

Fractions

When dividing why do I have to learn the “invert and multiply” rule? Why can’t I divide two common fractions by using this; “top divided by top, bottom divided by bottom”?

The short answer is, “*You can.*”

It is an idea that works pretty good for a few problems, but for most situations it will not prove satisfactory.

Example: Just to prove that “*top divided by top, bottom divided by bottom*”

works, try this: $\frac{8}{9} \div \frac{2}{3} = ?$

$$\frac{8}{9} \div \frac{2}{3} = \frac{8 \div 2}{9 \div 3} = \frac{4}{3} = \boxed{1 \frac{1}{3}}$$

This is a correct answer. If you don't believe it, solve it using “invert and multiply” or use your calculator.

Example: Try this: $\frac{7}{8} \div \frac{3}{5} = ?$

Right away you can see nothing is really divisible: $\frac{7}{8} \div \frac{3}{5} = \frac{7 \div 3}{8 \div 5} = \frac{\frac{7}{3}}{\frac{8}{5}} = ?$

This type of mess is the reason we use the “*invert and multiply*” rule. The following simple examples prove that *if done correctly*, you can replace division with multiplication.

You will agree that: $10 \div 2 = 5$

It is also true that: $10 \times \frac{1}{2} = 5$

Either way you get the same answer.

If you do a similar problem, you might see a pattern develop:

$$\begin{aligned} 30 \div 3 &= 10 \\ 30 \times \frac{1}{3} &= 10 \end{aligned}$$

In each case, the answers were the same. The message is, “*If you do not want to divide, you can go with multiplication as long as you invert the number on the right.*” Since multiplication *always* works, that is why when it comes to fractions, we always invert and multiply.