

Invert and Multiply Explanation

Basically: two algorithms for division of fractions	<ul style="list-style-type: none"> • Common denominator division • Invert and multiply division
Common denominator seen as more meaningful by the research	$4/5 \div 2/5 = 2/1$ or 2 $2/3 \div 1/6 = 4/6 \div 1/6 = 4/1 = 4$
To understand common denominator method, you have to understand that all numbers can be written in fractional form over ONE	$4 = 4/1$ $2 = 2/1$ even $3/4$ over $1 = 3/4$
Common denominator method becomes cumbersome when the division results in remainders or the divisor is greater than the dividend.	$2/3 \div 1/2 = 4/6 \div 3/6 = 4/3 = 1 \frac{1}{3}$ $1/3 \div 4/5 = 5/15 \div 12/15 = 5/12$
PLUS: students need to know invert and multiply to be successful in later math, particularly algebra and beyond. Middle school can't be the first time students see and learn about division of fractions.	briefly explain rational expression division $\frac{(x - 2)}{(x + 1)} \div \frac{(x + 2)}{(x + 3)} =$ Justifies the advantage of learning this algorithm
So, common denominator is a good intro, but students need practice in invert and multiply. Why does it work? Is it magic? (ask teachers to discuss this in their groups) Any volunteers	(Your's is not to question why. Simply invert and multiply)
To understand invert and multiply, we need to understand the mathematical concept of inverses.	Not the same as opposites Additive inverses are two numbers that add to make 0 (3 and -3) Multiplicative inverses are two numbers that combine to multiply to make 1 (3 and 1/3)
Focusing on multiplicative inverses, we start to see patterns that help us understand why invert and multiply works (they likely did some of this work with Carol)	$6 \div 6 = 1$ or $6 \times 1/6 = 1$ $2 \div 2 = 1$ or $2 \times 1/2 = 1$ $1/3 \div 1/3 = 1$ or $1/3 \times 3 = 1$ $3/4 \div 3/4 = 1$ or $3/4 \times 4/3 = 1$

<p>This partly explain with invert and multiply works, at least for division problems equalling 1. Why does this transfer to all division problems?</p>	$a \times \frac{1}{a} \text{ (for all numbers?)}$
<p>Let's look at a division problem: $5/7 \div 2/3$?</p> <p>How does multiplicative inverse relate to this problem?</p>	$5/7 \div 2/3 =$ $5/7 \times 3/2 =$ $15/14 =$ $1 \frac{1}{14}$ <p>Didn't see multiplicative inverse anywhere there.</p>
<p>To understand the role of multiplicative inverses, we have to remember that any fraction problem can be written as a fraction.</p>	<p>$6 \div 3 = 2$ is the same as $6/3 = 2$ (Which is why EM presents division in the form) (This is how division is ALWAYS shown in algebra)</p> <p>We can take the problem $\frac{5}{7} \div \frac{2}{3}$ and rewrite it as:</p> $\frac{\frac{5}{7}}{\frac{2}{3}} \text{ (awkward, but permissible under the logic of the notation)}$
<p>One this we don't want, though, is a fraction in the denominator. We want to change that fraction to a whole (1). We are, essentially, repartioning (up) to a whole number with this problem. Easiest way is to use the multiplicative inverse of $2/3$, which is $3/2$. Multiply numerator and denominator to do this.</p>	$\frac{\frac{5}{7} \frac{3}{2}}{\frac{2}{3} \frac{3}{2}} \text{ we are essentially multiplying by the equivalent of 1}$
<p>When we do this, we find that we have ended up inverting (which really means finding the reciprocal of the divisor)</p>	$\frac{\frac{5}{7} \frac{3}{2}}{\frac{2}{3} \frac{3}{2}} = \frac{5}{7} \times \frac{3}{2} = \frac{15}{14} = 1 \frac{1}{14}$

<p>There is an algebraic way to understand invert and multiply.</p>	<p>We know we can say that $6 \div 3 = 2$ can be rewritten as $3 \cdot 2 = 6$</p> <p>$\frac{5}{7} \div \frac{2}{3} = x$ can be rewritten as $\frac{2}{3} \cdot x = \frac{5}{7}$ in the same way, so now we need to solve for X by multiplying it with its multiplicative inverse. To keep equality, we need to do this on both sides of the equation.</p> $\frac{3}{2} \cdot \frac{2}{3} x = \frac{5}{7} \cdot \frac{3}{2}$
<p>Are these division problems? handout and discussion (small group, then whole group)</p>	



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Notes for Invert and Multiply

Multiplicative Inverse Logic

Algebraic Logic