Square Roots and Cube Roots

Name: _____

Prerequisite: Understand Solutions to Equations

Study the example problem showing how to write and solve an equation. Then solve problems 1–7.
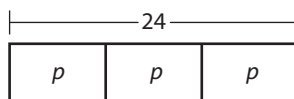
Example

Isabella has filled 3 album pages with photos. Each page has the same number of photos. Isabella has 24 photos. Write and solve an equation to find how many photos are on one album page.

Choose a variable to represent the number of photos on one page.
p

Write an expression to describe the total number of photos on the pages.
$3p$

Write an equation to compare the expression and the number of photos Isabella has.
$3p = 24$

Draw a bar model to represent the equation.

24		
p	p	p

You multiply 3 by 8 to get 24.

There are 8 photos on one album page.

1 What does the variable p represent in the example problem?

_____

_____

2 What is the solution to the equation $3p = 24$?

_____

3 Then Isabella filled 3 more pages with 36 photos which she evenly divided between the pages. Is the number of photos on one of those pages be more or less than the number in the example problem? Explain.

_____

_____

Vocabulary

equation a statement that tells you two expressions are equivalent.

$4 + 5 = 9$ $2b = 14$

Solve.

4 Alberto is saving money to buy a pair of shoes that cost
$58. He has already saved $32. He still needs to save
d dollars.

    a. Write an equation so that one side of the equation
        represents the cost of the shoes.

    _____

    b. Explain how to solve your equation to find how
        much more money Alberto needs to save. How
        much more does he need to save?

    _____

    _____

    _____

5 The bar model illustrates a division equation. What is the
equation? Explain how you know.

		s		
8	8	8	8	8

_____

_____
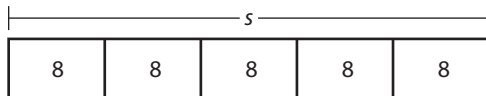
6 In the equation $10n = 120$, is $n = 10$? How do you know?

_____

_____

7 Write an equation that has a solution of 7, includes a
variable, and uses multiplication. Write a real-world
problem that you could represent with your equation.
Show how you know that 7 is the solution.

_____

_____

_____

Name: _____

Find Cube Roots

Study the example problem showing how to find a cube root. Then solve problems 1–8.

Example

Each edge of a cube is x centimeters long. The volume of the cube is 343 cm³. What is the length of each edge of the cube?

Use the formula for the volume of a cube.

$x^3 = V$ Write the formula.
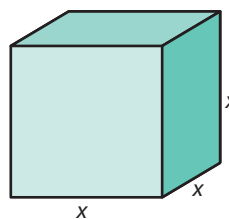
$x^3 = 343$ Substitute x for b and 343 for V.

$x = \sqrt[3]{343}$ Find the cube root of 343.

$x = 7$ Simplify.

Each edge of the cube is 7 centimeters long.

Volume $= 343$ cm³

1 What is the relationship of the volume of the cube to its edge length?

_____

2 What is the relationship of the edge length of the cube to its volume?

_____

_____

3 The volume of a cube is 8 ft³. What is the length of each edge of the cube?

_____

4 Explain the difference between a number that is a cube and a number that is a cube root.

_____

_____

_____

Vocabulary

cube root any number that is multiplied together three times to get the original number.

$$\sqrt[3]{8} = 2$$

2 is the cube root of 8.

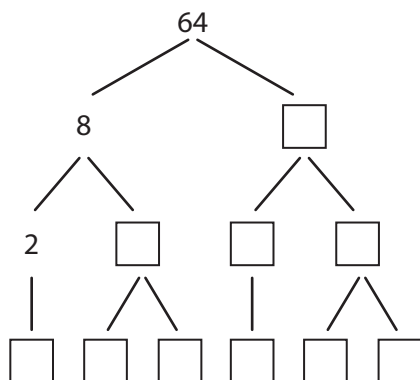**perfect cube** the product of an integer multiplied together three times.

$$3^3 = 27$$

27 is a perfect cube.

Solve.

5 You can use prime factorization to find a cube root.

    a. Complete the prime factorization of 64.

    b. Show the prime factors as 3 equal groups of 2 factors.

        (____ · ____) (____ · ____) (____ · ____)

    c. What is $\sqrt[3]{64}$? _____

6 Is 48 a perfect cube? Explain your reasoning.

_____

_____

7 Explain how a cube root is different from a square root.

_____

_____

8 The volume of Cube A is 216 cubic inches. The length of each edge in Cube B is 2 inches longer than the length of each edge in Cube A. How much greater is the volume of Cube B than the volume of Cube A?

Show your work.

Solution: _____

Name: _____

Solve Word Problems

Study the example problem showing how to use square roots and cube roots to solve word problems. Then solve problems 1–6.

Example

Markus walked halfway around a square park that has an area of 90,000 square meters. How many meters did Markus walk?

Use the formula for the area of a square to find the length of one side. Markus walked halfway around, so find the total length of two sides of the park to find the distance he walked.

$s^2 = A$ Write the formula.

$s^2 = 90{,}000$ Substitute 90,000 for A.

$s = \sqrt{90{,}000}$ Find the square root of 90,000.

$s = 300$ The length of each side is 300 m.

The length of 2 sides $= 300 \cdot 2 = 600$

Markus walked 600 meters.

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1 A smaller square park has an area of 3,600 square meters. What is the length of one side of the park?

_____

2 When completely full, a cube-shaped container will hold 8,000 cubic centimeters of water. What is the length of an edge of the container?

_____

3 A planter in the shape of a cube has a volume of 1,000 in.^{3}. Is the area of the base of the cube greater than or less than 1 square foot? Explain.

_____

_____

Solve.

4 The distance d in feet that a dropped object falls in t seconds is given by the equation $d \div 16 = t^2$. How long does it take a dropped object to fall 64 feet?

Show your work.

Solution: _____

5 The area of the top face of a small cube is 9 square centimeters. It takes 9 of these small cubes to make a larger cube. What is the volume of the larger cube?

Show your work.

Solution: _____

6 The diagram shows the dimensions of Taylor's deck. The area of the deck is 233 square feet. Taylor is going to put a railing along the longest edge. How many feet of railing will she need?

Show your work.

Solution: _____

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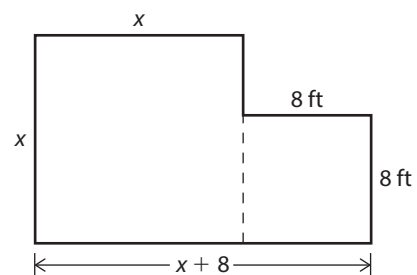
Square Roots and Cube Roots

Solve the problems.

1 The formula for the surface area of a cube is $S = 6x^2$, where x is the length of one side. Find the length of the side of a cube with a surface area of 150 square inches.

A 5 inches

C 30 inches

B 25 inches

D 900 inches

Jack chose **C** as the correct answer. How did he get that answer?

_____

_____

How do you find the value of x^2?

2 Choose *Yes* or *No* to tell whether the number is a perfect cube.

a. 27 ☐ Yes ☐ No

b. 100 ☐ Yes ☐ No

c. 125 ☐ Yes ☐ No

d. 1,000 ☐ Yes ☐ No

Remember that a perfect cube is the product of three equal factors.

3 The formula for the volume of a square pyramid is $V = (b^2h) \div 3$, where b is the length of one side of the square base and h is the height of the pyramid. Find the length of a side of the base of a square pyramid that has a height of 3 inches and a volume of 25 cubic inches.

Show your work.
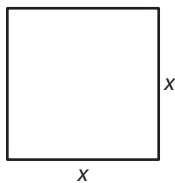
What is 3 ÷ 3?

Solution: _____

Solve.

4 The area of a square is a perfect square between 100 and 250 square centimeters. Which could be the area of the square? Select all that apply.

> Remember that a perfect square is the product of two equal factors.

    A   102 square centimeters

    B   121 square centimeters

    C   125 square centimeters

    D   144 square centimeters

    E   225 square centimeters

    F   240 square centimeters

5 The base of a cube is shown. The area of the base is $\frac{1}{4}$ ft². What is the volume of the cube?

> What is the square root of the numerator of $\frac{1}{4}$? What is the square root of the denominator?

x

x

Show your work.

Solution: _____