5 ▷ How to ⬭ •••••••••••••• Solve Word Problems with Geometry

Facts to Know

Basic Geometric Formulas

Perimeter

- Perimeter is the length around a closed shape. It is computed by adding the length of all the sides of the figure.

- The formula for finding the perimeter of rectangles and other parallelograms is
$P = (l + w) \times 2$ or $P = 2\,l + 2\,w$

Area

The area of a flat surface is a measure of how much space is covered by that surface. Area is measured in square units.

- **Area of a Rectangle**

  The area of a rectangle is computed by multiplying the width of one side times the length of the adjoining side.
  $A = l \times w$

  The area of a rectangle can also be determined by multiplying the base times the height.
  $A = b \times h$

- **Area of a Triangle**

  A triangle is always one half of a rectangle or a parallelogram. The area of a triangle is computed by multiplying 1/2 of the base times the height of a triangle.
  $A = \frac{1}{2}\,b \times h$

- **Area of a Parallelogram**

  The area of a parallelogram is computed by multiplying the base times the height.
  $A = b \times h$

- **Area of a Circle**

  To find the area of a circle, multiply π (3.14) times the radius times the radius again.
  $A = \pi\,r^2$

Circumference

The circumference is the distance around a circle. To find the circumference of a circle, multiply π (which always equals 3.14) times the diameter or multiply 2 times π (3.14) times the radius.

$$C = \pi\,d \ \text{ or } \ C = 2\,\pi\,r$$

Volume

- The formula for finding the volume of a rectangular prism, such as a box, is to multiply the length times the width times the height. $V = l \times w \times h$

- The formula for finding the volume of a cylinder is to multiply π (3.14) times the radius squared times the height. $V = \pi \times r^2 \times h$

- Volume is always computed in cubic units. Use cubic inches or centimeters when determining volume for small prisms and cylinders, and cubic feet or meters for larger ones.

5 ►Practice • • • • • • • • • • • • • Solving Word Problems with Geometry

Geometry at Home

Geometry is a very important aspect of math around the home. Houses and property are measured in geometric terms. Floor and wall coverings, heating systems, and the water supply all have a geometric component.

For this practice page, you need to know the following:

- Wallpaper is sold in double rolls totaling 44 square feet.
- Carpeting is priced by the square yard.
- There are 9 square feet in 1 square yard.
- You cannot buy partial rolls of carpeting or wallpaper.

Directions: Use the formulas and information on page 21 and the information above to help you solve these word problems.

1. Your mother said you can have new carpeting in your room if you compute the amount of carpeting needed and the cost. The length of your room is $18\frac{1}{2}$ feet and the width is 17 feet. The cost of one medium grade of carpeting is $20.00 per square yard.

   A. Compute the number of square feet in the room: _____

   B. Convert square feet to square yards (divide by 9): _____

   C. Compute the cost of carpeting needed (multiply by $20.00): _____

2. You want to cover one wall of your room with neon-colored wallpaper that costs $25.00 for a double roll containing 44 square feet. The wall is $18\frac{1}{2}$ feet long and 10 feet high.

   A. Compute the area of your wall in square feet. _____

   B. Determine how many rolls of wallpaper you need: _____

   C. Compute the cost of the wallpaper: _____

3. Your friend decided to paint the walls and the ceiling of her room with a lovely lavender paint. One gallon of this paint will cover only 400 square feet and costs $17.99 a gallon. These are the dimensions of her room:

   - Wall 1—$21\frac{1}{4}$ feet long and $11\frac{1}{2}$ feet high
   - Wall 3—$21\frac{1}{4}$ feet long and $11\frac{1}{2}$ feet high
   - Wall 2—20 feet long and $11\frac{1}{2}$ feet high
   - Wall 4—20 feet long and $11\frac{1}{2}$ feet high
   - Ceiling—$21\frac{1}{4}$ feet long and 20 feet wide

   A. Compute the area of each wall and ceiling in square feet.

   Wall 1 _____ Wall 2 _____ Wall 3 _____ Wall 4 _____ Ceiling _____

   B. Compute the total area in square feet: _____

   C. Determine how many gallons of paint are needed: _____

   D. Compute the total cost of the paint: _____

Neighborhood Jobs

You need money to supplement your allowance. You decide to pick up some jobs at home and in the neighborhood so you can buy some necessities such as a scooter, a mountain bike, and a boom box.

Directions: Use the formulas and information on page 21 to help you solve these word problems.

1. Your dad agrees to pay you for mowing the front and back lawn. He will pay you $0.01 a square foot. The front lawn is 62 feet long and 38 feet wide.

   A. What is the square footage? _____

   B. How much will you be paid? _____

2. Your dad will pay you $0.03 a linear foot for trimming the edge of this lawn.

   A. What is the perimeter of the lawn? ____

   B. How much will you be paid? _____

3. The back lawn is shaped like a parallelogram. The base is 36 feet and the height is 31 feet.

   A. What is the square footage? _____

   B. How much will you be paid? _____

4. Your next-door neighbor offers to pay you the same price for edging and mowing his circular lawn which has a radius of 5.5 feet.

   A. What is the circumference of the lawn? _____

   B. How much will you be paid for edging? _____

   C. What is the area of the lawn in square feet? _____

   D. How much will you be paid for mowing it? _____

5. A neighbor down the street offers to pay you $0.15 a square foot to paint his fence which is 103 feet long and 6.25 feet high. He will supply the paint.

   A. What is the square footage? _____

   B. How much will you be paid? _____

6. Your favorite uncle offers to pay you $0.18 a square foot to paint his board fence. It is $8\frac{1}{2}$ feet high and 26 feet long.

   A. What is the square footage? _____

   B. How much will you be paid? _____

7. A neighboring mother wants you to paint a dodge ball court with a 6-foot radius on her driveway.

   A. What is the circumference of the court? _____

   B. What is the area in square feet of the court? _____

Extension

- Measure and compute the perimeter and area of your lawn.
- Measure and compute the perimeter and area of a neighbor's lawn.

Directions: Use the formulas and information on page 21 to help you solve these word problems.

1. You decide to start your own sidewalk business after school selling candy bars. The candy bars come packed in cartons which are 1 foot long, 1 foot wide, and 1 foot high (a cubic foot). How many of these cartons could you pack into your closet which is 5 feet long, 4 feet wide, and 12 feet high? _____

2. Your bedroom is 20 feet wide, $18\frac{1}{2}$ feet long, and 11 feet high. How many cubic feet of space are in your bedroom? _____

3. The circular top of your water heater has a radius of 9 inches. The height of the cylinder is 8 feet 5 inches. How many cubic inches of water will the water heater hold? _____

4. A can of cleanser has a radius of 4.5 cm and a height of 22.3 cm. How many cubic centimeters of cleanser will the can hold? _____

5. A closet in your parent's bedroom is $9\frac{1}{4}$ feet long, $3\frac{1}{3}$ feet wide, and 12 feet high. How many cubic feet of space does it have? _____

6. This is a diagram of the living room in a house. Compute the number of cubic feet in the room. (*Hint*: Do the problem in two sections.)_____

51 feet

$36\frac{1}{2}$ feet

The height of the ceiling is 10 feet.

$16\frac{1}{2}$ feet

28 feet
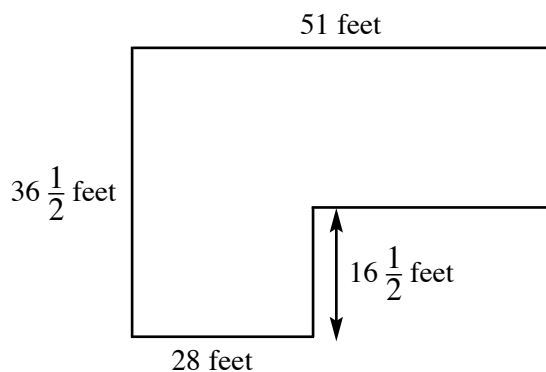
7. A city water tower is 83 feet high with a radius of 25 feet. How many cubic feet of water can be stored in the tower? _____

8. A cubic foot of water weighs 62.38 pounds. What is the weight of the water that can be stored in the water tower in problem #7? _____

9. One cubic foot of water equals 7.48 gallons. How many gallons of water can be stored in the water tower in problem #7? _____

10. How many cubic inches of water will fit into a hose which is 50 feet long and has a radius of $\frac{1}{2}$ inch? _____

11. One silo or elevator for storing grain has a radius of 15 feet and is 120 feet high. How many cubic feet of grain can be stored in it? _____

Page 6

1. change
   subtraction
   $2.12
2. money spent
   multiplication
   $36.64
3. split evenly
   division
   28 cards
4. amount needed
   subtraction
   $10.33
5. total cost
   addition
   $129.17
6. how much saved
   subtraction
   $2.21
7. total cost
   multiplication
   $41.58

Page 7

1. change
   subtraction
   $16.11
2. % discount
   multiplication
   $59.80
3. total cost
   addition
   $50.73
4. times as much
   multiplication
   $5,325
5. average
   division
   11.03 miles
6. total cost
   addition
   $1,342.97
7. times as much
   multiplication
   $350.10
8. total
   addition
   125.3 miles

Page 8

1. how much change
   subtraction
   $8.05

2. how much saved
   subtraction
   $6.95
3. product
   multiplication
   $113.85
4. how much left
   subtraction
   $25.41
5. split evenly
   division
   $1.59
6. share evenly
   division
   27 CDs
7. discount
   multiplication
   $3.19
8. difference
   subtraction
   $3.11

Page 10

1. addition
   $34.42
2. subtraction
   $2.55
3. subtraction
   $7.50
4. addition
   $40.47
5. subtraction
   $3.50
6. addition
   $78.41
7. addition
   Answers will vary.

Page 11

1. multiplication
   $45.00
2. division
   $3.75
3. multiplication
   $126.50
4. multiplication
   $99.80
5. multiplication
   $119.25
6. division
   $1.79
Challenge: $11.25; $8.75

Page 12

1. multiplication
   $22.68
2. addition
   $8.97
3. multiplication
   $59.67
4. addition
   $13.46
5. division
   $17.04
6. subtraction
   $2.70

Challenge:
   $70.20; 1 large
   cola, 1 Double Bean
   Burrito, 1 Tornado
   Taco; $0.39

Page 14

1. 1 1/2 miles
2. 5/12 miles
3. 2 2/3 miles
4. 1/3 mile
5. 1 1/6 miles
6. 8 miles
7. 1 1/4 miles
8. 4 5/18 miles
9. 1/2 mile
10. 26 2/3 miles

Extension: Answers will
vary.

Page 15

1. 3/4 pizza
2. 10 cups
3. 3 3/4 pizzas
4. 1 1/2 pizzas
5. 1/2 pizza
6. 1/10 cake
7. 15/16 cake
8. 14 cups
9. 5/8 pizza
10. 81 ounces
11. 338 ounces
12. 1 1/2 ounces

Extension: 4 2/3 pizzas

Page 16

1. 33 3/4 miles
2. 39/40 mile

3. 7/10 mile
4. 1/2 lb.
5. 14 2/3 miles
6. 9 lbs.
7. 4 5/3 miles
8. 1 13/40 sec.
9. 12 3/8 miles
10. 7 17/24 miles
Extension: Answers will
vary.

Page 18

1. $62.29; $237.71
2. $77.50; $160.21
3. $11.88; $148.33
4. $7.46; $29.82;
   $118.51
5. $57.94; $60.57
6. $10.00; $60.00;
   $0.57
7. $299.43
8. no

Page 19

1. 60%
2. 24 shots
3. 71% or 71.4%
4. 17 shots
5. 89% or 89.3%
6. 19 shots
7. 94% or 94.4%
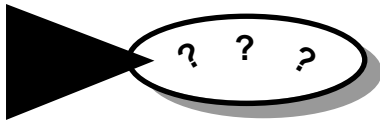8. 65% or 64.7%
9. 64% or 63.9%
10. 4 shots
Challenge: Answers will
vary.

Page 20

1. 0.625 gallons
2. 25.2 lbs.
3. 4.4 oz.
4. 43.2 lbs.
5. 2.4 qts.
6. 114.7 lbs.
7. 19.5 lbs.
8. 3.75 or 3 3/4 times
9. 56% or 55.6%
10. 41%

Page 22

1. A. 314.5 sq. ft.
   B. 34.9 or
       35 sq. yd.

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.