Dividing by Fractions Discovery

This lesson allows students to derive the algorithm for dividing fractions using visual fraction models and equations to represent the problem.

Subject(s): Mathematics
Grade Level(s): 6
Intended Audience: Educators
Suggested Technology: Document Camera, LCD Projector
Instructional Time: 1 Hour(s) 30 Minute(s)
Resource supports reading in content area: Yes
Freely Available: Yes
Keywords: division of fractions, modeling, dividing
Instructional Component Type(s): Lesson Plan, Assessment
Resource Collection: CPALMS Lesson Plan Development Initiative

ATTACHMENTS

Att. AInformal Assessment.docx
Att. BLesson Plan Outline.docx
Att. D Independent Practice.docx
Att. E Dividing Fractions Assessment.docx
Teaching Phase.docx
Formative Assessment.docx
ExtensionDeriving the process of division of fractions.docx
Summative Assessment.pdf

LESSON CONTENT

Lesson Plan Template: General Lesson Plan

Learning Objectives: What should students know and be able to do as a result of this lesson?

Students will represent division of fractions using models. Students will discover the algorithm from these examples and solve problems using fractions.

Prior Knowledge: What prior knowledge should students have for this lesson?

1. Students should have an understanding of the following vocabulary: dividend, divisor, quotient, numerator, denominator, mixed number, improper fraction, and simplest form.
2. 2) Students should be able to represent whole numbers and fractions using rectangular bar models.
3. 3) Students should be able to covert between mixed numbers and improper fractions, multiply fractions use cross cancellation when appropriate and write fractions in simplest form.

Guiding Questions: What are the guiding questions for this lesson?

- How many whole rectangles did you start with?
- How did you represent that?
- What size group are you making?
- How did you model that?
- How many groups of that size did you make?
- How would you write a mathematical sentence to represent the model you have drawn?
- Do you see a pattern?

- What conjecture can you make?

Teaching Phase: How will the teacher present the concept or skill to students?

Quick demonstration: ask 5 volunteers to come to the front of the classroom. Give each student a freezer pop (use pops with two sticks) and ask if they have ever eaten one. Then ask if they had eaten the entire freezer pop or split it in half. Because of the two sticks, one student may answer that he/she splits the freezer pop in half. Ask students to split the pops in half and have a student count the total number of halves.

- Ask students if they notice anything about the size of the ten pieces compared to the original 5 freezer pops. Student should note that they are smaller. Elicit that they are half the size of the original freezer pops.
- Ask a volunteer to write a number sentence to represent the 5 freezer pops divided in half and the answer on the board. (5 ÷ 1/2 = 10) If students need help determining the number sentence, ask "How many half-size freezer pops were contained in the original 5 whole freezer pops? Then, remind the class that when we ask how many of something is in something else, that is a division situation (e.g., if we want to know how many groups of 3 are in 12, we divide 12 by 3). Students will enjoy eating freezer pops before moving on to next examples.

Move from demonstration to lesson, see Attachment TeachingPhase.docx

Guided Practice: What activities or exercises will the students complete with teacher guidance?

Place students in pairs and pose another situation. I have a half a pound of candy and want to make 1/4 pound bags. How many 1/4 pound bags can I make? Model this situation and write a number sentence.

Monitor partners working on the task and ask the same type of guiding questions when students appear to be struggling with how to represent the situation.

There are two 1/4's in 1/2. Ask the partners to write a number sentence for the problem (1/2 ÷ 1/4 = 2). Ask for a volunteer to provide the number sentence. Ask the student why he/she placed the numbers in that order.

Students will do another problem: I have two thirds of a rectangle and I want to divide it by one half. How many pieces will I have? 2/3 ÷ 1/2 = 4/3, and 4/3 = 1 1/3.

Once again students should be multiplying second denominator by first numerator, then dividing by product of first denominator and second numerator.

Independent Practice: What activities or exercises will students complete to reinforce the concepts and skills developed in the lesson?

Students will do the following exercises independently and teacher will circulate to assist.

Students will draw a model first, then write the mathematical sentence and finally solve the sentence using the algorithm discovered.

Independent practice:

1. Sienna has 3 yards of ribbon she wants to cut into strips of 3/8 yard. How many strips will she get from the 3 yards of ribbon?
2. Winton has 3 1/2 cups of chocolate chips to make cookies. The recipe uses 1/3 cup of chips in each batch. How many batches of cookies can Winton make?

Answers:

1. 3 ÷ 3/8 = 3/1 x 8/3 = 24/3 = 8
2. 3 1/2 ÷ 1/3 = 7/2 x 3/1 = 21/2 = 10 1/2

For more independent work, see Attachment IndependentPractice.docx

Closure: How will the teacher assist students in organizing the knowledge gained in the lesson?

Now that we understand what to do when dividing fractions, I will give you my little keys to help you remember.

Step 1: Anchor the first fraction. (You are on a boat.)

Step 2: Flip-flop (use the reciprocal) of the second fraction. (You need the flip-flops on your boat.)

Step 3: Multiply (Have a good time (x) on your boat).

Go back over examples from the Teaching Phase and use the steps from above to help students see how they can help them remember the rule for dividing fractions.

Summative Assessment

Students will answer questions using rectangular models. See Attachment SummativeAssessment.pdf

Formative Assessment

At the beginning of class, activate prior knowledge using the Four Corners strategy.

Write this statement on the board, "I know how to multiply fractions, I understand their meaning, and I could teach my neighbor how to multiply fractions."

Label the corners in your room A) Strongly Agree B) Agree C) Disagree D) Strongly Disagree. Once students have chosen the corner that best represents their response to the statement, have students discuss for 1 minute why they chose that corner. Next ask corners A & D and B & C to join. Give students 2 minutes to discuss and list as many concepts and procedures associated with multiplying fractions as they can. Give students from each group an opportunity to tell all they know about multiplying fractions.

Students should be able to explain how to change a mixed number to an improper fraction and vice versa, put a whole number over one, use cross cancellations, and write a fraction in simplest form. Students should recognize the word *of* as an indication to multiply. (1/2 *of* 3/4 - means 1/2 x 3/4).

If students appear to be weak in any one of the concepts above, the teacher can insert a quick review of that concept and procedures. (Correct students who state finding a common denominator is necessary to multiply fractions. Remind them common denominators were needed for addition and/or subtraction.)

Feedback to Students

During direct instruction and guided practice, students will be working in pairs. The teacher moves between each pair of students, asking Guiding Questions and providing immediate specific feedback on student's progress.

Students will confer with partners to see if their models and results are the same. They will check their number sentences to see if they make sense. If they did not solve it correctly, students can make adjustments at that time.

ACCOMMODATIONS & RECOMMENDATIONS

Accommodations:

Fraction tiles could be used to help struggling students manipulate and visualize dividing by fractions.

Regroup students pairing a student who is able to accurately model and write a number sentence with a student who is not having the same success.

Allow students to use the fraction models until they experience success.

Extensions:

Have students test the algorithm developed in class with other types of fractions. For example, dividing a fraction by a whole number or dividing a number by an improper fraction.

Distribute pattern blocks for the students to manipulate. Present several division problems for students to model with the pattern blocks and have students rewrite each division problem as multiplication sentence. Example: 4 ÷ 1/2 = 8 can be written as 1/2 x 8 = 4.

See Attachment Extension-Deriving the process of division of fractions

Suggested Technology: Document Camera, LCD Projector

Special Materials Needed:

5 - 2-stick freezer pops for each class. (Used for demonstration at the beginning of class.)

1 set of circle fraction pieces for each pair of students.

1 set of Pattern Blocks - for each pair of students. (Used for Extension)

Further Recommendations:

It would be wise to have all supplies and materials gathered a day prior to the lesson.

Supplies needed:

- 5 (2-stick) freezer pops (for each class)
- 1 set of circle fraction pieces for each pair of students
- Set of examples to be used on white board or document camera
- Enough copies of Independent Practice for each student
- 1 set of Pattern Blocks for each pair of students (used with extension)

SOURCE AND ACCESS INFORMATION

Related Standards

Name	Description
MAFS.6.NS.1.1:	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?* **Remarks/Examples:** **Examples of Opportunities for In-Depth Focus** This is a culminating standard for extending multiplication and division to fractions. **Fluency Expectations or Examples of Culminating Standards** Students interpret and compute quotients of fractions and solve word problems involving division of fractions by fractions. This completes the extension of operations to fractions.