Bellwork: Simplify the following expression

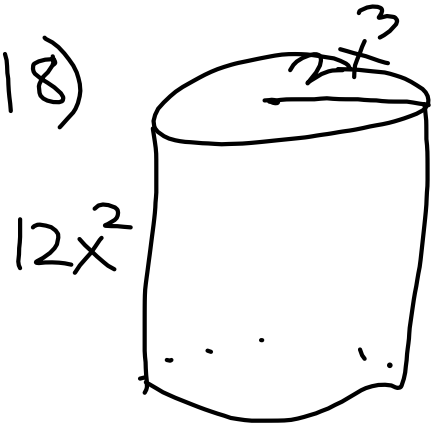
$$\frac{20x^2y^5}{5x^{-3}y^7} = \frac{20x^2y^5x^3}{5y^7}$$

$$\frac{4x^5}{1y^2} \leftarrow 4x^5y^{-2}$$

12) $\left(\frac{xy}{ab}\right)\left(\frac{ab}{xy}\right)^{-3} = \left(\frac{xy}{ab}\right)\left(\frac{a^{-3}b^{-3}}{x^{-3}y^{-3}}\right)$

$$= \frac{x^1y}{ab} \cdot \frac{x^3y^3}{a^3b^3} = \frac{x^4y^4}{a^4b^4}$$

18)



$V = \pi r^2 h$

$V = \pi(2x^3)^2(12x^2)$

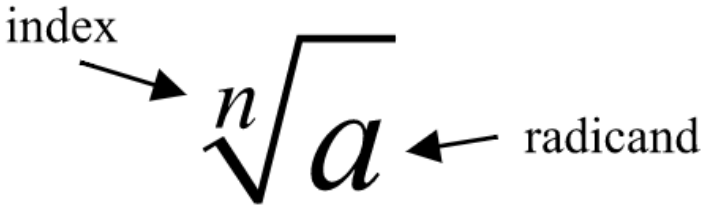
$= \pi 4x^6 \cdot 12x^2$

$= 48x^8\pi$

Objective:

I can simplify expressions with radical (roots) or rational (fraction) exponents

Overview of Radicals (Roots)



If no index is explicitly given for a radical, it is assumed to be 2 (square root).

$\sqrt[2]{16} = 4 \quad = \sqrt{4^2}$

$(4^2)^{1/2} = 4^1 \quad 4^{\frac{2}{2}}$

9 3

3 3

PROPERTIES OF RADICALS & RATIONAL EXPONENTS

index → $\sqrt[n]{a}$ ← radicand

Product Property of Roots	$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$	
Quotient Property of Roots	$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$	
Radical to Rational Exponents	$\sqrt[n]{a} = a^{\frac{1}{n}}$ or	$\sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m = a^{\frac{m}{n}}$

Radical to Rational exponents

$$\sqrt[n]{a} = a^{\frac{1}{n}} \quad \text{or} \quad \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m = a^{\frac{m}{n}}$$

- A ***rational exponent*** is an exponent that can be written as a fraction of positive integers

- Properties of Exponents from 1.2 still work when exponents are fractions

- This means those properties also apply to radicals

Product Property of Roots $\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$

Quotient Property of Roots $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

Simplify and write in radical form

$2\sqrt{75}$

$3 \quad 25$

$5 \quad 5$

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

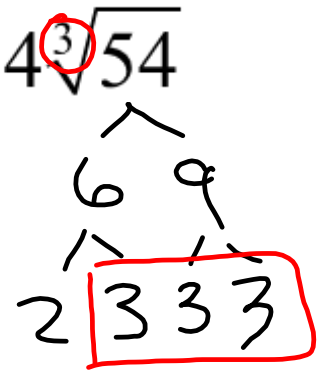
$2 \cdot \sqrt{3} \cdot \sqrt{5^2}$

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

$= 10\sqrt{3}$

Simplify and write in radical form

$4\sqrt[3]{54}$



$4 \cdot 3\sqrt[3]{2} = 12\sqrt[3]{2}$

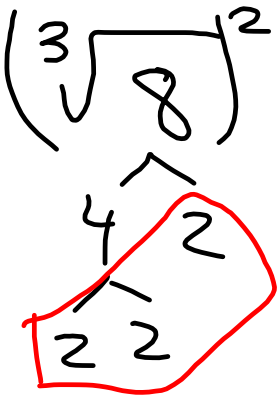
Simplify and write in radical form

$8^{\frac{2}{3}}$

$8^{2/3} = 4$

$(\sqrt[3]{8})^2$

$(2)^2$



Simplify and write in radical form

$$\left(32x^{12}y\right)^{\frac{3}{4}}$$

$\sqrt[4]{32^3 x^{36} y^3}$

$\sqrt[4]{2^{15} x^{36} y^3}$

4 8

2 2 4 2

2 2

$2^3 x^9 \sqrt[4]{2^3 y^3}$

$8x^9\sqrt[4]{8y^3}$

Simplify and write in radical form

$\sqrt[2]{10x^7}$

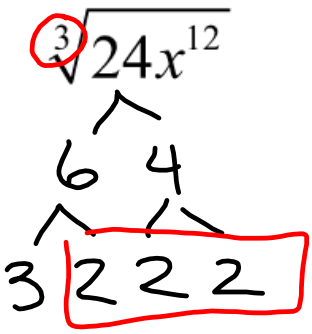
2 5

$x^3\sqrt[2]{10x^1}$

$x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$

Simplify and write in radical form

$\sqrt[3]{24x^{12}}$



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

$x^4 \cdot x^4 \cdot x^4$

Simplify and write in radical form

$\left(y^{\frac{2}{3}}\right)\left(y^{\frac{3}{5}}\right)(y)^1$

$y^{34/15}$

$\sqrt[15]{y^{34}}$

$y^2\sqrt[15]{y^4}$

Simplify and write in radical form

$\sqrt{98a^4b^7c}$

2 49

7 7

$7a^2b^3\sqrt{2bc}$