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Methods
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# "Multiplying and Dividing Fractions and Mixed Numbers"

**Lesson Plan By:** Kelly R. Plank

**Lesson:** Multiplying and Dividing Fractions and Mixed Numbers

**Length:** 40 minutes

**Class Intended:** 7th Grade Mathematics

**Academic Standards: Standard 2 Computation**

Students solve problems involving integers, fractions, decimals, ratios, and percentages.

**7.2.1** *Solve addition, subtraction, multiplication, and division problems that use integers, fractions, decimals, and combinations of the four operations.*

**7.2.4** *Use estimation to decide whether answers are reasonable in problems involving fractions and decimals.*

**7.2.5** *Use mental arithmetic to compute with simple fractions, decimals, and powers.*

**Performance Objectives:**

All students will solve fraction equations by means of multiplication or division on the homework worksheet receiving 10 out of 15 correct.

**Assessment:**

The first is based off of group participation. If students are participating in class then I know, as the teacher, if they understand the material. It makes it easier to know it if is time to move on or not.

The last is completion of the homework and handing it in by next class period. They will have some free time to work on the homework in class. It will be over what was discussed in the class lecture.

**Advanced Preparation by Teacher:**

- Creating the homework worksheet.
- Writing the day's homework, agenda, and what needs to be turned in on one of the boards before class starts.
- Work out step-by-step the solution for the example problems that they groups will be doing in class.
- Work out the homework problems to help foresee any problems or questions that might arise.

**Procedure:**

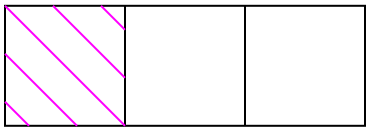
**Introduction/Motivation:**

Today we are going to be multiplying and dividing fractions. Who knows their multiplication facts? That is just about all that is needed to be able to multiply or divide fractions. Seems pretty easy right? Well I will also tell you something about them that makes

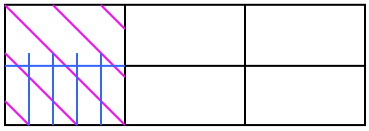
them even easier, they don't need common denominators. I will also show you a trick so that we only have to multiply and never divide.

**Step-by-Step Plan:**

1. Now I will list the four steps for multiplying and the three steps for dividing on the board. These steps can be used to solve any multiplication or division problem.
    a. Multiplication
        i. Convert mixed numbers and whole numbers into improper fractions
        ii. Cross simplify
        iii. Multiply numerators with numerators and denominators with denominators
        iv. Convert improper fractions into mixed numbers
    b. Division
        i. Step 1 of Multiplication
        ii. Keep it, Change it, Flip it
        iii. Steps 2 – 4 of Multiplication
2. First we are only going to focus on the multiplication. By looking at the first step it says to change any mixed numbers to improper fractions. How do we change 3 into an improper fraction (Comprehension)? What about changing 5 ½ into an improper fraction (Comprehension)? Remember to go clockwise, multiply the denominator with the whole number (2 * 5 = 10), and add that to the numerator (10 + 1 = 11), so we would have 11/2.
3. To multiply fractions, multiply the numerators and multiply the denominators. It looks something like this:
    a. $\frac{1}{3} * \frac{2}{5} = \frac{1 * 2}{3 * 5} = \frac{2}{15}$
4. Lets look at another example
    a. $\frac{1}{2} * \frac{1}{3} = \frac{1*1}{2*3} = \frac{1}{6}$
    b. It is the same as taking ½ of ⅓, which can be shown through a picture as well. ⅓ of an object looks something like this.



    c. Now we have to take ½ of this ⅓.



    d. Is this portion ¼ of the whole rectangle because there are four sections now, or do we need to do something to the other ⅔ of the rectangle? We do need to mark a line in half of the other ⅔ of the rectangle. Therefore all the sections are even. Now the section is

1/6 of the rectangle, which when we multiplied is exactly what we got.

5. So it may be a little bit backwards from what you are use to with whole numbers, but when multiplying fractions the answer gets smaller. Like the picture just showed. Then when dividing fractions the answer gets larger.
6. One thing that it is important to remember is that when we get an answer, to make sure it is in simplest form. We all know how to reduce fractions, which we can do after we multiply two fractions. We can also cancel/reduce before we multiply, which if we reduce in lowest terms we will automatically get an answer that is in lowest terms. We can only reduce with a numerator and a denominator across, not two denominators or two numerators.
7. One example of this is
    a. $\frac{1}{9} * \frac{3}{5} = \frac{1}{\cancel{9}3} * \frac{\cancel{3}1}{5} = \frac{1}{3} * \frac{1}{5} = \frac{1*1}{3*5} = \frac{1}{15}$
    b. Now the answer is in lowest terms because we reduced before hand.
8. The same goes when you have a mixed number. If you reduce before hand you will get an answer in lowest terms except for when it needs to be converted back to a mixed number.
    a. $\frac{1}{4} * 4\frac{2}{5} = \frac{1}{4} * \frac{22}{5} = \frac{1}{\cancel{4}2} * \frac{\cancel{22}11}{5} = \frac{1*11}{2*5} = \frac{11}{10} = 1\ \frac{1}{10}$
    b. Even though we canceled out a factor of 2 from 4 and 22 we still needed to convert our answer to a mixed number. Yet it was in simplest form, which is what canceling does.
9. Now for division. To divide by a fraction, multiply its multiplicative inverse, or reciprocal. That seems simple enough, but what is a multiplicative inverse or reciprocal? Who knows what it means?
10. An inverse is a number that when multiplied by the original fraction gets an answer of 1. In my own words, in a fraction when the numerator becomes the denominator and the denominator becomes the numerator. When looking at a fraction, it just flips over. So when we are dividing fractions we are going to flip the one on the right and multiply by the flipped fraction. It would look like this.
    a. $\frac{3}{4} \div \frac{1}{2} = \frac{3}{4} * \frac{2}{1} = \frac{3}{2} * \frac{1}{1} = \frac{3*1}{2*1} = \frac{3}{2} = 1\ \frac{1}{2}$
11. Think about a mixed number now. Do you think we would convert the mixed number to a fraction first and flip or flip and then convert it to a fraction? (Evaluation)
12. Does it matter what order we divide (flip) the fractions? (Evaluation)Yes it does matter.
13. Most of the time the problem will already be written out. Just remember Keep, Change, Flip. We are going to keep the first fraction the same, change the sign from division to multiplication, and flip the second fraction. Then we are ready to divide.

**Closure:**

Next class we will be having a review on adding, subtracting, multiplying, and dividing fractions and mixed numbers.

**Gardner's Multiple Intelligences:**

- Logical – Mathematical because this is obviously math. Students have to be able to use their multiplication and skills to multiply and divide fractions and mixed numbers. The logical part is also needed because in word problems students need to look at the answer and see if it is logically correct.
- Visual – Spatial through pictures showing diagrams of fractions of a fraction. They can see that multiplying creates a smaller number.
- Verbal Linguistic because I verbalize how to multiply and divide fractions and mixed numbers. I also have it writing up on the board so that it can be easily seen and read.

**Self-Reflection:**

- Was there a point that everyone got lost?
- Did everyone get involved in the lecture or did they talk and not do the problems?
- Were students participating on their own, or did I have to force them to participate? If so how can I make them want to participate?
- Did the students understand the concept of reciprocal?
- Was there any confusion on simplifying fractions before doing the asked operation?

**References**


Bailey, Day, Frey, Howard, Hutchens, McClain, Moore-Harris, Ott, Pelfrey, Price, Vielhaber, Willard, (2004). *Mathematics: Applications and Concepts (Indiana Edition) Course 2*. New York, New York; Columbus, Ohio; Chicago, Illinois; Peoria, Illinois; Woodland Hills, California: The McGraw-Hill Companies, Inc..

*Indiana's Academic Standards, Grade 7, Mathematics.*. Indiana Department of Education. http://dc.doe.in.gov/Standards/AcademicStandards/PrintLibrary/docs-math/2006-math-grade07.pdf

*Indiana's Standards and Resources.* Indiana Department of Education. http://dc.doe.in.gov/Standards/AcademicStandards/resources.aspx

http://www.coolmath4kids.com/fractions/index.html

http://www.k111.k12.il.us/King/math.htm#Fractions

Who wants pizza? Game has a good idea on using graph paper and coloring in the totals of a fraction and another fraction of that fraction

http://www.homeschoolmath.net/online/fractions.php

http://www.funbrain.com/fractop/
http://www.funbrain.com/cgi-bin/fract.cgi

Has a game where you play to shoot a soccer goal and block them. If you miss one it shows you the steps as to why it was answered incorrectly.

http://www.dositey.com/math/mistery2.html#s

Website needs paper and pencil along to do. Click on equation, solve it and click on the corresponding correct answer to reveal the hidden picture. (OLD SITE)