Math 10C

L05 – 4.4 Entire to Mixed Radicals

Real Numbers
(includes rational numbers and irrational numbers)

Integers
(includes the whole numbers and natural numbers)

0, −1, −2 …
1, 2, 3 …

Natural Numbers
1, 2, 3 …

Whole Numbers
(includes the natural numbers)

0, 1, 2 …

Rational Numbers *(includes the integers, whole numbers, natural numbers, fractions, and decimals that terminate or repeat)*
Examples include 0.2, $\frac{3}{5}$, and $\sqrt{9}$.

Irrational Numbers

Examples include π, $\sqrt{2}$, $\sqrt{5}$, and $\sqrt{\frac{2}{3}}$.

radical
- consists of a root symbol, an index, and a radicand

$$\text{index} \rightarrow \sqrt[n]{x} \leftarrow \text{radical}$$
radicand
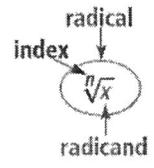
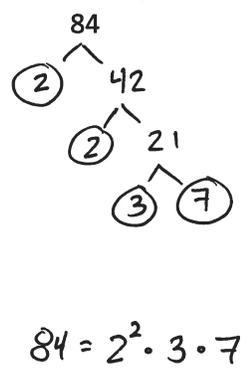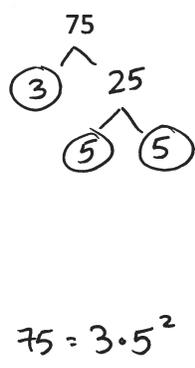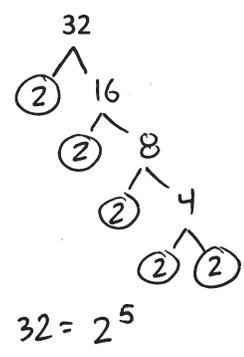- can be rational, $\sqrt{4}$, or irrational, $\sqrt{2}$

radicand
- the quantity under the radical sign

index
- indicates what root to take

Part 1 – Prime Factoring

Q1: Prime factor the following:

32
2, 16
2, 8
2, 4
2, 2

$$32 = 2^5$$

75
3, 25
5, 5

$$75 = 3 \cdot 5^2$$

84
2, 42
2, 21
3, 7

$$84 = 2^2 \cdot 3 \cdot 7$$

Part 2 – Prime Factoring Under Radicals

Q2: Prime factor the following:

$\sqrt{32}$

$$\sqrt{2^5}$$

$\sqrt{75}$

$$\sqrt{3 \cdot 5^2}$$

$\sqrt{84}$

$$\sqrt{2^2 \cdot 3 \cdot 7}$$

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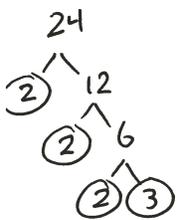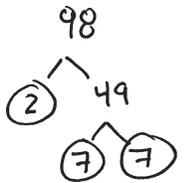## Part 3 –Entire to Mixed Radicals (Square Roots)

Q3: Convert the following to Mixed Radicals:

$\sqrt{32}$

$$\sqrt{2^5} = \sqrt{2^2 \cdot 2^2 \cdot 2}$$
$$= 2 \cdot 2 \sqrt{2}$$
$$= 4\sqrt{2}$$

$\sqrt{75x^5}$

$$= \sqrt{3 \cdot 5^2 \cdot x^5}$$
$$= \sqrt{3 \cdot 5^2 \cdot x^2 \cdot x^2 \cdot x}$$
$$= 5xx\sqrt{3x}$$
$$= 5x^2\sqrt{3x}$$
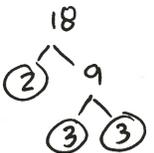
$\sqrt{84x^2y^7z} = \sqrt{2^2 \cdot 3 \cdot 7 \cdot x^2 \cdot y^7 \cdot z}$

$$= \sqrt{2^2 \cdot 3 \cdot 7 \cdot x^2 \cdot y^2 \cdot y^2 \cdot y^2 \cdot y \cdot z}$$
$$= 2xyyy\sqrt{3 \cdot 7 \cdot y \cdot z}$$
$$= 2xy^3\sqrt{21yz}$$

$\sqrt{98x^3y^4}$

$$= \sqrt{2 \cdot 7^2 \cdot x^3 \cdot y^4}$$
$$= \sqrt{2 \cdot 7^2 \cdot x^2 \cdot x \cdot y^2 \cdot y^2}$$
$$= 7xyy\sqrt{2x}$$
$$= 7xy^2\sqrt{2x}$$

98

② 49

⑦ ⑦

24

② 12

② 6

② 3

$\sqrt{24x^5y^3z^4} = \sqrt{2^3 \cdot 3 \cdot x^5 \cdot y^3 \cdot z^4}$

$$= \sqrt{2^2 \cdot 2 \cdot 3 \cdot x^2 \cdot x^2 \cdot x \cdot y^2 \cdot y \cdot z^2 \cdot z^2}$$
$$= 2xxyzz\sqrt{2 \cdot 3 \cdot x \cdot y}$$
$$= 2x^2yz^2\sqrt{6xy}$$

$\sqrt{18x^2y^6}$

$$= \sqrt{2 \cdot 3^2 \cdot x^2 \cdot y^6}$$
$$= \sqrt{2 \cdot 3^2 \cdot x^2 \cdot y^2 \cdot y^2 \cdot y^2}$$
$$= 3xyyy\sqrt{2}$$
$$= 3xy^3\sqrt{2}$$

18

② 9

③ ③

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Part 4 – Entire to Mixed Radicals (Cube Roots)

Q4: Convert the following to Mixed Radicals:

$\sqrt[3]{32} = \sqrt[3]{2^5}$

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

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

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

$\sqrt[3]{75x^5} = \sqrt[3]{3 \cdot 5^2 \cdot x^5}$ Nothing can come out.

$= \sqrt[3]{3 \cdot 5^2 \cdot x^3 \cdot x^2}$

$= x\sqrt[3]{3 \cdot 5^2 \cdot x^2}$

$= x\sqrt[3]{75x^2}$

$\sqrt[3]{84x^2y^7z} = \sqrt[3]{2^2 \cdot 3 \cdot 7 \cdot x^2 \cdot y^7 \cdot z}$

$= \sqrt[3]{2^2 \cdot 3 \cdot 7 \cdot x^2 \cdot y^3 \cdot y^3 \cdot y \cdot z}$

$= y \cdot y \cdot \sqrt[3]{2^2 \cdot 3 \cdot 7 \cdot x^2 \cdot y \cdot z}$

$= y^2 \sqrt[3]{84x^2yz}$

$\sqrt[3]{98x^3y^4} = \sqrt[3]{2 \cdot 7^2 \cdot x^3 \cdot y^3 \cdot z}$

$= xy\sqrt[3]{2 \cdot 7^2 \cdot z}$

$= xy\sqrt[3]{98z}$

$\sqrt[3]{24x^5y^3z^4} = \sqrt[3]{2^3 \cdot 3 \cdot x^5 y^3 z^4}$

$= \sqrt[3]{2^3 \cdot 3 \cdot x^3 \cdot x^2 \cdot y^3 \cdot z^3 \cdot z}$

$= 2xyz\sqrt[3]{3x^2z}$

$= 2xyz\sqrt[3]{3x^2z}$

$\sqrt[3]{18x^2y^6} = \sqrt[3]{2 \cdot 3^2 \cdot x^2 \cdot y^6}$

$= \sqrt[3]{2 \cdot 3^2 \cdot x^2 \cdot y^3 \cdot y^3}$

$= yy\sqrt[3]{2 \cdot 3^2 \cdot x^2}$

$= y^2\sqrt[3]{18x^2}$