Radicals

Tuesday, April 12, 2016 8:11 AM

Working with Radicals

When I was a kid 'radical' meant something different:

In the news I often hear radical used differently:

And Math has yet another definition:

$\sqrt{x}$

$\sqrt[3]{y}$

Any function with a root in it. The root is a radical. That's pretty radical, right?

These are radicals:

$\sqrt{4},\ \sqrt{2x},\ \sqrt{4x-7},\ \sqrt[3]{7}$

Let's define the parts of a radical:

$$a\sqrt[n]{x}$$

a=coefficient

n=index or root

x=radicand

We group like terms with radicals the same way we do with x, x^2. Ie:

$$x+2x+3x^2+4x^2$$

$$3x + 7x^2$$

Radicals work the same way:

$$\sqrt{x}+2\sqrt{x}+3\sqrt[3]{x}+4\sqrt[3]{x}$$

$$3\sqrt{x} + 7\sqrt[3]{x}$$

Simplifying Radicals:
In order to simplify a radical, you want to break down the radicand to its prime factors. Look for pieces that can come out.

$\sqrt{24}$: 24 → 4, 6; 4 → 2, 2; 6 → 2, 3

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

$$= \sqrt{4}\,\sqrt{6} = 2\sqrt{6}$$

First let's look at how we can put a number into a radical:

Convert the following to an entire radical:

$4\sqrt{3}$ $= \sqrt{3\cdot 4^2}$ $= \sqrt{3\cdot 16}$ $= \sqrt{48}$	$5\sqrt{10}$ $= \sqrt{10\cdot 5^2}$ $= \sqrt{10\cdot 25} = \sqrt{250}$
$2\sqrt[3]{3}$ $\sqrt[3]{3\cdot 2^3}$ $= \sqrt[3]{3\cdot 8} = \sqrt[3]{24}$	$x^2\sqrt[4]{x}$ $\sqrt[4]{x\cdot (x^2)^4}$ $= \sqrt[4]{x\cdot x^8}$

$x^2\cdot x^3$

x^{2+3}

$(x^2)^3$

$= x^{2(3)}$

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

$= \sqrt[4]{x \cdot x^8}$

$= \sqrt[4]{x^9}$

$= x$

Now let's take a radical expression and simplify it. You will be expected to do this for every radical question you come across for the rest of your life. You cannot leave a fraction as 2/4. Same thing here!

$x = \sqrt{4} = 2$ $\quad y = \sqrt{1}$

$= 1$

$\sqrt[2]{75}$	$2\sqrt{48}$

$25 \quad 3$

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

$5\sqrt{3}$

$16 \quad 3$

$4 \quad 4$

$2 \quad 2 \quad 2 \quad 2$

$= 2\sqrt{4^2}\sqrt{3}$

$= 2(4)\sqrt{3}$

$= 8\sqrt{3}$

$\sqrt[3]{54}$	$\sqrt[3]{x^7}$

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

$\sqrt[3]{xxx\,x\,xxx}$

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

List the following from least to greatest. Hint: put everything under the radical so that you can easily compare numbers.

$\sqrt{25} = \sqrt{5^2} = 5$

$5,\ 2\sqrt{6},\ 3\sqrt{3},\ \sqrt{23}$

$\sqrt{25}$ $\sqrt{6\cdot 2^2}$ $\sqrt{3\cdot 3^2}$

$\sqrt{24}$ $\sqrt{27}$ $\sqrt{23}$

Adding and subtracting:
We can do it, if the things are the same. Ie: $\sqrt{x}+2\sqrt{x}=3\sqrt{x}$

$5\sqrt{3}-2\sqrt{3}=$ $3\sqrt{3}$

$7\sqrt{2}+4\sqrt{3}-5\sqrt{2}+6\sqrt{3}=$

$2\sqrt{2}+10\sqrt{3}$

$\sqrt{24}+\sqrt{54}=$

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

$5\sqrt{6}$

81

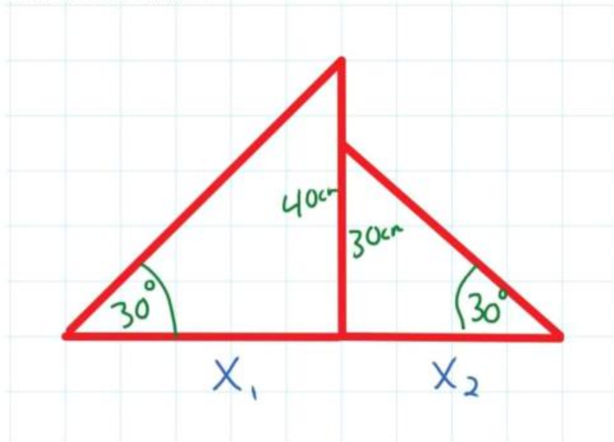
9 9

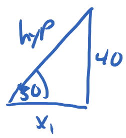
3 3 3 3

$2\sqrt[3]{3}-\sqrt[3]{81}=$ $2\sqrt[3]{3}-3\sqrt[3]{3} = -\sqrt[3]{3}$

A skateboard ramp is shown. What is the total length? X_1+x_2?

Hint: special triangles.





$\tan\theta = \frac{opp}{adj}$

$\tan 30 = \frac{40}{x_1}$

$\frac{1}{\sqrt{3}} = \frac{40}{x_1}$

$x_1 = \sqrt{3}(40)$

HW: 278 #1,2,3ab, 6,8,9,10ab, 11,12,25

$d = x_1 + x_2$

$= 40\sqrt{3} + 30\sqrt{3}$

$= 70\sqrt{3}$