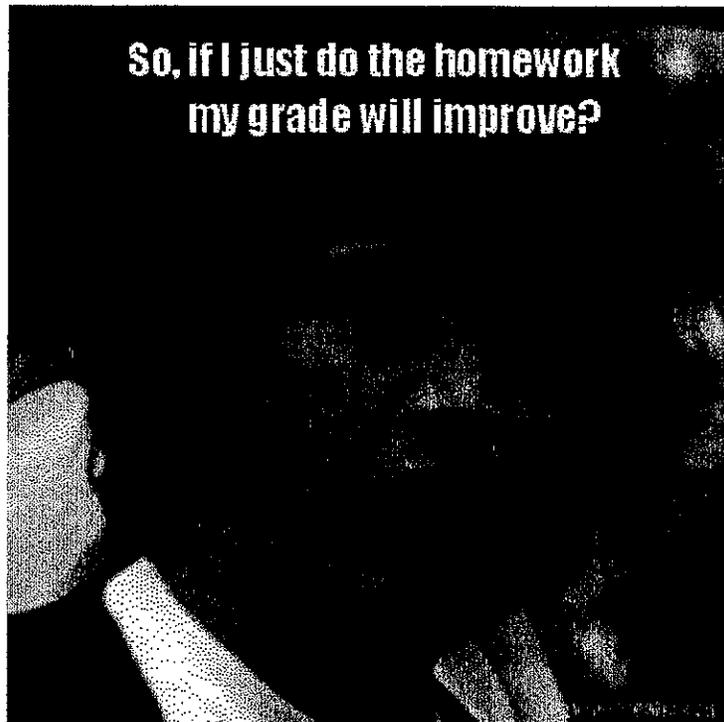


Name: KEY!

Hour: \_\_\_\_\_

# Chapter 8: Radicals



## Lesson 8-4: Radical Form

### Vocabulary

Radical: " $\sqrt{\quad}$ ", finding the root of a number

Review...

$$x^{1/2} = \sqrt{x} \leftarrow \text{square root of } x$$

$$x^{1/3} = \sqrt[3]{x} \leftarrow \text{cube root of } x$$

$$x^{1/5} = \sqrt[5]{x} \leftarrow \text{5th root of } x$$

$n$ th root of  $x$ : for any non-negative real  $\#$   $x$  and any integer  $n \geq 2$ ,  $\sqrt[n]{x} = x^{1/n}$

So...what about this?  $x^{4/3} = (x^{1/3})^4 = (\sqrt[3]{x})^4 \rightarrow \sqrt[3]{x^4}$

Root of a Power Theorem: for any non-negative real  $\#$   $x$  & any integer  $n \geq 2$ ,  $\sqrt[n]{x^m} = (\sqrt[n]{x})^m = x^{m/n}$

### Practice

Evaluate without a calculator.

$$1. \sqrt[5]{32} = 32^{1/5} \\ = \boxed{2}$$

$$2. \sqrt[3]{125} = 125^{1/3} \\ = 5$$

Estimate to the nearest hundredth. \* Use a calculator! \*

$$3. \sqrt[5]{4829} = 4829^{1/5} \\ \boxed{5.45} \leftarrow$$

$$4. \sqrt{15} = 15^{1/2} \\ \boxed{3.87} \leftarrow$$

$$5. \sqrt[4]{2401} = 2401^{1/4} \\ \boxed{7} \leftarrow$$

Simplify.

$$6. \quad \sqrt[4]{x^8} = x^{8/4}$$

$$= \boxed{x^2}$$

$$7. \quad \sqrt[3]{y^{18}} = y^{18/3}$$

$$= \boxed{y^6}$$

Rewrite each radical as a rational exponent.

$$8. \quad \sqrt[6]{\sqrt{x}} = (x^{1/2})^{1/6}$$

$$= x^{1/12}$$

$$= \boxed{\sqrt[12]{x}}$$

$$9. \quad \sqrt[5]{\sqrt[3]{x^9}}$$

$$= \left( (x^9)^{1/3} \right)^{1/2}^{1/5}$$

$$= x^{9/30}$$

$$= x^{3/10}$$

$$= \boxed{\sqrt[10]{x^3}}$$

## Lesson 8-7: Radicals w/ Negatives

### Vocabulary

nth root of a negative number: When x is negative & n is an odd integer > 2,  $\sqrt[n]{x}$  stands for the real nth root of x.

- A root is always "defined" (has an answer) if x is positive.
- ★ • If x is negative, it is only "defined" if n is odd.
- If x is negative and n is odd, then the answer will be negative.
- Exception: we can take the square root of a negative number, however the answer is not real, it is imaginary (i).

### What's the Difference???

$$\begin{aligned} & \sqrt[3]{-5^6} \\ & = \sqrt[3]{-15,625} = \boxed{-25} \end{aligned}$$

vs.

$$\begin{aligned} & \sqrt[3]{(-5)^6} \\ & = \sqrt[3]{15,625} = \boxed{25} \end{aligned}$$

### Practice

Evaluate.

1. a.  $\sqrt[5]{(-2)^5}$   
 $\sqrt[5]{-32} = \boxed{-2}$

b.  $\sqrt[8]{(-2)^8} = \sqrt[8]{256}$   
 $= \boxed{2}$

Simplifying Radicals: finding groups of factors & pulling them out of the radical. The # of groups depends on the root!

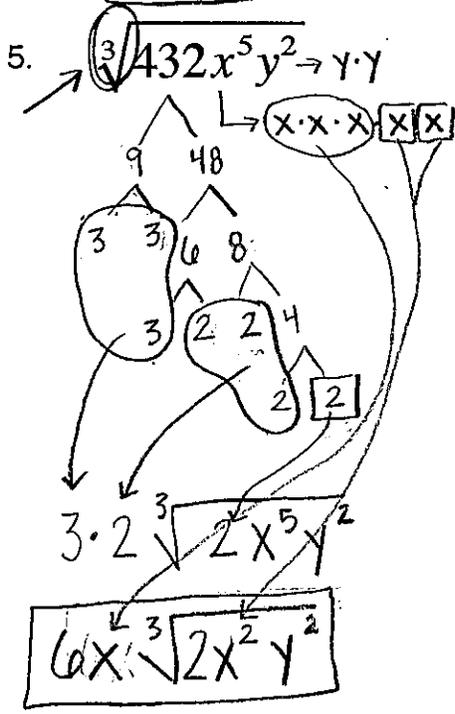
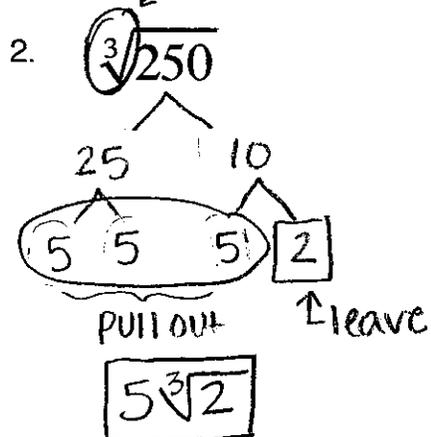
Example:  $\sqrt{12}$  \* can't be done w/ a calculator - no decimals for an answer!

Square root:  
 groups of 2!

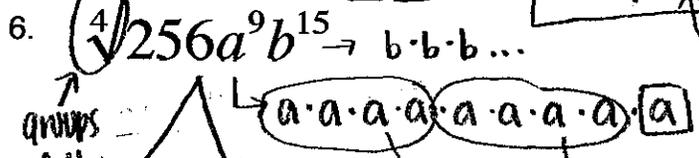
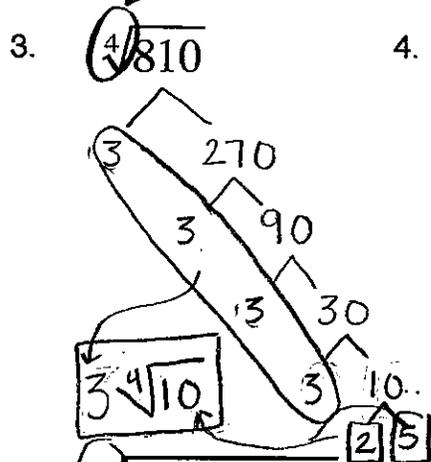
pull out the 2 & leave 3 inside

$$= \boxed{2\sqrt{3}}$$

Simplify. ← groups of 3



← groups of 4



groups of 5

