Looking Ahead

In the following example, you will find the square root of an expression that contains variables raised to exponents that are not all even.

Example Preview

Simplify the following radical expression.

$$\sqrt{14y^{14}z}$$

Solution

This expression can be simplified as follows.

$$\begin{aligned}\sqrt{14y^{14}z} &= \sqrt{14}\cdot\sqrt{y^{14}}\cdot\sqrt{z}\\ &= \sqrt{14}\cdot\sqrt{z}\cdot\left|y^7\right|\\ &= \sqrt{14}\cdot\left|y^7\right|\\ &= \left|y^7\right|\sqrt{14}\end{aligned}$$

3.R.4 Exercises

Concept Check

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

1. Any variable term with an exponent of 5 has a perfect cube factor within that variable term.

2. The simplest form of a radical expression can be found by using prime factorization.

3. If x is a real number, then $\sqrt{x^2} = x$.

4. The term $7b\sqrt[3]{6c^2}$ is in simplified form.

Practice

Simplify each of the following radical expressions. Assume that all variables represent positive real numbers.

5. $\sqrt{162}$

6. $\sqrt{\frac{32}{49}}$

7. $\sqrt{24x^{11}y^2}$

8. $\sqrt[3]{56}$

9. $\sqrt[3]{-8x^8}$

Applications

Use the following two formulas associated with electricity

$I = \sqrt{\frac{P}{R}}$ P = power (in watts)
I = current (in amperes)
E = voltage (in volts)
$E = \sqrt{PR}$ R = resistance (in ohms, Ω)

10. ***Electricity:*** What is the current in amperes of a light bulb that produces 150 watts of power and has a 25 Ω resistance?

11. ***Electricity:*** If a light bulb has a resistance of 30 Ω and produces 90 watts of power, what is its current in amperes?

Writing & Thinking

12. Under what conditions is the expression $\sqrt{a}$ not a real number?

13. Explain why the expression $\sqrt[3]{y}$ is a real number regardless of whether $y > 0,\ y < 0,$ or $y = 0.$