Section P.2 Exponents and Radicals

Objective: In this lesson you learned how to use properties of exponents and radicals to simplify and evaluate expressions.

Important Vocabulary

Exponential form
Scientific notation
Principal nth root

Define each term or concept.

I. Integer Exponents (Pages 12–13)

In general, if \( b \) is a real number and \( r \) is a positive integer, then

\[
 b^r = b \cdot b \cdot b \cdot \ldots \cdot b, \quad \text{where } r \text{ is the } \quad \quad \quad \text{and } b \text{ is the } \quad \quad \quad \\
\text{factors}
\]

What you should learn

How to use properties of exponents.

Complete the following properties of exponents.

\[
(\text{ab})^n = \quad \quad \quad \quad a^{m+n} = \quad \quad \quad \quad
\]

\[
\frac{1}{a^n} = \quad \quad \quad \quad |a^2| = \quad \quad \quad \quad
\]

\[
\frac{a^m}{a^n} = \quad \quad \quad \quad a^{m-n} = \quad \quad \quad \quad
\]

\[
a^0 = \quad \quad \quad \quad \left(\frac{a}{b}\right)^m = \quad \quad \quad \quad
\]

II. Scientific Notation (Page 14)

When a number is written in scientific notation, a _________ exponent indicates that the number is between 0 and 1.

A _________ exponent indicates that the number is 10 or more.

What you should learn

How to use scientific notation to represent real numbers.

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Example 1:  (a) Write 970,000 in scientific notation.  
(b) Write $8.3 \times 10^{-4}$ in decimal form.

III. Radicals and Their Properties (Pages 15–16)  
Let $a$ and $b$ be real numbers. If $a = b^2$, then $b$ is the \underline{\text{square root}} of $a$. If $a = b^3$, then $b$ is the \underline{\text{cube root}} of $a$.

In $\sqrt[n]{a}$, the positive integer $n$ is the \underline{\text{index}} of the radical, and the number $a$ is the \underline{\text{radicand}}.

The radical expression $\sqrt{-36}$ is not a real number because . . .

Example 2:  Simplify each radical expression.  
(a) $-\frac{81}{\sqrt{16}}$  
(b) $\sqrt[3]{3} \cdot \sqrt[3]{9}$

IV. Simplifying Radicals (Pages 17–18)  
An expression involving radicals is in \textbf{simplest form} when the following conditions are satisfied:
1)  
2)  
3)  
Radical expressions are \textbf{like radicals} if . . .

Example 3:  Explain how to simplify a radical.
V. Rationalizing Denominators and Numerators
(Pages 18–19)

To change a radical expression so that it is free of radicals in the
denominator is called _______________________.

The conjugate of the radical expression \( a + b\sqrt{m} \) is

___________________.

What type of rationalizing factor should be used if a denominator
is of the form:

(a) \( \sqrt{m} \) ? ________________________________

(b) \( m^{3/2} \) ? ________________________________

Example 4: Explain how to rationalize the denominator of the
expression \( \frac{4 + \sqrt{13}}{5 - \sqrt{8}} \).

VI. Rational Exponents (Pages 19–20)

If \( a \) is a real number and \( n \) is a positive integer such that the
principle \( n \)th root of \( a \) exists, then \( a^{1/n} = \sqrt[n]{a} \), where \( 1/n \) is the
_______________________.

The numerator of a rational exponent denotes the _________ to
which the base is raised, and the denominator denotes the
__________ or the _________ to be taken.

Example 5: Write the radical expression \( \sqrt[4]{w^5} \) in exponential
form.

Example 6: Explain how to simplify the expression \( \frac{\sqrt[3]{x^{3/4}}}{\sqrt[2]{x^{2/3}}} \).
Additional notes

Homework Assignment

Page(s)

Exercises