# *Area Model of Multiplication*

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| **Reporting categories** | Number and Number Sense, Computation and Estimation |
| **Overview** | Students relate the area of a rectangle to the multiplication of fractions or decimals. |
| **Related Standards of Learning** | 6.6, 6.7 |

## Objectives

- The student will gain experience in visualizing the meaning of multiplication of fractions.
- The student will connect the meaning of multiplication of fractions to the multiplication of whole numbers.

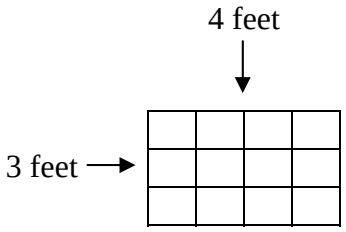
## Materials needed

- Plain copy paper
- Pencils
- Colored pencils
- Rulers (optional)
- Blank transparencies
- Overhead and regular markers
- Chart paper
- Sticky notes

Note: It is important to script this activity carefully and thoroughly for the students. The value of this activity is dependent upon clearly relating the divisions of paper to the operation of multiplication. Each step of the operation should be fully discussed.

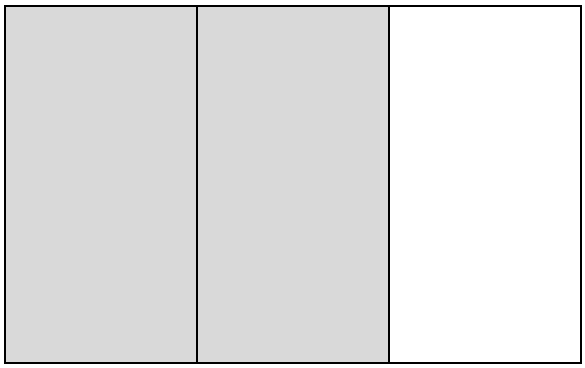
## Instructional activity

1. *Initiating Activity:* Lead the students in the following dialogue and steps: "We are using an area model for fractions. To understand this better, we should look at whole number multiplication as it relates to the area of a rectangle. How do we find the area of a rectangular piece of tile that is 3 feet wide by 4 feet long?" Demonstrate this on the board or overhead, as follows:

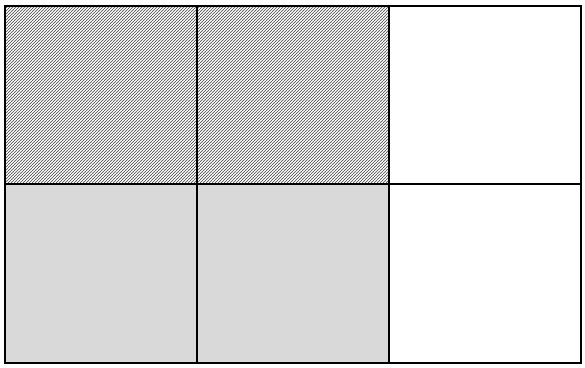


Notice that the area contains 12 squares or 12 square feet. We multiplied 3 feet by 4 feet to get the total of 12 square feet.

2. "Consider the problem $\frac{1}{2}$ of $\frac{2}{3}$. We can think of this as finding the area of a rectangle with a height of $\frac{1}{2}$ and a width of $\frac{2}{3}$."
3. "Draw a rectangle. Separate it with two vertical lines into three equal-sized sections, and shade or color two adjacent sections."



4. "The shaded portion represents which fraction?" ($\frac{2}{3}$).
5. "We can represent the first fraction ($\frac{1}{2}$) by separating the original rectangle with a horizontal line into two equal-sized sections. In this case, however, we will use stripes to shade only that part of the picture that shows a fraction of the original fraction — that is $\frac{1}{2}$ of the $\frac{2}{3}$.



6. "What is the width of the rectangle that is striped?" ($\frac{2}{3}$ of a unit)
7. "What is the height of that rectangle?" ($\frac{1}{2}$ of a unit)

8. "What is the area of that rectangle?" "Count the equal portions of the original rectangle that are striped." (2 out of 6, or $\frac{2}{6}$, or $\frac{1}{3}$)
9. "How does this answer relate to the original problem $\frac{1}{2} \times \frac{2}{3}$?" (It is equivalent.)
10. Discuss the equivalence thoroughly. If necessary, model additional problems.
11. *Closing Activity:* Ask the participants to work in groups to draw the following problems on chart paper. (Write the problems on the overhead for groups to copy). Post students' work on the board, and allow everyone to walk around and view the work of other groups. Use sticky notes or markers to point out any discrepancies or disagreements. Hold a class discussion after everyone has had the opportunity to work all the problems.

    $\frac{1}{3} \times \frac{3}{4}$

    $\frac{1}{2} \times \frac{1}{4}$

    $\frac{1}{4} \times \frac{3}{5}$

    $\frac{1}{2} \times \frac{5}{6}$

## Sample assessment

- Circulate around the classroom, observing students as they complete each part of the activity. Watch for understanding of each concept, pose questions about the activity, and encourage student explanations and questions. Note any misunderstandings and correct those immediately by engaging students in additional drawings and pictorial models.