

L2 Simplifying Radicals

Review of yesterdays work

Classify the following numbers as: N , Q , \overline{Q} , I , W and R . There can more than one way to classify the following, make sure to list them all.

$$\sqrt{81} = 9 \text{ - rational - natural - real - whole - Integer}$$

$$\sqrt{3.6} = 1.8973.. \text{ - irrational, real}$$

$$-\sqrt{\frac{1}{4}} = -0.5 \text{ - rational, real}$$

$$\sqrt{\frac{25}{36}} = \frac{5}{6} = 0.8\overline{3} \text{ - rational, real}$$

$$\sqrt{0.25} = 0.5 \text{ - rational, real}$$

We also looked at some vocabulary

$$\boxed{\text{index} \sqrt{\text{radicand}}} \text{ and the } (\sqrt{\quad}) \rightarrow \text{radical - sign}$$

The only way to express the exact value of any irrational number that comes from a square root is to leave it in the form of a radical.

Therefore $\sqrt{3}$ is considered an exact value. Once you use a calculator to find its value, then you must round the answer to a certain number of decimal places. The number is now an approximated value. 1.732 is the approximate value of $\sqrt{3}$ rounded to the nearest thousandth.

Roots are often left in radical form so as to represent the exact value of an answer. We must learn to work with exact values, in other words with radicals.

There are 2 types of radicals

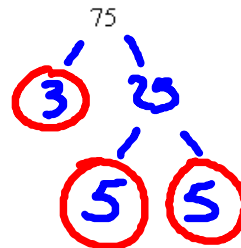
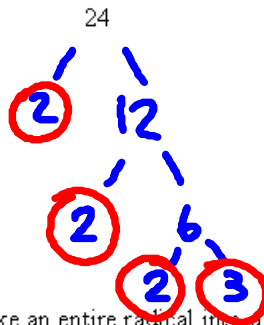
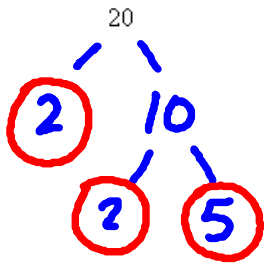
An entire radical $\sqrt{20}, \sqrt{75}$

A mixed radical $2\sqrt{5}, 3\sqrt{11}$ (think of a mixed fraction $2\frac{2}{3}$)

Before we continue, we have to review prime numbers. A prime number is a number that can only be divided by 1 and itself (2, 3, 5, 7, 11, 13, 17...)

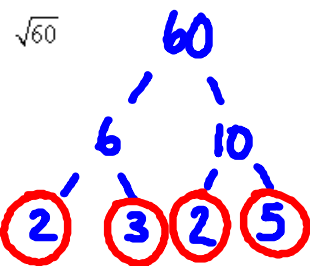
$$19 = 1 \times 19$$

We also have to review the prime factorization of a number that we learned in J.H. (aka factor tree)



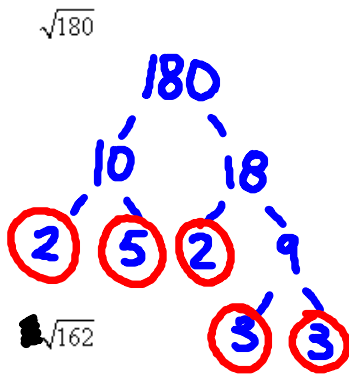
Index = 2

When we simplify radicals we make an entire radical into a mixed radical



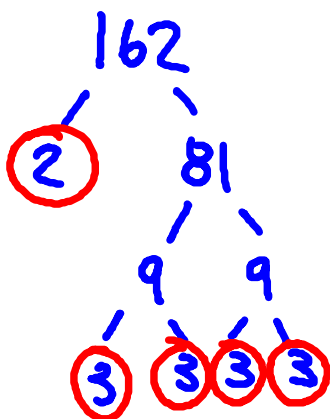
$$\begin{aligned} \sqrt{60} &= \sqrt{2 \times 2 \times 3 \times 5} \\ &= 2\sqrt{3 \times 5} \\ &= 2\sqrt{15} \end{aligned}$$

Index = 2

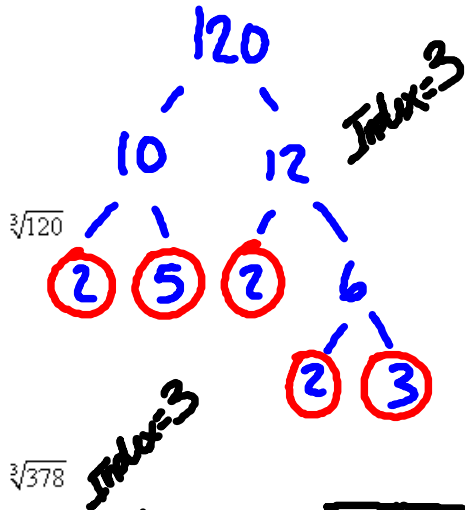


$$\begin{aligned} \sqrt{180} &= \sqrt{2 \times 2 \times 3 \times 3 \times 5} \\ &= (2 \times 3)\sqrt{5} \\ &= 6\sqrt{5} \end{aligned}$$

Index = 2

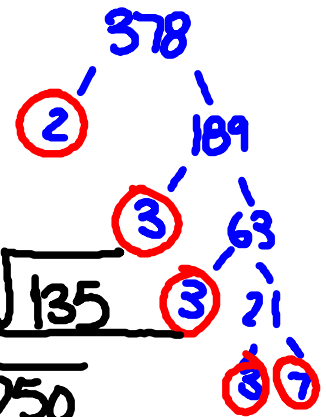


$$\begin{aligned} \sqrt{162} &= \sqrt{2 \times 3 \times 3 \times 3 \times 3} \\ &= (3 \times 3)\sqrt{2} \\ &= 9\sqrt{2} \end{aligned}$$



$$\begin{aligned} \sqrt[3]{120} &= \sqrt[3]{2 \times 2 \times 2 \times 3 \times 5} \\ &= 2 \sqrt[3]{3 \times 5} \\ &= 2 \sqrt[3]{15} \end{aligned}$$

$$\begin{aligned} \sqrt[3]{378} &= \sqrt[3]{2 \times 3 \times 3 \times 3 \times 7} \\ &= 3 \sqrt[3]{2 \times 7} = 3 \sqrt[3]{14} \end{aligned}$$



When going from a mixed radical to an entire radical you just do the opposite.

$$\sqrt[3]{15} \quad \text{Index}=2 \quad 3\sqrt{15} = \sqrt{3 \times 3 \times 15} = \sqrt{135}$$

$$5\sqrt{10} \quad \text{Index}=2 \quad 5\sqrt{10} = \sqrt{5 \times 5 \times 10} = \sqrt{250}$$

$$6\sqrt[3]{12} \quad \text{Index}=3 \quad 6\sqrt[3]{12} = \sqrt[3]{6 \times 6 \times 6 \times 12} = \sqrt[3]{2592}$$

$$5\sqrt[3]{18} \quad \text{Index}=3 \quad 5\sqrt[3]{18} = \sqrt[3]{5 \times 5 \times 5 \times 18} = \sqrt[3]{2250}$$

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Try #24 for a challenge