Name ______________________ Date __________ Class __________

LESSON 9-5

Practice C

Effects of Changing Dimensions Proportionally

Irene has learned how to solve problems about the effects of changing dimensions, but she is suspicious about math formulas until she has seen a proof. Complete Exercises 1–3 to assuage Irene's doubts. Use A_I to indicate the initial area and A_c to indicate the changed area.

1. Show that multiplying one dimension of a rectangle by n also multiplies the area by n^2.

2. Show that multiplying the base and the height of a triangle by n multiplies the area by n^2.

3. Show that multiplying the radius of a circle by n multiplies the area by n^2.

For Exercises 4–7, assume the resulting figure is similar to the original. Give answers in simplest radical form.

4. The area of a rectangle with length 8 m is divided by 3. Find the length of the resulting rectangle. ____________

5. The area of a circle with radius 9 ft is multiplied by $\frac{5}{2}$. Find the length of the radius of the resulting circle. ____________

6. The area of a square with diagonals $\sqrt{2}$ in. long is doubled. Find the length of a side of the resulting square. ____________

7. The area of a circle with a radius of $\sqrt{3}$ cm is squared. Find the length of the radius of the resulting circle. ____________

The volume of an object is the amount of three-dimensional space it occupies. The volume of a rectangular prism (a solid object shaped like a shoe box) can be found with the formula $V = \ell wh$, in which V is the volume, ℓ is the length, w is the width, and h is the height.

8. Describe the effect on the volume of multiplying the height of a rectangular prism by 5. ____________

9. Describe the effect on the volume of multiplying the length, the width, and the height of a rectangular prism by 2. ____________

10. The volume of a rectangular prism is divided by 343 without changing the ratios among the length, width, and height. Describe the effect of the volume change on the height. ____________

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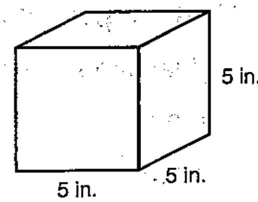
LESSON 9-5

Challenge

A "Reverse" Investigation of Area and Volume Ratios

Many real-life situations involving area and volume require you to perform a familiar process "in reverse" to achieve a desired result.



A manufacturer packages its product in a distinctive cubic package that has the dimensions shown at the right. The manufacturer wants to offer the product in a cubic package that has twice the volume.

1. **a.** What is the volume of the original package? ____________

   b. What is the volume of the new package? ____________

   c. Write the ratio $\frac{\text{volume of new package}}{\text{volume of original package}}$ in simplest form. ____________

2. **a.** What is the length of one edge of the original package? ____________

   b. What is the length of one edge of the new package? (*Hint:* When you multiply a number by itself three times, you are *cubing* the number. What is the inverse operation?) ____________

   c. Write the ratio $\frac{\text{length of edge of new package}}{\text{length of edge of original package}}$ in simplest form. ____________

3. **a.** What is the surface area of the original package? ____________

   b. What is the surface area of the new package? ____________

   c. Write the ratio $\frac{\text{surface area of new package}}{\text{surface area of original package}}$ in simplest form. ____________

Refer to the situation in Exercises 1–3. Suppose that the manufacturer wants to offer the product in a cubic package that has two-thirds the volume of the original. Write a ratio in simplest form to compare the given measure for the new package to the corresponding measure for the original package.

4. volume ____________ 5. length of an edge ____________ 6. surface area ____________

7. Complete this statement: Two cubes with volumes in the ratio $\frac{a}{b}$ have linear measures in

   the ratio ____________ and surface areas in the ratio ____________.

8. Refer to the statement in Exercise 7. Conduct an investigation to determine whether the statement is true when the word *cubes* is replaced by the phrase *similar solids*. Show your work on a separate sheet of paper.

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LESSON 9-5

Problem Solving

Effects of Changing Dimensions Proportionally

1. Mara has a photograph 5 inches by 7 inches. She wants to enlarge the photo so that the length and width are each tripled. Describe how the area of the photo will change.

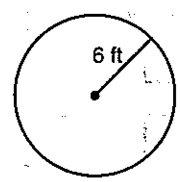
2. On a map, 1 inch = 2 miles. On the map, the area of a wildlife preserve is about 3 square inches. Estimate the actual area of the preserve in acres. (*Hint:* 1 square mile = 640 acres)

3. A triangle has vertices $N(3, 5)$, $P(7, 2)$, and $Q(3, 1)$. Point P is moved to be twice as far from $\overline{NQ}$ as in the original triangle. Describe the effect on the area.

4. The length of each base of a trapezoid is divided by 2. How does the area change?

Use the information below for Exercises 5 and 6.

Steven's dog is on a chain 6 feet long with one end of the chain attached to the ground as shown in the diagram. Steven replaces the chain with one that is $1\frac{1}{2}$ times as long.

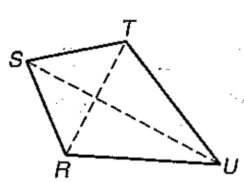


5. Describe how the circumference of the circle determined by the chain is changed.

6. Describe how the area of the circle determined by the chain is changed.

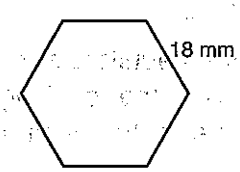
Choose the best answer.

7. In kite $RSTU$, $RT = 2.5$ centimeters and $SU = 4.3$ centimeters. Both diagonals of the kite are doubled. What happens to the area of the kite?



A The area is doubled.
B The area is tripled.
C The area is 4 times as great.
D The area is 8 times as great.

8. The side length of the regular hexagon is divided by 3. Which is a true statement?



F The perimeter is divided by 9, and the area is divided by 3.
G The perimeter is divided by 3, and the area is divided by 9.
H The perimeter and area are both divided by 3.
J The perimeter and area are both divided by 9.