Reinventing and Connecting Rules for Dividing Fractions

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Operations with Fractions

COMMON CORE STATE STANDARDS ADDRESSED:

Mathematical Practices:

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

GRADE 4: Number and Operations—Fractions

• Extend understanding of fraction equivalence and ordering.
-Decompose a fraction into a sum of fractions with the
same denominator in more than one way, *3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.*
-Add and subtract mixed numbers with like denominators,
-Solve word problems involving addition and subtraction of fractions
• Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
Build fractions from unit fractions by applying and extending
previous understandings of operations on whole numbers.
-EX: 5/4 = 5 × (1/4).; 3 × (2/5) as 6 × (1/5),
Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators
Solve word problems involving multiplication of a fraction by a whole number

GRADE 5: The Number System
• Use equivalent fractions as a strategy to add and subtract fractions.

• Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
Use equivalent fractions as a strategy to add and subtract fractions.
• Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

GRADE 6, 7: The Number System
Apply and extend previous understandings of multiplication and
division to divide fractions by fractions.---Interpret and compute quotients of fractions, and solve word problems *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction*

PRE-REQUISITE SKILLS:

A1 (1) Your Uncle gives you ½ of his inheritance. How rich are you??
(2) you ate ¼ of a pizza and your sister ate 1/3 of a pizza. Who ate more pizza?
(3) Prove or disprove with a manipulative: ½ + 2/4 = 3/6

A2. Write a Real-life problem for each of the problems below (WHO CARES AND WHY/WCAY?) then model with a manipulative.

1. $\frac{3}{4} - \frac{1}{4}$ 2. $\frac{2}{3} + \frac{1}{3}$ 3. $\frac{5}{6} - \frac{2}{6}$

Notice any pattern? If so what? _____

Make-up a problem to test your theory, get the answer and then test it with a manipulative.

B. Consider this problem: Mary is diabetic and can only have 1/12 of a small pecan pie from her buffet party. She has the following-sized pieces left over from small pecan pies: $\frac{1}{2}, \frac{1}{3}, \frac{3}{4}, \frac{3}{5}, \frac{1}{6}$

Which portion of the leftovers below can she eat?

1. $\frac{1}{3} of \frac{1}{2}$ 2. 1/2 of 1/2 3. $\frac{3}{4}$ of $\frac{1}{3}$

4. $\frac{2}{3}$ of $\frac{3}{4}$ 5. $\frac{1}{2} of \frac{3}{5}$ 6. $\frac{1}{2}$ of $\frac{1}{6}$

Find a pattern (algorithm) that can help you to get the answer without using a manipulative.
_____

Make-up a problem to test your pattern, get the answer and then have a friend test it with a manipulative.

C. Use your pattern to compute the following and check with the manipulative. See any more patterns?

(1) a. $\frac{3}{2} of \frac{2}{4}$ b. $\frac{2}{2}$ of $\frac{3}{6}$ c $\frac{3}{4} of \frac{3}{3}$

d. $\frac{2}{3} of \frac{4}{4}$ e. $\frac{6}{6} of \frac{1}{2}$ f. $1\frac{1}{3} of \frac{1}{4}$

QUESTION: why did we skip adding/subtracting fractions with unlike denominators until AFTER developing the rule for multiplication?

D. **Using Measurement to Re-invent a Rule for Division.** The sign, ÷ , looks like a plus sign but it is division.

What questions can we ask to get an answer to a division problem?

Write a real-life problem (Who Cares and Why: WCAY) for 1 and #2 then compute 1- 10 with a manipulative.
Note patterns or algorithms you find-- Why not use these rule all of the time?

1. $8 \div 2$ 2. $\frac{3}{4} \div \frac{1}{12}$ 3. $\frac{8}{10} \div \frac{2}{5}$ 4. $\frac{4}{5} \div \frac{1}{5}$

5. $\frac{6}{10} \div \frac{1}{5}$ 6. $\frac{6}{12} \div \frac{2}{12}$ 7. $\frac{4}{6} \div \frac{2}{6}$ 8. $\frac{2}{3} \div \frac{1}{3}$ 9. $\frac{11}{12} \div \frac{1}{12}$ 10. $\frac{3}{5} \div \frac{2}{5}$

E. **Using Measurement to Re-invent another Rule for Division.**

1.	Use the Rule to compute:	Write the measurement question. Use Manipulative to compute the answer
2.	$\frac{1}{2} x \frac{4}{1}$	$\frac{1}{2} \div \frac{1}{4}$ How many sets of ¼ in ½?
3.	$\frac{2}{3} \div \frac{1}{3}$	$\frac{2}{3} \div \frac{1}{3}$
4.	$\frac{8}{12} x \frac{6}{1}$	$\frac{8}{12} \div \frac{1}{6}$
5.	$\frac{4}{5} x \frac{10}{2}$	$\frac{4}{5} \div \frac{2}{10}$
6.	$\frac{6}{10} x \frac{5}{1}$	$\frac{6}{10} \div \frac{1}{5}$
7.	$\frac{4}{6} x \frac{3}{2}$	$\frac{4}{6} \div \frac{2}{3}$
8.	$\frac{3}{4} x \frac{2}{1}$	$\frac{3}{4} \div \frac{1}{2}$
9.	$\frac{5}{10} x \frac{5}{3}$	$\frac{5}{10} \div \frac{3}{5}$

See any patterns?