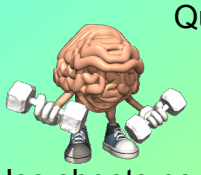
Quiz Tuesday Feb. 14



Warm Up

Use sheets no calculators

Review :

a) $\sqrt[3]{\frac{27}{125}} = \frac{\sqrt[3]{27}}{\sqrt[3]{125}} = \frac{3}{5}$

b) $\sqrt[5]{7776} = 6$

c) $\sqrt[3]{0.125} = \frac{\sqrt[3]{125}}{\sqrt[3]{1000}} = \frac{5}{10} = \frac{1}{2} = 0.5$

d) $\sqrt{2.25} = \frac{\sqrt{225}}{\sqrt{100}} = \frac{15}{10} = 1.5$

2. Order the following radicals from least to greatest (Show work)

$\sqrt{40}, \quad \sqrt{98}, \quad \sqrt[3]{98}, \quad \sqrt{75}, \quad \sqrt[3]{300}$

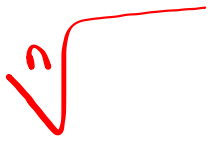
$\sqrt{36} = 6, \quad \sqrt{49}, \quad \approx 6.3$

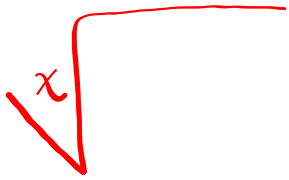
$\sqrt{81}, \quad \sqrt{100} = 10, \quad \approx 9.8$

$\sqrt[3]{64} = 4, \quad \sqrt[3]{125} = 5, \quad \approx 4.6$

$\sqrt[3]{216} = 6, \quad \sqrt[3]{343} = 7, \quad \approx 6.7$

$\sqrt[3]{98}, \sqrt{40}, \sqrt[3]{300}, \sqrt{75}, \sqrt{98}$





Homework

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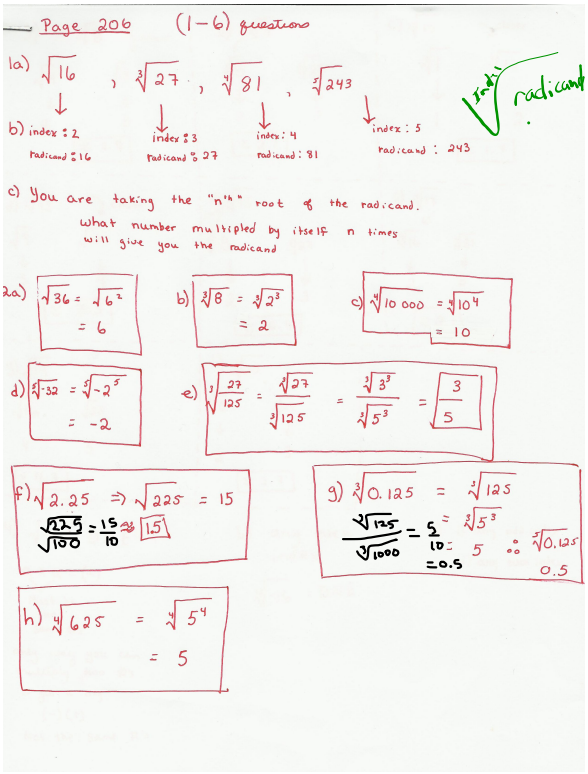
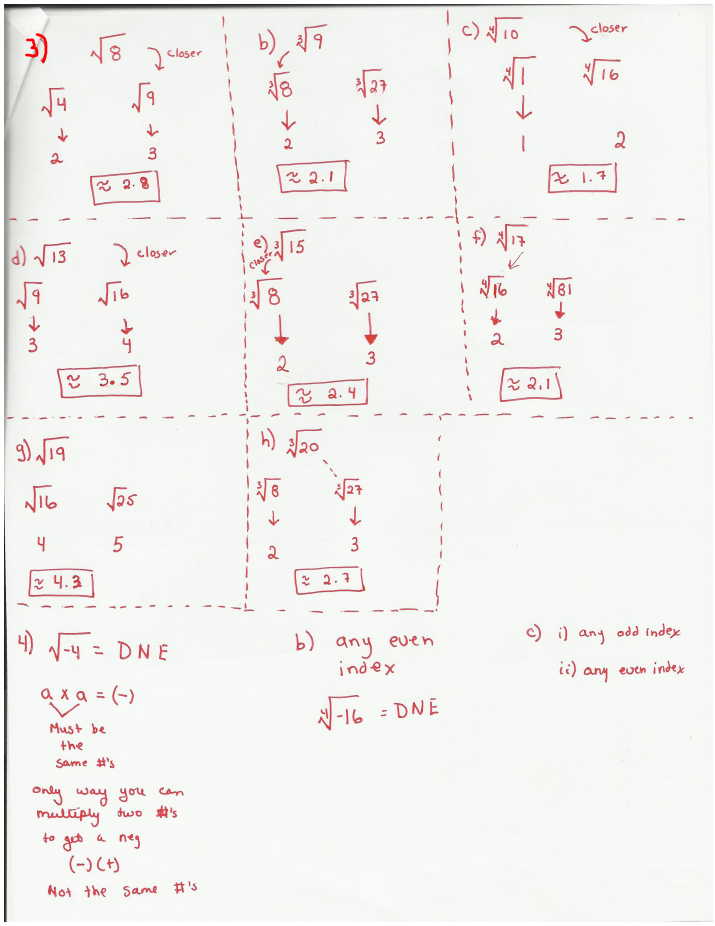
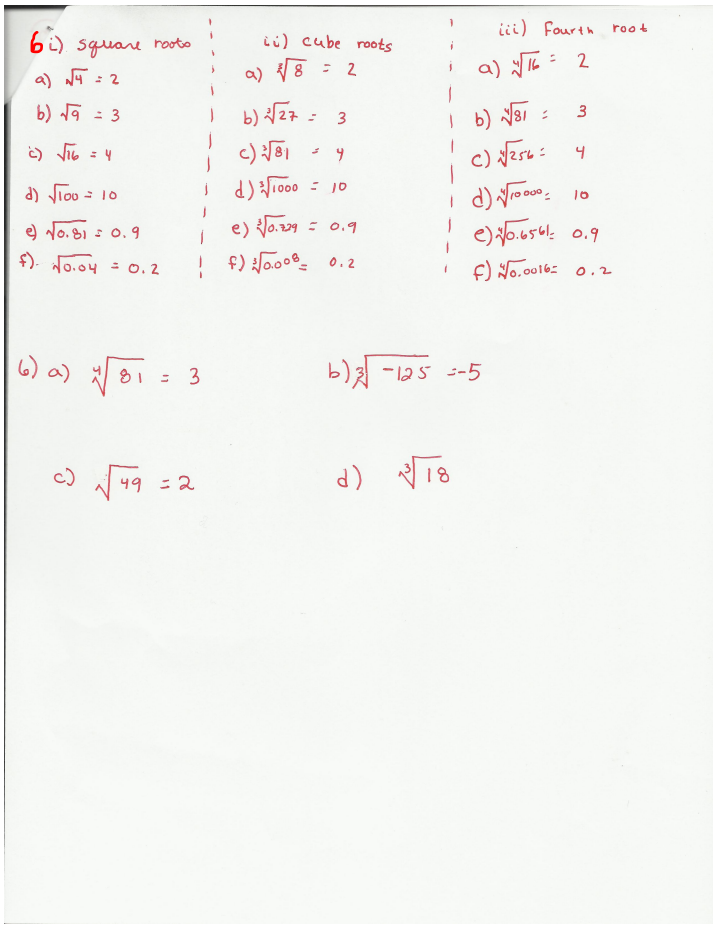
Questions 1-6







List

Evaluate each radical. Justify you answer

a) $\sqrt{49}$ b) $\sqrt[4]{1024}$ c) $\sqrt[3]{729}$

Estimate to one decimal (Show Work)

a) $\sqrt[4]{78}$ b) $\sqrt[3]{576}$

Remember

Rational numbers are numbers that can be written as a fraction or is a decimal that repeats or terminates. Ex) $\sqrt[4]{\frac{1296}{10000}}$ Ex) $\sqrt[3]{\frac{8}{27}}$

Irrational numbers are numbers that cannot be written as a fraction and its decimal neither terminates or repeats. $\sqrt{28}$

Mixed Radical - has a coefficient in front of the radical sign.

ex: $3\sqrt{5}$ OR $\frac{2\sqrt{26}}{3}$ OR $-3\sqrt[3]{3}$.

Entire Radical - has a coefficient of 1 or -1 in front of the radical sign. Everything is entirely under the radical sign

ex: $\sqrt{12}$ OR $-\sqrt{45}$

$\sqrt[3]{216}$ or $-1\left(\sqrt[4]{72}\right)$

Have from last day

Reducing Radicals

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

Same works if we change the "index":

$\sqrt[3]{8 \cdot 27} = \sqrt[3]{8} \cdot \sqrt[3]{27}$
$= 2 \cdot 3$
$= 6$

or

$\sqrt[3]{8 \cdot 27} = \sqrt[3]{216}$
$= 6$

Reducing Radicals

To reduce a radical, you must find the largest "n^{th}" number that will divide into the radicand

$\sqrt[n]{a \cdot b} = \sqrt[n]{a} \cdot \sqrt[n]{b}$

Greatest perfect n^{th}

Entire to Mixed

Reducing Radicals

To reduce $\sqrt{125}$ you must find the largest square number that will divide into 125 evenly!

1 4 9 16 25 36 49 64 81 100 121 144

Ex) $\sqrt{125}$

$\sqrt{25 \cdot 5}$

Put perfect square separate

$\sqrt{25}$ can take $\sqrt{5}$ can't so leave

$5\sqrt{5}$

$$\sqrt[n]{a \cdot b} = \sqrt[n]{a} \cdot \sqrt[n]{b}$$

Greatest perfect nth

Must Know list of perfect nth

$\sqrt{48}$

$= \sqrt{16 \cdot 3}$

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

$= 4\sqrt{3}$

Entire to Mixed

continued

Reducing Radicals

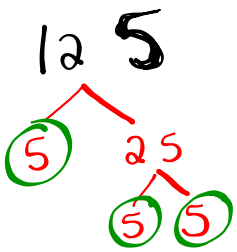
Prime Factorization

To reduce $\sqrt{125}$ you must find the largest square number that will divide into 125 evenly!

a) $\sqrt{125}$

b) $\sqrt{54}$

125



$\sqrt[3]{125}$ → make triplets

$\sqrt{5 \cdot 5 \cdot 5}$

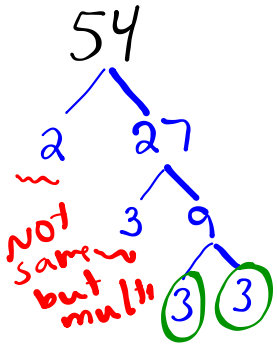
5

$\sqrt{125}$ make pairs — since sq root

$\sqrt{5 \cdot 5}\ \sqrt{5}$

$5\sqrt{5}$

54



$\sqrt{54}$

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

$3\sqrt{6}$

prime

2
3
5
7
11
13
17
19
23
⋮

4
9
16
25
36
49
64
81
100
121

Try these:

a) $\sqrt{12}$

$\sqrt{4 \cdot 3}$

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

$2\sqrt{3}$

b) $\sqrt{72}$

$\sqrt{36 \cdot 2}$

$\sqrt{36}\ \sqrt{2}$

$6\sqrt{2}$

c) $\sqrt{54}$

d) $\sqrt{81} = 9$

$\sqrt{9}\ \sqrt{9}$

$3 \cdot 3$

9

e) $7\sqrt{128}$

$7\ \sqrt{64 \cdot 2}$

$7 \cdot \sqrt{64}\ \sqrt{2}$

$7 \cdot 8\sqrt{2}$

$56\sqrt{2}$

Remember Prime Factorization of square roots:

ex) $\sqrt{162}$

$= \sqrt{(3\cdot3)(3\cdot3)\cdot 2}$

$= \sqrt{(3\cdot3)}\sqrt{3\cdot3}\sqrt{2}$

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

$= 9\sqrt{2}$

OR

162

2 81

9 9

3 3 3 3

Factor tree

162

2 81

3 27

3 9

3 3

ex) $\sqrt{128}$

ex) $\sqrt[3]{256}$

We can also use prime factorization to simplify a radical.

Example 1 Simplifying Radicals Using Prime Factorization

Simplify each radical.

a) $\sqrt{80}$ b) $\sqrt[3]{144}$ c) $\sqrt[4]{162}$

SOLUTION

a) $\sqrt{80}$

b) $\sqrt[3]{144}$

CHECK YOUR UNDERSTANDING

4.3 Mixed and Entire Radicals

c) $\sqrt[4]{162}$

We can also use prime factorization to simplify a radical.

Example 1 Simplifying Radicals Using Prime Factorization

Simplify each radical.

a) $\sqrt{80}$ b) $\sqrt[3]{144}$ c) $\sqrt[4]{162}$

SOLUTION

Same questions using largest perfect nth factors

CHECK YOUR UNDERSTANDING

a) $\sqrt{80} = \sqrt{16 \cdot 5} = \sqrt{16} \times \sqrt{5}$

$= 4\sqrt{5}$

b) $\sqrt[3]{144} = \sqrt[3]{8 \cdot 18} = \sqrt[3]{8} \cdot \sqrt[3]{18}$

$= 2\sqrt[3]{18}$

4.3 Mixed and Entire Radicals

c) $\sqrt[4]{162} = \sqrt[4]{81 \cdot 2} = \sqrt[4]{81} \sqrt[4]{2}$

$= 3\sqrt[4]{2}$

Example 2 Writing Radicals in Simplest Form

Write each radical in simplest form, if possible.

a) $\sqrt[3]{40}$ b) $\sqrt{26}$ c) $\sqrt[4]{32}$

either use prime factorization or largest nth factor

SOLUTION

CHECK YOUR UNDERSTANDING

$\sqrt[3]{40}$

$\sqrt[3]{8 \cdot 5}$

$\sqrt[3]{8}\ \sqrt[3]{5}$

$2\ \sqrt[3]{5}$

4.3 Mixed and Entire Radicals

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Homework

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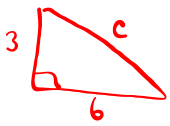
#4, #7a, #8a, #9, #10, #11

a) $c^2 = a^2 + b^2$

$c = \sqrt{a^2 + b^2}$

b) $\sqrt{45} = \sqrt{(\ )\cdot(\ )}$



$c^2 = a^2 + b^2$

$c = \sqrt{a^2 + b^2}$

$= \sqrt{3^2 + 6^2}$

$= \sqrt{9 + 36}$

$= \sqrt{45}$

$\sqrt{9} \cdot \sqrt{5}$

$3\sqrt{5}$