When a variable with an exponent is under a radical you simplify by ....

Dividing the exponent by the index.

$$\sqrt[7]{b^{42}} = b^{\frac{42}{7}} = \boxed{b^6}$$

what do you do if the exponent on the variable is not divisible by the index?

$$\sqrt[3]{c^{23}} =$$

Ask yourself the following:

How many times does the index 3 go into the exponent 23?

3 goes into 23 seven times with a remainder of two.

$$\sqrt[3]{c^{23}} = c^7\sqrt[3]{c^2}$$

A real number raised to an even power is ALWAYS POSITIVE.

A real number raised to an odd power can either be negative or positive.

When there is nothing in front of an even radical the answer must be POSITIVE.

The answer from an odd radical can be Pos or Neg.

When simplifying radicals:

You MUST use Absolute Value symbols when

1. The index is EVEN and the result could be negative
answer is something to an odd power

You DON'T use Absolute Value symbols when

1. The index is ODD
2. The index is EVEN but the result won't be negative
answer is something to an even power

Simplify. Use absolute value symbols when needed.

$$\sqrt[9]{\underbrace{78732}_{19683\cdot 4}e^{57}g^{117}h^{191}}$$

$2^9 = 512$

$3^9 = 19683$

$\cancel{4^9 = 262144}$

already too big so stop here

$$= \boxed{3e^{6}g^{13}h\sqrt[9]{4e^{3}h^{2}}}$$

$57 \div 9 = 6 \quad R=3$

$117 \div 9 = 13 \quad R=0$

$191 \div 9 = 21 \quad R=2$

Simplify. Use absolute value symbols when needed.

$$\sqrt[8]{\underbrace{5376}_{256\cdot 21}a^{433}b^{1382}}$$

$2^8 = 256$

$\cancel{3^8 = 6561}$

already too big so stop here

$$= \boxed{2a^{54}b^{172}\sqrt[8]{21a^{1}b^{6}}}$$

$433 \div 8 = 54 \quad R=1$

$1382 \div 8 = 172 \quad R=6$

You can now finish Hwk #33:

Sec 7-1

Due Tomorrow

page 372

probs 3-5, 9, 23-25, 27, 44, 45, 50, 51

What's the difference between these two questions?

Simplify. Use absolute value symbols when needed.

$\sqrt{25c^{14}d^{29}}$

Use absolute values around variables with odd exponents when coming out of even radicals.

Simplify. Assume all variables are positive.

$\sqrt[4]{m^{12}n^{23}p^{6}}$

since you know all variables are positive there is no reason to use absolute values at any time.

$? = b^8c^5d^{11}\sqrt[3]{c^2d}$

What was the original problem that produced the answer shown above?

You divided all exponents of the original problem by 3 and put this as the exponent outside of the radical along with any remainder as the exponent left under the radical.

To find the original problem reverse this process by multiplying the index by the exponent of the variable outside the radical then add the exponent of the variable under the radical.

$= \sqrt[3]{b^{8\cdot 3}c^{5\cdot 3}c^{2}d^{11\cdot 3}d}$

$= \sqrt[3]{b^{24}c^{15+2}d^{33+1}}$

$= \boxed{\sqrt[3]{b^{24}c^{17}d^{34}}}$

$? = 6x^4y^7\sqrt{2xy}$

What was the original problem that produced the answer shown above?

$= \sqrt{6^2\cdot 2\, x^{4\cdot 2}x\, y^{7\cdot 2}y}$

$= \sqrt{36\cdot 2\, x^{8+1}y^{14+1}}$

$= \boxed{\sqrt{72x^9y^{15}}}$

$? = 3g^{11}h^6\sqrt[4]{5g^2h^3}$

What was the original problem that produced the answer shown above?

$= \sqrt[4]{3^4\cdot 5\, g^{11\cdot 4}g^2\, h^{6\cdot 4}h^3}$

$= \sqrt[4]{81\cdot 5\, g^{44+2}h^{24+3}}$

$= \boxed{\sqrt[4]{405g^{46}h^{27}}}$

Sec 7-2: Multiplying and Dividing Radical Expressions.

Property **Multiplying Radical Expressions**

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers, then $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$.

We've already used this Property!!

$$\sqrt{20} = \sqrt{4 \cdot 5} = \sqrt{4} \cdot \sqrt{5}$$

This property works in both directions:

You can put the product of several radicals together into one radical

AND

You can split one radical into the product of several radicals

Simplify without talking.

$$\sqrt{5a} \cdot \sqrt{20a^7} = \sqrt{5a \cdot 20a^7}$$

$$= \sqrt{100a^8}$$

$$= \boxed{10a^4}$$

Simplify. Assume all variables are positive.

$$\sqrt{6ab^3} \cdot \sqrt{2a^6b^5} = \sqrt{\underbrace{12}_{4 \cdot 3} a^7 b^8}$$

$$= \boxed{2a^3b^4\sqrt{3a}}$$

Simplify. Assume all variables are positive.

$$\sqrt{14P^5Q^8} \cdot \sqrt{35P^9Q^3}$$

$$= \sqrt{\underbrace{490}_{49\cdot 10} P^{14} Q^{11}}$$

$$= \boxed{7P^7Q^5\sqrt{10Q}}$$

Simplify. Assume all variables are positive.

$$6\sqrt[3]{12c^{11}d^7} \cdot 3\sqrt[3]{10c^2d^5}$$

$$= 18\sqrt[3]{\underbrace{120}_{8\cdot 15} c^{13} d^{12}}$$

$$= 18\cdot 2\, c^4 d^4 \sqrt[3]{15c}$$

$$= \boxed{36c^4d^4\sqrt[3]{15c}}$$