Radical expressions can be simplified using exponent rules. This is very helpful when radical expressions have different indexes.

Formula to convert radical to rational form:

$$\sqrt[n]{a^m} = (a^m)^{\frac{1}{n}}$$

Steps to Simplify a Radical Expression Using Rational Exponents

1. Write original problem.

$$\sqrt[3]{8x^4} = \left(8x^4\right)^{\frac{1}{3}}$$

2. Put each radicand in a ( ) with an exponent of one over the index. [Note: Step is by the original problem.]

3. If there is more than one number or variable in the ( ), put a ( ) around each number or variable and its exponent. Each ( ) has the original exponent outside.

$$= (8)^{\frac{1}{3}} \left(x^4\right)^{\frac{1}{3}}$$

4. For a number in a ( ), go to the side and factor completely and write factors with exponents and replace back in the main problem. If there is more than one number in a ( ), repeat the previous step.

$$= \left(2^3\right)^{\frac{1}{3}} \left(x^4\right)^{\frac{1}{3}}$$

$$\begin{array}{c} 8 \\ / \ | \ \backslash \\ 2 \cdot 2 \cdot 2 \\ 2^3 \end{array}$$

5. Multiply exponent outside of ( ) with exponent inside of ( ).

$$= 2^{\frac{3}{1}\cdot\frac{1}{3}} x^{\frac{4}{1}\cdot\frac{1}{3}}$$

6. Simplify multiplication of exponents.

$$= 2^{\frac{3}{3}} x^{\frac{4}{3}}$$

$$= 2x^{\frac{4}{3}}$$