Simplify each. Use Absolute Value symbols where needed.

1. $\sqrt[5]{m^{20}q^{35}}$

Odd Root - No Absolute Values

$= m^4 q^7$

2. $\sqrt[4]{a^{12}b^{32}}$

Even Root - may need Absolute Values

$= |a^3| b^8$

Remember, you must make sure that what ever comes out of these even radicals is positive. This means that when a variable ends up with an odd exponent after doing the root, it needs to be placed inside Absolute Value symbols to ensure that it is coming out positive.

Simplify. Assume all variables are positive.

3. $\sqrt[8]{x^{40}y^{21}z^{15}}$

$x^5 y^2 z \sqrt[8]{y^5 z^7}$

4. $\sqrt[9]{k^{41}j^{29}}$

$k^4 j^3 \sqrt[9]{k^5 j^2}$

Since the directions tell us all the variables are positive all the results will be positive, therefore, NO Absolute Value symbols need to be used regardless of what the index is.

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

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

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

$3 \times 5 + 2$

To find the exponent that would have been on the inside of the radical you do the following:
Multiply the index by the exponent on the coefficient then add the exponent on the same variable in the radicand.

Find the original probem that gave the following simplified answers.

a) $3x^3y^7\sqrt{x}$

$\sqrt{9x^7y^{14}}$

b) $2d^5eg^2\sqrt[4]{5d^3e^2}$

$\sqrt[4]{16 \cdot 5}$

$\sqrt[4]{80\, d^{23} e^6 g^8}$

Simplify: $\sqrt{20} = \sqrt{4 \cdot 5} = \sqrt{4} \cdot \sqrt{5} = 2\sqrt{5}$

Simplifying this way uses a Property of Exponents shown below.

Property of Exponents: If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real #'s, then

$$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$$

You can take a single radical and break it into multiple radicals all with the same index.

Sec 7-2: Multiplying and Dividing Radical Expressions.

Simplify. Assume all variables are positive.

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real #'s, then

$$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$$

this also works in the other direction:

$$\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$$

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

You could multiply first then do the square root

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

$$= 10a^4$$

Simplify. Assume all variables are positive.

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

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

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

For the coefficients you could do the following:

Instead of multiplying 14 and 35 you might notice that they have a common factor which means you could write their product as

$$\sqrt{7 \cdot 2 \cdot 7 \cdot 5}$$

$$= \sqrt{7^2 \cdot 10}$$

Since 7^2 is a perfect square you can do the square root of this factor and get

$$7\sqrt{10}$$