

Division of Rational Expressions

If you can successfully multiply rational expressions, division only adds one twist and it occurs when you start the question and from that point on you do everything as you would with multiplication.

Example #1 $\frac{5x^2y}{3wz^3} \div \frac{2w^2z}{5x^3y^2}$

Step 1. Since each element is a product of another there is no need to place () around each numerator and denominator.

Step 2. This step represent the only real change between multiplication $\frac{5x^2y}{3wz^3} \cdot \frac{5x^3y^2}{2w^2z}$ between multiplication and division . Rewrite the question but this time “**copy the first fraction as shown, switch the division sign to a multiplication sign and flip (reciprocal) the fraction after the division sign**”.

Step 3. Simplify the resulting expression using the Laws of exponents as you did for multiplication. That is multiply the numbers, add exponents when multiplying the same bases and subtract exponents when dividing the same bases.

Step 4. Resulting answer: $\frac{25x^5y^3}{6w^3z^4}$

Example 2: $\frac{(x+3)^2}{(x-1)^3} \div (x+3)^4$

Step 1. Since these binomials have in place () we proceed to step 2.

Step 2. Rewrite the question changing sign and flipping $\frac{(x+3)^2}{(x-1)^3} \cdot \frac{1}{(x+3)^4}$ second fraction.

Step 3. Apply Laws of exponents and simplify (there are only two different factors present).

Step 4. Resulting answer $\frac{1}{(x-1)^3(x+3)^2}$

Example #3. $\frac{x^2 + 3x + 2}{2x^2 + 5x + 2} \div \frac{x^2 - 1}{4x^2 - 1}$

Step #1. Place () around each numerator and denominator.

Step #2. Re-write the question replacing the division sign with $\frac{(x^2 + 3x + 2)}{(2x^2 + 5x + 2)} \cdot \frac{(4x^2 - 1)}{(x^2 - 1)}$
a multiplication sign and flipping over the fraction after the division sign.

Step #3. Factor each set of brackets and write as one $\frac{(x + 2)(x + 1)(2x - 1)(2x + 1)}{(2x + 1)(x + 2)(x - 1)(x + 1)}$
fraction with both the numerator and denominator being written as a product of factors.

Step #4. Cancel like factors and leave the remainder as is. **Do not multiply out**

Step #5. Resulting answer: $\frac{(2x - 1)}{(x - 1)}$