

Dividing With and By Fractions

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Grade 5 math

Students will explore division fraction word problems to discover an algorithm.

5.c.7 (paraphrased) Use visual models and numbers to divide fractions by whole numbers and divide whole numbers by fractions.

5.at.4 (paraphrased) Solve problems – fractions divided by whole numbers –and- whole numbers divided by fractions using visual fraction models.

Language Objective: Students will write and speak a procedure for solving fraction division problems by multiplying.

BEFORE

The following activities are designed to extend student understanding after they have gained fluency with **multiplication** of fractions as demonstrated with visual fraction models and algorithm(s). The following activities relies on strong, intuitive, fraction multiplication skills.

The teacher shall have laid the foundation necessary built upon experiences in multiplying fractions using manipulatives.

Students should have mastered multiplication of fractions and should continue to rehearse skills.

DURING

Present kids with the following problems, one at a time. Allow pattern blocks.

1. *“Mr. Jarrett brought $\frac{1}{3}$ of a pumpkin pie to school. He shared it among 4 kids. What fraction of a whole pie will each kid get?” (easily translated to: each kid gets one fourth of one third. Multiplication. Let kids solve and show with visuals. Do NOT mention division.)*
2. *Mrs. Moore has $\frac{1}{2}$ pizza and wants to split it evenly between 3 kids. How much of a pizza will each kid get?*
3. *Mrs. Carlson has $\frac{1}{4}$ of a pan of brownies. She shares them amongst 2 parents. How much will each parent get?*

Ask: What mathematical sentence can you make to restate the problem?

For each problem above kids create a mathematical sentence. KEY: kids may derive “divide by 2” is same as “take $\frac{1}{2}$ of...” Don’t push it, however. There’s time yet for a kid to discover. Give three more problems. Use more words and, take it easy on the word “divide.”:

4. *There are three pizzas. Each student gets $\frac{1}{4}$ pizza. How many kids are served?*
5. *You have 5 cups of rice. You make $\frac{1}{2}$ cup servings. How many servings did you make?*
6. *I have seven pounds of chocolate. I share portions of $\frac{1}{5}$ pound. How many servings did I make?**

**This one cannot be solved easily with pattern blocks.*

Again, have kids create number sentence for each of second set. Again, someone may stumble on pattern worth investigating.

Why did you use a \div sign? Why did you use a \times sign?

For discussion, place number sentences for each of the six on the board together.

After each, write the multiplication sentence that better fits the kids' calculating of the answer, for example:

$$\frac{1}{3} \div 4 = \frac{1}{12} \text{ ---- } \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$$

$$\frac{1}{2} \div 3 = \frac{1}{6} \text{ ---- } \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$$

(continue...)

What patterns do you see?

Does that hold true for all the samples?

Can you create another problem and show that your idea works?

From this, further impress the change from division (unknown) to multiplication (known.)

Guide students to recognize the change of operation sign and the "flipping" of the divisor.

When the kids are developing a budding understanding of dividing fractions, give them more.

1. Timmy has $\frac{1}{3}$ cake to share between 3 friends. How much cake will each friend get?
2. $\frac{1}{2}$ of a sandwich is split among 4 monkeys. How much of a sandwich does each monkey get?
3. $\frac{1}{4}$ hour of video game time is shared by 3 teachers. How much video game time does each teacher get?
4. 4 bags of sand are used to fill pots to $\frac{1}{4}$ full. How many pots can be filled to $\frac{1}{4}$ full?
5. There are 5 boxes of Moon Pies. Each participant gets $\frac{1}{2}$ box of Pies. How many participants get Moon Pies?

How does your system work?

What changes do you need to make?

AFTER

Finally, extend the process to dividing with/by fractions with denominators other than 1. Also allow the samples to be out of context.

1. $2/5 \div 4 =$
2. $3/4 \div 7 =$
3. $6 \div 4/7 =$
4. $3 \div 2/3 =$
5. $1/2 \div 2/3 =$
6. $4/5 \div 1/2 =$

Assessment Opportunities:

Observe students' strategies. Invite procedural refinement.

Demonstrate how you divide fractions by multiplying them.

Write sentences describing how to divide fractions.

Create a division fraction word problem for a partner to solve with pattern blocks.