# Simplifying Expressions with Fractional Exponents

Review the rules for exponents and the steps adding, subtracting, and multiplying fractions.

## Exponent Rules

a) $(x^m)(x^n) = x^{m+n}$

b) $\frac{x^m}{x^n} = x^{m-n}$

c) $(x^m)^n = x^{mn}$

d) $(xy)^m = x^m y^m$

e) $x^{-n} = \frac{1}{x^n}$

g) $x^{\frac{m}{n}} = \sqrt[n]{x^m}$

f) $\left(\frac{b}{a}\right)^n = \frac{b^n}{a^n}$

## Steps for Adding or Subtracting Fractions

1 First find the Least Common Denominator

$$\frac{2}{3} + \frac{1}{7}$$

Least common Denominator=21

2. Rewrite the fractions with the same denominator.

$$\frac{14}{21} + \frac{3}{21}$$

3. Add or subtract the numerators

$$\frac{17}{21}$$

## Steps for Multiplying Fractions

Case 1: Multiply numerator and multiply denominators.

$$\frac{3}{8} \cdot \frac{4}{9} = \frac{12}{72} = \frac{1}{6}$$

Case 2: If possible "cross cancel" before multiplying.

$$\frac{\cancel{3}^{1}}{\cancel{8}_{2}} \cdot \frac{\cancel{4}^{1}}{\cancel{9}_{3}} = \frac{1}{2} \cdot \frac{1}{3} = \frac{1}{6}$$

Example: Simplify the following expression using rational fractional exponents.

$$\left(\frac{25x^{2/3}y^{3}}{x^{-1/4}y^{1/3}}\right)^{1/2}$$

Solution: see exponent rules on the first page. These exponent rules are referred to in the steps below

$$\left(\frac{25x^{2/3}y^{3}}{x^{-1/4}y^{1/3}}\right)^{1/2}$$

$$\left(\frac{25x^{2/3}x^{1/4}y^{3}}{y^{1/3}}\right)^{1/2} \quad (\textbf{\textit{ERe}}) \qquad \frac{1}{x^{-1/4}} = x^{1/4}$$

$$\left(\frac{25x^{11/12}y^{3}}{y^{1/3}}\right)^{1/2} \quad (\textbf{\textit{ERa}}) \qquad \frac{2}{3} + \frac{1}{4} = \frac{8}{12} + \frac{3}{12} = \frac{11}{12}$$

$$\left(\frac{25x^{11/12}y^{8/3}}{1}\right)^{1/2} \quad (\textbf{\textit{ERb}}) \qquad \frac{3}{1} - \frac{1}{3} = \frac{9}{3} - \frac{1}{3} = \frac{8}{3}$$

$$(25)^{1/2}\left(x^{11/12}\right)^{1/2}\left(y^{8/3}\right)^{1/2} \quad (\textbf{\textit{ERd}})$$

$25^{1/2}\, x^{11/24}\, y^{4/3}$ **(ERc)**

$$\frac{11}{12} \cdot \frac{1}{2} = \frac{11}{24}$$

$$\frac{\cancel{8}^{4}}{3} \cdot \frac{1}{\cancel{2}_{1}} = \frac{4}{3} \cdot \frac{1}{1} = \frac{4}{3}$$

$5\, x^{11/24} y^{4/3}$ **(ERg)**

$$25^{1/2} = \sqrt[2]{25} = 5$$