Multiplying With Proper Fractions

Strand: Computation and Estimation

Topic: Multiplying a whole number by a proper fraction to solve practical problems

Primary SOL: 5.6 The student will
b) solve single-step practical problems involving multiplication of a whole number, limited to 12 or less, and a proper fraction, with models.

Related SOL: 5.2a, 5.6a, 4.2b

Materials

- Paper
- Practice Problem activity sheet (attached)
- Colored chips or cubes

Vocabulary

denominator, factor, multiple, multiply, numerator, proper fraction, set models, sets, simplest form, whole number

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Present the following problem to the class: "Maria had a candy bar with 4 sections, and she gave her little sister Susie one-fourth of the candy bar. How many candy bar sections did she give Susie?"
2. Ask students to use pictures, numbers, and words to explain how they solved the problem. Ask, *"How do you know your answer is correct?"* As students work, circulate around the room making note of students who are having trouble getting started. Identify two to three student solutions you want to use in the whole-class discussion.
3. Ask the students you identified to draw their picture and explain how they solved the problem. Leave all solutions on the board for the whole-class discussion.
4. Instruct the class to think about their own work and the work on the board and pose these questions for them to consider: *"What do you notice about the answer in relationship to the problem?" "Why is the answer 1?"* Give the students time to discuss these answers with partners. Next, facilitate a whole-class discussion. Students should understand that each section of the candy bar is $\frac{1}{4}$ of Maria's whole candy bar.
5. Ask students to write a number sentence for the problem. Then, ask volunteers to share what they wrote. ($\frac{1}{4}$ x 4 = 1) One-fourth of four equals one whole. Remind students about working with the word "*of*" with whole numbers (e.g., 3 bags *of* 5 apples can be written as 3 x 5 = 15).
6. Next, tell the students Maria changed her mind. She has decided to give her sister $\frac{3}{4}$ of the candy bar. How many sections of the candy bar will her sister get? Ask students to

describe the difference between $\frac{1}{4}$ of the candy bar and $\frac{3}{4}$ of the candy bar. Discuss the strategies they used.

7. Review with students again the phrase "$\frac{1}{4}$ of 4 sections" and "$\frac{3}{4}$ of 4 sections." Look back at the previous problem and how $\frac{1}{4}$ of 4 sections is the same as $\frac{1}{4}$ x 4 = 1. Ask students to write a number sentence for the current problem.
8. Distribute paper to the students. Tell the students that four of them each have one-fourth of a candy bar. How much do they have altogether? Ask students to draw the fourths and figure out the answer. Discuss the answer and compare it to the candy bar problem. Ask, *"What is the difference between $\frac{1}{4}$ of 4 sections of a candy bar and 4 students each having $\frac{1}{4}$ of a candy bar?" "How are the problems the same and different?" "Why do both equal 1?"* Have students write the equation for the problem.
9. Distribute the Practice Problems activity sheet. Remind students they must draw a picture and show how they found the answer, write a number sentence for the problem, and write the answer to the problem in a sentence that explains what the number means. Some students may need the chips, others may want to draw the problem, while others may work the equation numerically. These problems can be used in small groups or with two to three students.
    a. Circulate and facilitate as needed. Pose questions to determine how students are thinking about the problems. Identify students who you want to share answers to the first two problems.
    b. When you see that everyone has finished the first two problems, pause the students long enough to discuss these two problems. Ask the students you identified to present their solutions for the two problems. Clarify why these are multiplication problems. Also, stress that the answer to the problem should be in a sentence that explains what the number means. For example, in question 1, the answer is: There are 3 inches of soil in all. After the discussion, instruct students to complete the remainder of the problems and then to review all problems to make sure they have recorded all information required.

Assessment

- **Questions**
    - What happens to a whole number when it is multiplied by a proper fraction?
    - Lilly used $\frac{1}{4}$ of a set of magnets for a science experiment. When the experiment failed, she tried it again with 4 times the amount of magnets. How many sets of magnets were used by Lilly in the repeat experiment? How does the product compare to the whole number in the equation?
- **Journal/writing prompts**
    - Explain how you would solve this problem. Tamara bought 10 bows for her hair, with $\frac{2}{5}$ of the bows being blue. How many bows are blue?
    - Explain the difference between 6 x $\frac{1}{2}$ and $\frac{1}{2}$ x 6.

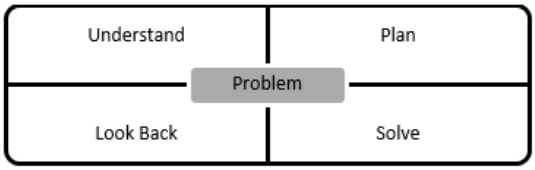
- **Other Assessments**
  - Write a word problem that could be solved using the equation $\frac{3}{4}$ x 12.
  - Sharla and Leonard were discussing the problem $\frac{5}{12}$ x 12. Sharla said, "$\frac{5}{12}$ of 12 is 5 because the numerator is 5." Leonard drew 12 squares and circled 5 of them. He said, "$\frac{5}{12}$ of 12 equals 5 because I circled 5 of the 12 squares." Who is correct, and why?

Extensions and Connections

- Explain how these questions are similar and/or different: 12 x $\frac{1}{6}$ and $\frac{1}{6}$ x 12. Draw the solutions.
- The product is 12. How many equations can you list using a fraction multiplied by a whole number?

Strategies for Differentiation

- Use manipulatives to show repeated addition for multiplying.
- Some students may need to continue to use manipulatives for problem solving before being able to represent their work with drawings or equations.
- Use a UPSC problem-solving graphic organizer for each word problem.



Note: The following pages are intended for classroom use for students as a visual aid to learning.

Practice Problems	
1. A student is preparing soil for a science experiment. He is making a layer of pebbles, a layer of humus, and a layer of clay soil. Each layer is measures $\frac{1}{2}$ inch. If the student makes 6 layers, how many inches tall will the soil be?	**2.** The fifth-grade students decided to have a Valentine's Day candy fundraiser. In Mr. Smith's class, 8 students each sold $\frac{3}{4}$ of a box of candy. How many whole boxes did these students sell?
Solve the problem.	Solve the problem.

Practice Problems	
3. Malik and Riley are comparing the number of chocolate candy pieces they have in their lunches. Malik has $\frac{5}{6}$ the amount that Riley has. Riley has 12 pieces. How many pieces of chocolate candy does Malik have?	**4.** Alana and Tanisha hand out pencils for the class. There are 10 pencils. They only need $\frac{4}{5}$ of the pencils. How many pencils do they need?
Solve the problem.	Solve the problem.

Practice Problems	
5. Mrs. Reddy has 9 cookies. She only needs $\frac{2}{3}$ of the cookies for dinner. How many cookies does Mrs. Reddy need for dinner?	**6.** The janitor is replacing the clocks in the school. He used $\frac{1}{4}$ of the 12 boxes of clocks the school ordered. How many boxes of clocks has he used to replace clocks in the school?
Solve the problem.	Solve the problem.

7. Jordan has planted $\frac{2}{6}$ of 12 packets of seeds donated for the school garden. How many packets did Jordan use?	**8.** Manny spent 9 hours reading last week. Kim spent $\frac{1}{3}$ of that time reading. How long did Kim read?
Solve the problem.	Solve the problem.

CHALLENGE **9.** The equation is: $\frac{2}{5}$ x 10.	**CHALLENGE** **10.** The equation is: 12 x $\frac{3}{4}$.
Write a story to go with the equation.	Write a story to go with the equation.