Mathematics: The Language of STEM
What part of the whole?
Krista Dausman

CONTENT AND TASK DECISIONS

Grade Level(s): 5th

Description of the Task: Students will be presented with problems to solve in which they will use paper/pencil and objects representing the real items mentioned to work out the tasks. They will be showing their math understanding by modeling the division problems with their drawings. Students will draw out their answers. This will help build their understanding of dividing a fraction by a whole number.

Indiana Mathematics Content Standards:

- 5.C.7: Use visual fraction models and numbers to divide a unit fraction by a non-zero whole number and to divide a whole number by a unit fraction.

Indiana Mathematics Process Standards:

- PS.1: Make sense of problems and persevere in solving them.
- PS.4: Model with mathematics.
- PS.7: Look for and make use of structure.

Mathematics Content Goals: Students will use drawings to model fraction division.

Language Objectives: In small groups, students will be drawing pictures to model fraction division problems.

Materials: Counters or unifix cubes (other manipulatives), paper and pencil, worksheet

THE LESSON

Before: This phase of the lesson should be designed to get students ready for problem solving. It also provides an opportunity for you to find out what they already know about the topic. Describe how you will accomplish each of the following in this phase of the lesson:

- **Activate prior knowledge** Students will model basic fractions by using manipulatives (example: what does ¾ look like? ⅚? ½? 4/6?). Students will draw pictures or use manipulatives model of the given fractions.
- **Be sure the problem is understood**
- **Establish clear expectations (**including the specific expectations you have for students to record their mathematical thinking in writing or drawing).
    - Students need to:
        - Model problems given using manipulatives of their choice.
        - After modeling, students need to draw a picture of the problem they have solved.
        - Students need to work collaboratively with the others at their group to convince the others of their answers.

During: This phase of the lesson should be designed for students to explore the focus task. Describe specifically what the students will be doing in this phase. Include a description of how the students will record their mathematical thinking in writing or drawing throughout the investigation. Describe how you will accomplish each of the following in this phase of the lesson:

- **Let go -** Students will start with a realistic task to solve using manipulatives and paper/pencil. Students will solve problems on paper, using drawings to model mathematics. Students will work in their table groups.
    - Task 1 - You have 1/2 of a candy bar. You and your table group (4 students) will be sharing this equally. How much of the whole candy bar is each portion? (We will bring in real candy bars for students to see/use to solve the problem.)
    - Task 2 - Your friend is over for the afternoon and you are looking for a snack. You see that there is 1/4 of a pizza left in the refrigerator. How much of the whole pizza will you each get?
    - Task 3 - There is 1/2 pan of brownies left. You and four of your friends are going to share them. What part of the whole pan of brownies does each person get?
- **Listen actively -** Teacher will walk around as students are working, listening to discussions and guiding students if needed.
    - Students should be engaging in conversations with group.
    - Students should be modeling math with either manipulatives or drawings.
- **Provide appropriate support** (including the specific questions you will ask to focus students' thinking on the critical features of the task or to help students who are stuck)**,**
        - What do you need to find out?
        - Why is that true?
        - Does it make sense that there are ____ pieces in the whole set? How do you know?
        - What connections do you notice between what you did with the manipulatives and your drawing?

- **Provide worthwhile extensions**.
    - How can we use a number sentence to show our work?
    - What connections do you see between the manipulatives & drawings and the number sentence?
    - Write your own story problem and solve it. Prove your answer with pictures or manipulative a.
    - How does the problem (or answer) change when the fraction is a mixed number?
        - What does that look like with manipulatives?
        - What does that look like with drawings?

After: In this portion of the lesson, students should work as a community of learners, discussing, justifying, and challenging various solutions to the problem all have just worked on. Here is where much of the learning will occur. It is critical to plan sufficient time for a discussion and make sure the During portion does not go on for too long. Describe how you will accomplish each of the following:

- **Promote a mathematical community of learners** Students will share out. their strategies for solving the problems. Each table group will show how they solved the problem. Students will be encouraged to share their strategy, struggle, and solution.
- **Listen actively without evaluation** (How will you respond to students' presentations of their solutions?) Teacher will ask clarifying questions to help the other students understand what the students have done to solve the problem. Students can ask questions of the group sharing as well.

- **Make connections** (What questions will you ask to help students make sense of the mathematics, make connections, see patterns, and make generalizations?) Teacher will ask: What do you see in the drawings that connects to what was asked? Does the drawing make sense? Is there another way to show it?
- **Summarize main ideas** (How will you formalize the main ideas of the lesson? How will you reinforce appropriate terminology, definitions, or symbols?) Teacher will discuss with students how we can show numerically what was done to solve the problem. Discuss what connections they see in the drawing and the number sentence.

ASSESSMENT

Observe: Describe how you will observe students to gather evidence about what they are learning, and describe the specific evidence of mathematical understanding that you will look for in your observations.

Ask: List the specific questions you will ask students to assess their learning.
* Students will complete an exit ticket with similar problems as tasks presented earlier to demonstrate their understanding. Students can show responses in picture form, number sentences (computation) or both.
* Exit ticket will also include students to write a statement about their understanding of fraction division.

Exit Ticket

Name _____

Solve the problems any way you choose.

1.) What is $\frac{1}{3} \div 5$?

2.) What is $\frac{1}{2} \div 7$?

3.) You and your friend want to share $\frac{1}{2}$ of the pizza that is left. What part of the whole pizza will you each eat?

4.) What is the main idea you learned today?