Name Answer Key Date

# Radical! Because It's Cliché!
## Properties of Rational Exponents

### Vocabulary

Match each definition to its corresponding term.

1. the number $a$ in the expression $\sqrt[n]{a}$
   D radicand
2. the number $b$ when $b^3 = a$
   A cube root
3. the exponent $\frac{1}{n}$ in the expression $a^{\frac{1}{n}}$
   E rational exponent
4. the number $n$ in the expression $\sqrt[n]{a}$
   B index
5. the number $b$ when $b^n = a$
   C $n$th root

A cube root

B index

C $n$th root

D radicand

E rational exponent

### Problem Set

Write each expression as a single power.

1. $\frac{10^5}{10^8}$

   $\frac{10^5}{10^8} = 10^{5-8} = 10^{-3} = \frac{1}{10^3} = \frac{1}{1000}$

2. $\frac{10^0}{10^4}$

   $\frac{10^0}{10^4} = 10^{0-4} = 10^{-4} = \frac{1}{10^4} = \frac{1}{10000}$

3. $\frac{10^2}{10^5}$

   $\frac{10^2}{10^5} = 10^{2-5} = 10^{-3} = \frac{1}{10^3} = \frac{1}{1000}$

4. $\frac{x^4}{x^9}$

   $\frac{x^4}{x^9} = x^{4-9} = x^{-5} = \frac{1}{x^5}$

5. $\frac{5^3}{5^{10}}$

   $\frac{5^3}{5^{10}} = 5^{3-10} = 5^{-7} = \frac{1}{5^7} = \frac{1}{78125}$

6. $\frac{y^2}{y^8}$

   $\frac{y^2}{y^8} = y^{2-8} = y^{-6} = \frac{1}{y^6}$

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Evaluate each expression.

**7.** $\sqrt[3]{216}$ =
$\sqrt[3]{216} = 6$

**8.** $\sqrt[3]{64}$ =
$\sqrt[3]{64} = 4$

**9.** $\sqrt[3]{-125}$ =
$\sqrt[3]{-125} = -5$

**10.** $\sqrt[3]{-343}$ =
$\sqrt[3]{-343} = -7$

**11.** $\sqrt[3]{729}$ =
$\sqrt[3]{729} = 9$

**12.** $\sqrt[3]{-8}$ =
$\sqrt[3]{-8} = -2$

Evaluate each expression.

**13.** $\sqrt[5]{32}$ =
$\sqrt[5]{32} = 2$

**14.** $\sqrt[4]{625}$ =
$\sqrt[4]{625} = 5$

**15.** $\sqrt[6]{729}$ =
$\sqrt[6]{729} = 3$

**16.** $\sqrt[5]{-1024}$ =
$\sqrt[5]{-1024} = -4$

**17.** $\sqrt[7]{-128}$ =
$\sqrt[7]{-128} = -2$

**18.** $\sqrt[5]{-243}$ =
$\sqrt[5]{-243} = -3$

Write each radical as a power.

**19.** $\sqrt[4]{15}$
$\sqrt[4]{15} = 15^{\frac{1}{4}}$

**20.** $\sqrt[3]{5}$
$\sqrt[3]{5} = 5^{\frac{1}{3}}$

**21.** $\sqrt[4]{31}$
$\sqrt[4]{31} = 31^{\frac{1}{4}}$

**22.** $\sqrt[3]{x}$
$\sqrt[3]{x} = x^{\frac{1}{3}}$

**23.** $\sqrt[6]{y}$
$\sqrt[6]{y} = y^{\frac{1}{6}}$

**24.** $\sqrt{z}$
$\sqrt{z} = z^{\frac{1}{2}}$

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Write each power as a radical.

**25.** $12^{\frac{1}{3}}$

$12^{\frac{1}{3}} = \sqrt[3]{12}$

**26.** $7^{\frac{1}{5}}$

$7^{\frac{1}{5}} = \sqrt[5]{7}$

**27.** $18^{\frac{1}{4}}$

$18^{\frac{1}{4}} = \sqrt[4]{18}$

**28.** $a^{\frac{1}{2}}$

$a^{\frac{1}{2}} = \sqrt{a}$

**29.** $d^{\frac{1}{5}}$

$d^{\frac{1}{5}} = \sqrt[5]{d}$

**30.** $c^{\frac{1}{6}}$

$c^{\frac{1}{6}} = \sqrt[6]{c}$

Write each expression in radical form.

**31.** $5^{\frac{2}{3}}$

$5^{\frac{2}{3}} = \sqrt[3]{5^2}$

**32.** $8^{\frac{2}{5}}$

$8^{\frac{2}{5}} = \sqrt[5]{8^2}$

**33.** $18^{\frac{3}{4}}$

$18^{\frac{3}{4}} = \sqrt[4]{18^3}$

**34.** $x^{\frac{3}{5}}$

$x^{\frac{3}{5}} = \sqrt[5]{x^3}$

**35.** $y^{\frac{4}{3}}$

$y^{\frac{4}{3}} = \sqrt[3]{y^4}$

**36.** $m^{\frac{5}{2}}$

$m^{\frac{5}{2}} = \sqrt{m^5}$

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Write each expression in rational exponent form.

**37.** $\sqrt[4]{6^3}$

$\sqrt[4]{6^3} = 6^{\frac{3}{4}}$

**38.** $\sqrt[5]{8^4}$

$\sqrt[5]{8^4} = 8^{\frac{4}{5}}$

**39.** $\sqrt[3]{12^2}$

$\sqrt[3]{12^2} = 12^{\frac{2}{3}}$

**40.** $\sqrt{n^5}$

$\sqrt{n^5} = n^{\frac{5}{2}}$

**41.** $\sqrt[4]{p^7}$

$\sqrt[4]{p^7} = p^{\frac{7}{4}}$

**42.** $\sqrt[5]{m^3}$

$\sqrt[5]{m^3} = m^{\frac{3}{5}}$

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