# Warm-Up

1) (2i)(-4i)(9i)

2) $\sqrt[3]{128x^5y^6}$

3) $\left(28x^4y^7\right)^{\frac{1}{2}}$

## Objectives

- Rewrite and Evaluate expressions with rational exponents
  - By Hand
  - On the Calculator
- Simplify powers of i

## Agenda

- Essential Concept Review
- Rational Exponents Notes/Examples
- Powers of i discovery
- Go over Quizzes
- Lesson Check

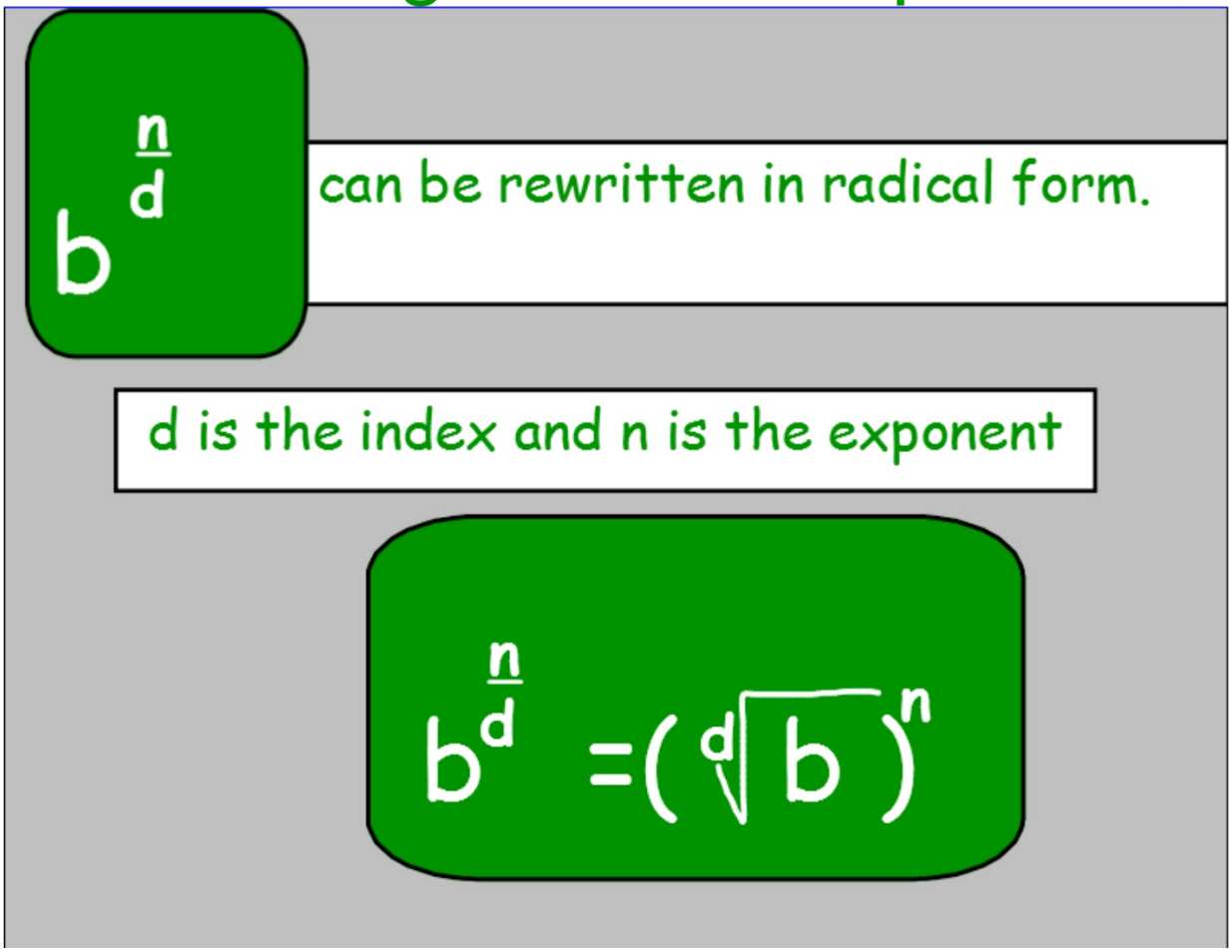
# Essential Concepts!

1) $(3x^2 - 5x) - (8x^2 + 4x)$

2) $(3x^2 - 5x)(8x^2 + 4x)$

3) $\left(3\sqrt{12}\right)^2$

# Rewriting Rational Exponents



# Let's Switch Forms...

| | | |
|---|---|---|
| 1) $x^{\frac{3}{2}}$ | 2) $50^{\frac{1}{4}}$ | 3) $32^{\frac{1}{2}}$ |
| 4) $x^{\frac{-4}{5}}$ | 5) $25^{\frac{3}{2}}$ | 6) $8^{\frac{-2}{3}} = \sqrt[3]{\frac{1}{8^2}}$ $\sqrt[3]{8^{-2}}$ $\sqrt[3]{\frac{1}{64}}$ $\frac{\sqrt[3]{1}}{\sqrt[3]{64}}$ $\frac{1}{4}$ |

Exponents ---> Radicals

## Now the other way!!!

| | | |
|---|---|---|
| 1) $(\sqrt[3]{x})^5$ <br> $x^{\frac{5}{3}}$ | 2) $\sqrt[3]{100}$ <br> $100^{1/3}$ | 3) $(\sqrt[4]{5})^3$ <br> $5^{\frac{3}{4}}$ |
| 4) $\sqrt{7}$ <br> $7^{1/2}$ | 5) $\sqrt[3]{23^2}$ <br> $23^{\frac{2}{3}}$ | 6) $(\sqrt[5]{x})^2$ <br> $x^{\frac{2}{5}}$ |

## Radicals ---> Exponents

# Evaluating nth Roots without a Calculator

**Ex 1:**

$$9^{\frac{3}{2}}$$

$$\left(\sqrt{9}\right)^3$$

$$(3)^3$$

$$\boxed{27}$$

**Ex 2:**

$$81^{\frac{1}{4}}$$

$$\sqrt[4]{81}$$

$$\boxed{3}$$

**Ex 3:**

$$32^{\frac{1}{2}}$$

$$\sqrt{32}$$

$$\sqrt{16}\sqrt{2}$$

$$4\sqrt{2}$$

# Evaluating nth Roots without a Calculator

**Ex 4:**

$$16^{\frac{3}{4}}$$

$$\left(\sqrt[4]{16}\right)^3$$

$$(2)^3$$

$$\boxed{8}$$

**Ex 5:**

$$27^{-\frac{4}{3}}$$

$$\left(\sqrt[3]{27}\right)^{-4}$$

$$(3)^{-4}$$

$$\frac{1}{3^4}$$

$$\boxed{\frac{1}{81}}$$

**Ex 6:**

$$64^{-\frac{2}{3}}$$

$$\left(\sqrt[3]{64}\right)^{-2}$$

$$(4)^{-2}$$

$$\frac{1}{4^2}$$

$$\boxed{\frac{1}{16}}$$

# Evaluating nth Roots without a Calculator

**Ex 7:**

$$\left(\sqrt[3]{-8}\right)^4$$

$-2 \cdot -2 \cdot -2$

$(-2)^4$

$16$

**Ex 8:**

$$12^{\frac{3}{2}}$$

$(\sqrt{12})^3$

$\sqrt{4}\sqrt{3}$

$(2\sqrt{3})^3$

$8\sqrt{27}$

$\neq$

**Ex 9:** Change

$$64^{-\frac{2}{3}}$$

$(\sqrt[3]{64})^{-2}$

$(4)^{-2}$

$\frac{1}{16}$

$8\sqrt{9}\sqrt{3}$

$24\sqrt{3}$

# Evaluating nth Roots WITH a Calculator

1. Change to rational exponent form
2. Type in calculator with base and exponent in ***parentheses***
3. Round to requested approximation

**You can only use this if you are asked to APPROXIMATE your answer!!! For simplified or exact answers you must evaluate WITHOUT a calc!!!

# Evaluating nth Roots WITH a Calculator

**Ex 1:**

$\sqrt[5]{7776}$

**Ex 2:**

$\left(\sqrt[6]{4096}\right)^4$

256

**Ex 3:**

$\left(\frac{2}{5}\right)^{\frac{3}{2}}$

0.25

(2/5)^(3/2)

# Simplifying Powers of i

$i^3 =$

$i^{51} =$

$i^4 =$

$i^{24} =$

$i^{22} =$

$i^{37} =$

# Simplifying Powers of i

$i^1 =$ $i^2 =$ $i^3 =$ $i^4 =$

- Find the closest multiple of 4 that is less than the exponent
- Split up the exponent using that number
- Every Multiple of 4 equals 1
- Simplify remaining exponent

# Wrap-up

- Why are rational exponents needed?
- What is the relationship between radicals and rational exponents?
- How do we simplify powers of i?
- When is the **only** time you FOIL?

$$\sqrt{18} + \sqrt{18}$$

# Reducing Rational Expressions

$$\frac{2-7i}{1+i}$$