Algebra II
Lesson 7.1-7.4 Review

Roots or radicals are the opposite operation of exponents. You can "undo" a power with a radical, and a radical can "undo" a power. For instance, if you square 2, you get 4, and if you "take the square root of 4", you get 2; if you square 3, you get 9, and if you "take the square root of 9", you get 3.

$4^2 = 16$ & $\sqrt{16} = \sqrt{4^2} = 4$; $8^2 = 64$ & $\sqrt{64} = \sqrt{8^2} = 8$; $\sqrt{81} = \sqrt{9^2} = 9$;

$\sqrt{144} =$_______________

question: What if it is not a perfect square? Look for perfect squares, simplifying the perfect square and leave the rest behind under the radical: $\sqrt{32} = \sqrt{16 \cdot 2} = \sqrt{4^2 \cdot 2} = 4\sqrt{2}$

$\sqrt{180} =$________________________

Question: What if the radical has a number in the corner? *Radicals other than a square root:* we also see radicals that have a number in the corner of the radical sign. This is called the **index** : $\sqrt[n]{}$ the index tells us how many times a number must be multiplied by itself under the radical, so to simplify.

$\sqrt[3]{\mathbf{8}}$ $we\ look\ for\ a\ number\ mutliplied\ by\ itself\ 3\ times\ so$: $\sqrt[3]{8} = \sqrt[3]{2^3} = 2$ We also must think about variables under the radical too. $\sqrt[3]{x^3} = x$; $\sqrt[3]{8x^6} = \sqrt[3]{2^3(x^2)^3} = 2x^2$;

$\sqrt[3]{64x^{12}} =$__________________; $careful\ not\ a\ perfect\ cube$: $\sqrt[3]{54y^7} =$______________________

$\sqrt[4]{\mathbf{16}}$ $we\ look\ for\ a\ number\ multiplied\ by\ itself\ 4\ times, so$: $\sqrt[4]{16} = \sqrt[4]{2^4} = 2$, and don't forget about those variables! $\sqrt[4]{81y^{12}} = \sqrt[4]{3^4(y^3)^4} = 3y^3$;

$remember\ that\ we\ may\ not\ have\ a\ number\ that\ can\ be\ multipled\ by\ itself\ 4\ times\ so\ there\ will\ be\ extra\ nubers\ left\ behind\ under\ the\ radical$: $\sqrt[4]{162t^{15}} = \sqrt[4]{3^4 2(t^3)^4 t^3} = 3t^3\sqrt[4]{2t^3}$;

$\sqrt[4]{144s^5r^{21}} =$_________________________________

Question: What do we do with radicals when they are combined with a fraction? First look at using the quotient property that allows us to combine the fraction under one radical and if possible simplify canceling out the denominator with factors from the numerator:

$$\frac{\sqrt{20x^{17}}}{\sqrt{5x^7}} = \sqrt{\frac{20x^{17}}{5x^7}} = \sqrt{4x^{10}} = \sqrt{2^2(x^5)^2} = 2x^5;$$

$\frac{\sqrt{72x^{12}y^{14}}}{\sqrt{2x^3y^2}} =$_________________________________

Question: What is rationalizing a denominator? When we get a fraction that has a radical in the denominator we need to multiply the denominator by another radical so that the radical simplifies to a rational denominator:

$$\frac{\sqrt{3x}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{6x}}{\sqrt{2^3}} = \frac{\sqrt{6x}}{2},$$

$if\ you\ have\ a\ cube\ root\ in\ the\ denominator, deal\ with\ in\ a\ similar\ way$:

$$\frac{\sqrt[3]{5x}}{\sqrt[3]{2}} \cdot \frac{\sqrt[3]{2^2}}{\sqrt[3]{2^2}} = \frac{\sqrt[3]{5x2^2}}{\sqrt[3]{2^3}} = \frac{\sqrt[3]{10x}}{2}$$