write the equation: _____

    Solve for n: _____

    Answer: _____

4. Valerie took 25 shots in a basketball game. She had a 60% shooting percentage. How many shots did she make?

    Write the equation: _____

    Solve for n: _____

    Answer: _____

5. Sherrie's CD played for 22 minutes, which was 7 minutes longer than Matthew's CD. How long did Matthew's CD play?

    Write the equation: _____

    Solve for n: _____

    Answer: _____

6. Jerry read 1,145 words in five minutes. Jonathan read 316 words less in the same time period. How many words did Jonathan read?

    Write the equation: _____

    Solve for n: _____

    Answer: _____

7. Jeremiah rode 88 minutes on his skateboard without falling or getting off. Nick rode only $\frac{3}{4}$ as long. How long did Nick ride?

    Write the equation: _____

    Solve for n: _____

    Answer: _____

Extension

Write a word problem comparing your age to another person's age.

Word Problem: _____

_____

_____

Solve for n: _____

Answer: _____

Ronny's father is 24 years older than Ronny. Their combined age is 46. How old is Ronny? How old is Ronny's father?

Write the equation: Let x stand for Ronny's age. Let $x + 24$ stand for his dad's age.

Equation:

$$x + x + 24 = 46$$
$$2x + 24 = 46$$
$$2x + 24 - 24 = 46 - 24$$
$$2x = 22$$
$$2x \div 2 = 22 \div 2$$
$$x = 11$$

Ronny is 11.

His father is 35.

Directions: Use the information on page 33 to help you solve these word problems. Write an equation for each problem using n and then solve the problem.

1. Sarah's mother is 28 years older than Sarah is. Their combined age is 50. How old is Sarah? How old is her mother?

   Write the equation: _____

   Solve for n: _____

   Answer: _____

2. Joe's dad weighs 140 pounds more than Joe. Their combined weight is 336 pounds. How much does Joe weigh? How much does his dad weigh?

   Write the equation: _____

   Solve for n: _____

   Answer: _____

3. Christina has $22.00 more than 3 times as much money as Melissa has. Together they have $122.00. How much money does each girl have?

   Write the equation: _____

   Solve for n: _____

   Answer: _____

4. In a one-minute time period, Joseph read 2 times as many words as John. Together they read 669 words. How many words did each boy read?

   Write the equation: _____

   Solve for n: _____

   Answer: _____

5. Norman is 4 times as old as his brother Nicholas. Their combined age is 15. How old is each boy?

   Write the equation: _____

   Solve for n: _____

   Answer: _____

6. George has 9 times as many stamps in his collection as Daniel has. Bryan has 2 times as many stamps as Daniel. The combined stamp collection of the three boys is 144. How many stamps does each boy have?

   Write the equation: _____

   Solve for n: _____

   Answer: _____

Directions: Use the information on page 33 to help you solve these word problems. Write an equation for each problem using *n* and then solve the problem.

1. Fred's dad is 25 years older than Fred. His mother is 23 years older than Fred. The combined age of the three people is 93. How old is Fred? How old is each parent?

   Write the equation: _____ Solve for *n*: _____

   Answer: _____

2. A bike costs $100.00 more than a scooter. A scooter costs $60.00 more than a skateboard. The total cost of the 3 items is $310.00. How much is the skateboard? How much is the scooter? How much is the bike?

   Write the equation: _____ Solve for *n*: _____

   Answer: _____

3. Jimmy's brother is 9 times as old as Jimmy. In 6 years, his brother will be only 3 times as old as Jimmy. How old is each boy?

   Write the equation: _____ Solve for *n*: _____

   Answer: _____

4. Maybelle is 5 years younger than Jesse. Ellen is 2 years older than Jesse. Jeanne is 8 years older than Jesse. The combined age of the four children is 53.

   How old is Jesse? _____ How old is Maybelle?_____

   How old is Ellen? _____ How old is Jeanne?_____

   Write the equation: _____ Solve for *n*: _____

   Answer: _____

5. Elsa had $15.00 more than Joseph. Julian had $10.00 less than Joseph. Martha had $23.00 more than Joseph. Together they had $108.00. How much money did each student have?

   Write the equation: _____ Solve for *n*: _____

   Answer: _____

6. Christina had 2 times as much money as Melissa. Charmain had 4 times as much money as Melissa. Together they had $105.00. How much money did each girl have?

   Write the equation: _____ Solve for *n*: _____

   Answer:_____

7. Matthew had 3 times as much money as Kristin. Joshua had $10.00 less than Matthew did. Altogether they had $74.00. How much money did each person have?
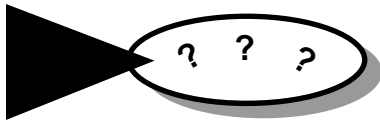
   Write the equation: _____ Solve for *n*: _____

   Answer: _____

8. Kenneth is 8 years older than Andrew. Billy is 3 times as old as Andrew. Cameron is 5 years younger than Andrew. The combined age of the four is 63. How old is each boy?

   Write the equation: _____ Solve for *n*: _____

   Answer: _____

C. $698.00 or
  $700.00
2. A. 185 sq. ft.
   B. 5 rolls
   C. $125
3. A. 244 3/8 sq. ft.
      230 sq. ft.;
      244 3/8 sq. ft.;
      230 sq. ft.;
      425 sq. ft.
   B. 1,373 3/4 sq. ft.
      or 1,374 sq. ft.
   C. 4 gallons
   D. $71.96

Page 23
1. A. 2,356 sq. ft.
   B. $23.56
2. A. 200 ft.
   B. $6.00
3. A. 1,116 sq. ft.
   B. $11.16
4. A. 34.54 ft.
   B. $1.04
   C. 94.99 sq. ft.
   D. $0.95
5. A. 643.75 sq. ft.
   B. $96.56
6. A. 221 sq. ft.
   B. $39.78
7. A. 37.68 ft.
   B. 113.04 sq. ft.

Extension: Answers will
vary.

Page 24
1. 240 cartons
2. 4,070 cu. ft.
3. 25,688.34 cu. in.
4. 1,417.95 cu. cm
5. 370 cu. ft.
6. 14,820 cu. ft.
7. 162,887.5 cu. ft.
8. 10,160,922 lb.
9. 1,218,398.5 gallons
10. 471 cu. in.
11. 84,780 cu.ft.

Page 26
1. $45.60
2. $34.13
3. $104.65

4. $43.51
5. $32.95
6. $29.25
7. $36.86
8. $30,555.64
9. Monday and
   Tuesday = Saturday
10. $17,111.16
11. $12,473.53

Page 27
1. $101.47
2. $12.27
3. You could buy the
   DVD player;
   $179.67
   $5.96 change
4. $786.15
5. The traditional
   machine/phone is
   $11.24 cheaper.
6. $19.20
7. $49.76
8. Boom Box City
   $25.46 less
9. $16.30
10. 25%

Page 28
1. 22.86 miles per day
2. 4 hr. 24 min.
3. 3 hr. 20 min.
4. 40 m.p.h.
5. 1 mile per minute
6. $21.00
7. $3.20
8. $0.82
9. $46.74

Page 30
1. 6 tops/4 skorts
2. 3 pennies, 3
   nickels, 0 dimes, 3
   quarters,
3. A. 1 penny, 0
   nickels,
   4 dimes,
      4 quarters,
      0 half dollars
   B. 1 penny, 4
   nickels,
   2 dimes,

   0 quarters,
   2 half dollars
4. 6, 9, 12, 15, 18
5. 300, 350, 400, 450,
   500
6. 3 footballs, 6 tennis
   balls, 3 baseballs, 2
   basketballs
7. Jack is 26 years
   old; Dad is 52 years
   old
8. Marie is 22 years
   old; Mother is 44
   years old

Page 31
1. $360.00
2. 2,700 beads
3. 240 total
   16 skirts
   32 jeans
   64 shorts
   128 blouses
4. $372.00 total
   Elaine $12.00
   Christina $24.00
   Alyse $48.00
   Doreen $96.00
   Melissa $192.00
5. James 2 years old
   Raymond 3 years
   old
   Brett 4 1/2 years
   old
   John 6 years old
   Robert 11 years old

Page 32
1. 3 hr. 2 min.
2. 31 games
3. 81 times
4. 30 names
5. 20 points on 8th
   game; 35 points on
   14th game
6. 35 players are 13
   years old

Page 34
1. $n = 36–23$
 $n = 13$
   13 years old
2. $n = (4 \times 15) + 2$

$n = 62$
62 CDs
3. $n = 216–122$
   $n = 94$
   94 lb.
4. $n = 25 \times .60$
   $n = 15$
   15 shots
5. $n = 22 – 7$
   $n = 15$
   15 minutes
6. $n = 1{,}145 – 316$
   $n = 829$
   829 words
7. $n = 88 \times 3/4$
   $n = 66$
   66 minutes
Extension: Answers will
vary.

Page 35
1. $n + (n + 28) = 50$
   $2n + 28 = 50$
      $n = 11$
   Mother is 39 years
   old.
   Sarah is 11 years
   old.
2. $n + (n + 140) = 336$
   $2n + 140 = 336$
      $n = 98$
   Joe weighs 98 lbs.
   Dad weighs 238
   lbs.
3. $n + 4n + 22 = 122$
      $n = 25$
   Melissa has $25.00.
   Christina has $97.00.
4. $n + 2n = 669$
   $3n = 669$
   $n = 223$
   John read 223
   words.
   Joseph read 446
   words.
5. $n + 4n = 15$
   $5n = 15$
   $n = 3$
   Nicholas is 3 years
   old.
   Norman is 12 years
   old.
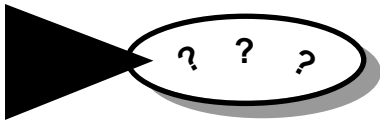
6. $n + 9n + 2n = 144$
   $12n = 144$
   $n = 12$
   Daniel has 12 stamps.
   Bryan has 24 stamps.
   George has 108 stamps.

Page 36

1. $n + (n + 25) + (n + 23) = 93$
   $3n + 48 = 93$
   $n = 15$
   Fred is 15 years old.
   Mom is 38 years old.
   Dad is 40 years old.
2. $3n + 220 = 310$
   $n = 30$
   The skateboard is $30.
   The scooter is $90.
   The bike is $190.
3. $9n + 6 = 3(n + 6)$
   $n = 2$
   Jimmy is 2 years old.
   Brother is 18 years old.
4. $n + (n - 5) + (n + 2) + (n + 8) = 53$
   $4n + 5 = 53$
   $n = 12$
   Jesse is 12 years old.
   Maybelle is 7 years old.
   Ellen is 14 years old.
   Jeanne is 20 years old.
5. $n + (n + 15) + (n - 10) + (n + 23) = 108$
   $4n + 28 = 108$
   $n = 20$
   Joseph had $20.00.
   Elsa had $35.00.

Julian had $10.00.
Martha had $43.00.
6. $n + 2n + 4n = 105$
   $7n = 105$
   $n = 15$
   Melissa had $15.00.
   Christina had $30.00.
   Charmain had $60.00.
7. $n + 3n + (3n - 10) = 74$
   $7n - 10 = 74$
   $n = 12$
   Kristin had $12.00.
   Matthew had $36.00.
   Joshua had $26.00.
8. $n + (n + 8) + 3n + (n - 5) = 63$
   $6n + 3 = 63$
   $n = 10$
   Andrew is 10 years old.
   Kenneth is 18 years old.
   Billy is 30 years old.
   Cameron is 5 years old.

Page 38

1. 4/7 or 4:7
   4/11 or 4:11
   7/4 or 7:4
   7/11 or 7:11
2. 5/8 or 5:8
   5/13 or 5:13
   8/5 or 8:5
   8/13 or 8:13
3. 6/7 or 6:7
   6/13 or 6:13
   7/6 or 7:6
   7/13 or 7:13
4. 60/1 or 60:1
5. 55/1 or 55:1
6. 16/1 or 16:1
7. 1,200/1 or 1,200:1
8. 24/1 or 24:1
9. 60/1 or 60:1
10. 365/1 or 365:1
11. 8/100 or 8:100

Page 39

1. $2:3 :: n:18$
   $n = 12$ blocks
2. $5:3 :: n:60$
   $n = 100$ pages
3. $5:7 :: n:630$
   $n = 450$ minutes
4. $14:3 :: n:90$
   $n = 420$ gallons
5. $170:4 :: n:240$
   $n = 10,200$ gallons
6. $20:3 :: 1000:n$
   $n = 150$ hours
7. $145:3 :: n:24$
   $n = 1,160$ lb.

Page 40

1. $55:1 :: n:7$
   $n = 385$ miles
2. $18:1 :: n:20$
   $n = 360$ miles
3. $60:1 :: n:5.5$
   $n = 330$ minutes
4. $24:1 :: n:13.5$
   $n = 324$ hours
5. $2,000,000:1 :: n:48$
   $n = 96,000,000$ tons
6. $2,980:n :: 40:1$
   $n = 74.5$ hr.
7. $100:9 :: n:40.5$
   $n = 450$ miles
8. $16:1 :: n:45$
   $n = 720$ oz.

Challenge: 86,400 sec.; 8,760 hr.

Page 41

1. 600 calories
2. 650 calories
3. 400 calories
4. 2,500 calories
5. handball and bicycling
6. 1,650 calories
7. bicycling and walking
8. 3-hr. walk
9. Answers will vary.
10. 8 states
11. 7 states
12. 12 states
13. 1 to 5 million

14. Answers will vary.
15. California has the most.
    Wyoming has the least.
16. Answers will vary.

Page 42

1. Friday
2. Thursday
3. 15° to 20°
4. Monday
5. Wednesday and Friday
6. Tuesday and Saturday
7. Monday, Saturday, and Sunday
8. 91.7° or 92°
9. 71.7° or 72°
10. Answers will vary.
11. water
12. nitrogen
13. 32%
14. other category
15. 47%
16. Answers will vary.

Page 43

1. $+2 - 12 = -10$
   You owe $10.00.
2. $32 - 40 = -8$
   8 below 0
3. $-4 + -11 + -6 = -21$
   21 below par
4. $-$1000 + $750 = 250
   $250 owed
5. $-600 + 200 + 100 + 150 = -150$
   He needed 150 points to get to 0.
6. $-69 + 35 = -34°$ F
7. $-129 - (+)136 = -265$
   265° difference
8. $-80 - (+)134 = -214$
   214° difference