

Skill Check:

$$(-3x)^3$$

Scientific Notation cont:

**10-5
Scientific notation**

Vocabulary :

Scientific Notation

When it is represented as the product of a factor and a power of 10. The factor must be greater than or equal to 1 and less than 10

Example 1
Identifying numbers
written in Scientific
Notation

a.) 5.9×10^{-6}

b.) 0.9×10^8

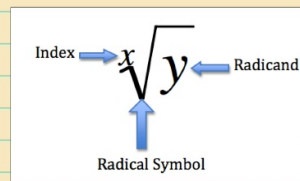
Example 2
Writing Numbers
in Standard Form

a.) Write 3.22×10^{-4} in
Standard form

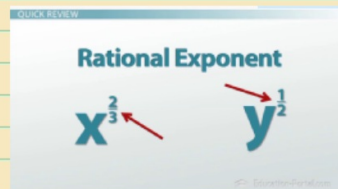
b.) Write 7.9×10^5 in
Standard form

6-2 Notes: Radicals and Rational exponents:

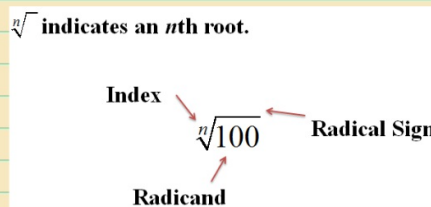
Radicals:



Rational Exponents:



n th root:



Example 1: Finding the n th root

Find the indicated real n th root(s) of a .

a. $n = 3, a = -27$

b. $n = 4, a = 16$

SOLUTION

- a. The index $n = 3$ is odd, so -27 has one real cube root. Because $(-3)^3 = -27$, the cube root of -27 is $\sqrt[3]{-27} = -3$, or $(-27)^{1/3} = -3$.
- b. The index $n = 4$ is even, and $a > 0$. So, 16 has two real fourth roots. Because $2^4 = 16$ and $(-2)^4 = 16$, the fourth roots of 16 are $\pm\sqrt[4]{16} = \pm 2$, or $\pm 16^{1/4} = \pm 2$.

Practice:

Find the indicated real n th root(s) of a .

1. $n = 3, a = -125$

2. $n = 6, a = 64$

Example 2 Evaluating nth root expressions

Evaluate each expression.

a. $\sqrt[3]{-8}$

b. $-\sqrt[3]{8}$

c. $16^{1/4}$

d. $(-16)^{1/4}$

SOLUTION

a. $\sqrt[3]{-8} = \sqrt[3]{(-2) \cdot (-2) \cdot (-2)}$
 $= -2$

Rewrite the expression showing factors.

Evaluate the cube root.

b. $-\sqrt[3]{8} = -(\sqrt[3]{2 \cdot 2 \cdot 2})$
 $= -(2)$
 $= -2$

Rewrite the expression showing factors.

Evaluate the cube root.

Simplify.

c. $16^{1/4} = \sqrt[4]{16}$
 $= \sqrt[4]{2 \cdot 2 \cdot 2 \cdot 2}$
 $= 2$

Rewrite the expression in radical form.

Rewrite the expression showing factors.

Evaluate the fourth root.

d. $(-16)^{1/4}$ is not a real number because there is no real number that can be multiplied by itself four times to produce -16 .

Skill Check:

Simplify

$$64^{1/3}$$

Volume = 113 cubic feet



EXAMPLE 4

Solving a Real-Life Problem

The radius r of a sphere is given by the equation $r = \left(\frac{3V}{4\pi}\right)^{1/3}$, where V is the volume of the sphere. Find the radius of the beach ball to the nearest foot. Use 3.14 for π .

SOLUTION

- 1. Understand the Problem** You know the equation that represents the radius of a sphere in terms of its volume. You are asked to find the radius for a given volume.
- 2. Make a Plan** Substitute the given volume into the equation. Then evaluate to find the radius.
- 3. Solve the Problem**

$$r = \left(\frac{3V}{4\pi}\right)^{1/3}$$

Write the equation.

$$= \left(\frac{3(113)}{4(3.14)}\right)^{1/3}$$

Substitute 113 for V and 3.14 for π .

$$= \left(\frac{339}{12.56}\right)^{1/3}$$

Multiply.

$$\approx 3$$

Use a calculator.

► The radius of the beach ball is about 3 feet.

- 4. Look Back** To check that your answer is reasonable, compare the size of the ball to the size of the woman pushing the ball. The ball appears to be slightly taller than the woman. The average height of a woman is between 5 and 6 feet. So, a radius of 3 feet, or height of 6 feet, seems reasonable for the beach ball.

EXAMPLE 5 Solving a Real-Life Problem

To calculate the annual inflation rate r (in decimal form) of an item that increases in value from P to F over a period of n years, you can use the equation $r = \left(\frac{F}{P}\right)^{1/n} - 1$.

Find the annual inflation rate to the nearest tenth of a percent of a house that increases in value from \$200,000 to \$235,000 over a period of 5 years.

SOLUTION

$$r = \left(\frac{F}{P}\right)^{1/n} - 1$$

Write the equation.

$$= \left(\frac{235,000}{200,000}\right)^{1/5} - 1$$


Substitute 235,000 for F , 200,000 for P , and 5 for n .

$$= 1.175^{1/5} - 1$$

Divide.

$$\approx 0.03278$$

Use a calculator.

>  The annual inflation rate is about 3.3%.