Algebra 1
Unit 1, Lesson 3: Simplifying Radicals
NOTES

Name Key Block______ Date___________

Essential Question: How do I simplify radical numbers?

I. Finding the Square Root(s) of a Number

- Vocabulary:

<table>
<tr>
<td>Square Root A value that, when x by itself gives the number.
ex. $\sqrt{16}=4$ b/c $\underbrace{4\times4}_{\text{same \#}}=16$</td>
<td>Radicand/Index/Radical
index ← radical sign
$\sqrt[4]{92}$ ← radicand</td>
</tr>
<tr>
<td>Perfect Square

$1^2 =$ 1 | $2^2 =$ 4 | $3^2 =$ 9
$4^2 =$ 16 | $5^2 =$ 25 | $6^2 =$ 36
$7^2 =$ 49 | $8^2 =$ 64 | $9^2 =$ 81
$10^2 =$ 100 | $11^2 =$ 121 | $12^2 =$ 144</td>
<td>Irrational Number
A # that cannot be written as a fraction using integers. In decimal form, it goes on forever & doesn't repeat or end.
ex. $\sqrt{17}$, $\sqrt{3}$, π</td>
</tr>
</table>

Example: Evaluate the expression.

- 1) $\sqrt{36}$ 2) $-\sqrt{9}$ 3) $\sqrt{81}$ 4) $-\sqrt{49}$

6 -3 9 -7

* These are the principal square roots (the non-negative ~~square roots~~ of a real #)
ex. $\sqrt{36}$ could actually be 6 or -6 since $6^2=36$ & $(-6)^2=36$

Example: Sometimes the radicand is not a perfect square. This is an irrational number. You could either use your calculator for a decimal approximation or use your perfect squares chart for an approximation.

1) $\sqrt{32}$ 2) $\sqrt{103}$ 3) $-\sqrt{48}$ 4) $\sqrt{23}$

≈ 6 ≈ 10 ≈ -7 ≈ 5

- * STOP & watch video on Edpuzzle

How can I simplify a square root that's not a perfect square?

Method 1 – Prime Factorization	Method 2 – find factors that are perfect squares
$\sqrt{40}$ 4 10 $\boxed{2\ 2}$ 2 5 $2\sqrt{2\cdot 5}$ $2\sqrt{10}$	$\sqrt{40} = \sqrt{4\cdot 10} = \sqrt{4}\cdot\sqrt{10} = 2\sqrt{10}$
$\sqrt{72}$ 9 8 $\boxed{3\ 3}$ 2 4 $\boxed{2\ 2}$ $2\cdot 3\sqrt{2}$ $6\sqrt{2}$	$\sqrt{72} = \sqrt{9\cdot 8} = \sqrt{9\cdot 4\cdot 2} =$ $\sqrt{9}\cdot\sqrt{4}\cdot\sqrt{2} = 3\cdot 2\cdot\sqrt{2} =$ $6\sqrt{2}$

Examples: Simplify each square root.

Stopped here

1) $\sqrt{72}$ — $6\sqrt{2}$

2) $\sqrt{20}$ — $2\sqrt{5}$

3) $\sqrt{300}$ — $10\sqrt{3}$

4) $\sqrt{90}$ — $3\sqrt{10}$

Let's think about radicals that aren't square roots. How about cube roots? Radicals with an index of 4? 5? Can we use the same methods that we just used? If not, how can we amend them?

Prime factorization Method: whatever the index is is the # of primes you need in a set

Method 2 → you need to look for perfect cubes, 4's, 5's... whatever the index is.

Examples: Simplify each radical.

1) $\sqrt[3]{80}$
8 10
2 4 2 5
2 2
$2\sqrt[3]{10}$

2) $\sqrt[3]{54}$
9 6
$\boxed{3\ 3\ 3}$ 2
$3\sqrt[3]{2}$

3) $\sqrt[4]{48}$
4 12
2 2 2 6
2 3
$2\sqrt[4]{3}$

4) $\sqrt[4]{162}$
3 54
6 9
2 3 3 3
$3\sqrt[4]{2}$