3- ma11 mixed and entire radicals.docx

Friday, September 27, 2019 12:26 PM

1.3 MIXED AND ENTIRE RADICALS Name: ___________________________ Blk: _________

Recall:

Perfect Squares - 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144....

Perfect Cubes- 1, 8, 27, 64, 125, 216.....

What is an Entire Radical?

A radical sign with a number under it
ex. $\sqrt{28}$, $\sqrt[3]{64}$

What is a Mixed Radical? A number written as a product of a number and a radical
ex. $3\sqrt{5}$, $4\sqrt[5]{10}$

Equivalent Forms:

a) $\sqrt{16 \cdot 9}$ is equivalent to $\sqrt{16} \cdot \sqrt{9}$ because:

$\sqrt{144} = 4 \cdot 3$

$12 = 12$

b) $\sqrt[3]{8 \cdot 27}$ is equivalent to $\sqrt[3]{8} \cdot \sqrt[3]{27}$ because:

$\sqrt[3]{216} = 2 \cdot 3$

$6 = 6$

This leads us to....

MULTIPLICATION PROPERTY OF RADICALS
$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$, where *n* is a natural number, and *a* and *b* are real numbers

***WE can use this property to simplify square roots and cube roots and more, that are *not* perfect squares or perfect cubes, etc. but have *factors* that are perfect squares or perfect cubes.**

1) Writing an Entire Radical as a Mixed Radical using perfect squares or cubes

1, 2, 3, 4, ...

- We can simplify $\sqrt{24}$ because 24 has a perfect square factor 4
  - Re-write $\sqrt{24}$ as a product of two factors, with the first one being the perfect square:

entire $\sqrt{24} = \sqrt{4 \cdot 6}$

$= \sqrt{4} \cdot \sqrt{6}$

$= \boxed{2\sqrt{6}}$

mixed radical (simplify)

Now simplify $\sqrt{4} = 2$!

- We can also simplify $\sqrt[3]{24}$ because 24 has a perfect cube factor of 8
  - Re-write $\sqrt[3]{24}$ as a product of two factors, with the first one being the perfect cube:

$\sqrt[3]{24} = \sqrt[3]{8} \cdot \sqrt[3]{3}$
$= \boxed{2\sqrt[3]{3}}$

Example 1) Simplify the following radicals- Write each entire radical as a mixed radical.

a) $\sqrt{63}$
$= \sqrt{9} \cdot \sqrt{7}$
$= \boxed{3\sqrt{7}}$

b) $-\sqrt[3]{80}$
$= -\sqrt[3]{8} \cdot \sqrt[3]{10}$
$= \boxed{-2\sqrt[3]{10}}$

c) $\sqrt[3]{72}$
$= \sqrt[3]{8} \cdot \sqrt[3]{9}$
$= \boxed{2\sqrt[3]{9}}$

d) $-\sqrt[5]{128}$
$= -\sqrt[5]{32} \cdot \sqrt[5]{4}$
$= \boxed{-2\sqrt[5]{4}}$

Example 2) Simplify using prime factors…

a) $\sqrt{45}$

-Rewrite the radical with the prime factorization

-Since we have a square root, look for a factor that appears 2 times!

$= \sqrt{9 \cdot 5}$
$= \sqrt{3 \cdot 3 \cdot 5}$ ← 3 appears twice!
$= \sqrt{3^2} \cdot \sqrt{5}$
$= \boxed{3\sqrt{5}}$

b) $-\sqrt{35}$
$= -\sqrt{5 \cdot 7}$ no perfect squares.
$= -\sqrt{35}$

b) $\sqrt[4]{48}$
$= \sqrt[4]{8 \cdot 6}$
$= \sqrt[4]{4 \cdot 2 \cdot 2 \cdot 3}$
$= \sqrt[4]{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3}$
$= \sqrt[4]{2^4} \cdot \sqrt[4]{3}$
$= \boxed{2\sqrt[4]{3}}$

c) $\sqrt[3]{54}$
$= 3\sqrt[3]{2}$

2) Writing Mixed Radicals as Entire Radicals

- Use the multiplication property of radicals
- Combine these under the same radical sign and multiply

Example 3 Write each as an entire radical:

a) $4\sqrt{3}$

$= 4 \cdot \sqrt{3}$ $\quad 4 = \sqrt{?}$

$= \sqrt{16} \cdot \sqrt{3}$ $\quad$ 16!

$= \sqrt{16 \cdot 3}$

$= \boxed{\sqrt{48}}$

b) $-6\sqrt{5}$ $\quad 6 = \sqrt{?}$

$= -\sqrt{36} \cdot \sqrt{5}$ $\quad$ 36!

$= \boxed{-\sqrt{180}}$

c) $3\sqrt[3]{2}$

$= \sqrt{3 \times 3 \times 3} \cdot \sqrt[3]{2}$

$= \sqrt[3]{27} \cdot \sqrt[3]{2}$

$= \boxed{\sqrt[3]{54}}$

d) $2\sqrt[4]{5}$

$= \sqrt[4]{2 \times 2 \times 2 \times 2} \cdot \sqrt[4]{5}$

$= \sqrt[4]{16} \cdot \sqrt[4]{5}$

$\boxed{= \sqrt[4]{80}}$

Assignment: $\boxed{\text{p.26-30}}$

Quiz Thursday Oct.3
- section 1.1-1.3