Distributive property with fractions

First, remember that the distributive property is a method you can use to simplify an expression by multiplying the factor outside of the parentheses by each term inside the parentheses.

It's the same thing with fractions. Just remember to multiply the outside numerator (top) by the numerators of the inside terms, and the outside denominator (bottom) by the denominators of the inside terms.

Distributive Property for fractions:

$$\frac{a}{b}\left(\frac{c}{d}+\frac{e}{f}\right)=\frac{ac}{bd}+\frac{ae}{bf} \qquad\qquad \left(\frac{a}{b}+\frac{c}{d}\right)\frac{e}{f}=\frac{ae}{bf}+\frac{ce}{df}$$

$$\frac{a}{b}\left(\frac{c}{d}-\frac{e}{f}\right)=\frac{ac}{bd}-\frac{ae}{bf} \qquad\qquad \left(\frac{a}{b}-\frac{c}{d}\right)\frac{e}{f}=\frac{ae}{bf}-\frac{ce}{df}$$

When you're learning to distribute with fractions, first write out the individual multiplications, and then reduce them in a separate step.

Example

Use the distributive property to expand the expression.

$$\frac{3a}{b^2}\left(\frac{4c}{5b}+\frac{a^3}{3b^2}\right)$$

Multiply the outside factor $3a/b^2$ by each term inside the parentheses

$$\frac{3a}{b^2}\left(\frac{4c}{5b}\right) + \frac{3a}{b^2}\left(\frac{a^3}{3b^2}\right)$$

Multiply the numerators and the denominators separately.

$$\frac{12ac}{5b^3} + \frac{3a^4}{3b^4}$$

Simplify if possible. Here, we can cancel the 3 in the top and bottom of the second fraction.

$$\frac{12ac}{5b^3} + \frac{a^4}{b^4}$$

Let's try another example of the distributive property with fractions.

Example

Use the distributive property to expand the expression.

$$\left(xz^2 - \frac{x^2y^3}{z^2}\right)\frac{xy^2}{z}$$

Multiply each term inside the parentheses by the factor outside of the parentheses xy^2/z.

$$xz^2\left(\frac{xy^2}{z}\right) - \frac{x^2y^3}{z^2}\left(\frac{xy^2}{z}\right)$$

Multiply the numerators and the denominators separately (remember that if there's no denominator, then the denominator is 1).

$$\frac{x^2y^2z^2}{z} - \frac{x^3y^5}{z^3}$$

Simplify if possible. Here, we can cancel one factor of z in the top of the first fraction with the z in the bottom of that fraction.

$$x^2y^2z - \frac{x^3y^5}{z^3}$$