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# Fraction Multiplication And Division: Beyond Invert And Multiply

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# Common Core State Standards

## Grade 4

- Solve word problems involving multiplication of a fraction by a whole number by using **visual models** and equations

## Grade 5

- Solve **real world problems** involving multiplication of fractions and mixed numbers by using **visual fraction models** or equations
- Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers divided by unit fractions.

# Multiplication of Fractions

## Grade 4

Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

## Grade 5

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

# Statements about Multiplication

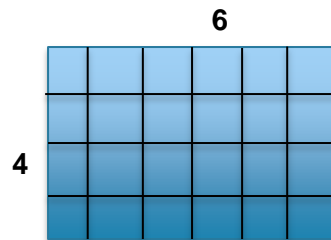
1. Multiplication is the same as repeated addition.

$$4 + 4 + 4 + 4 + 4 + 4$$

2. Times means “groups of.”



3. A multiplication problem can be shown as a rectangle.



# Statements about Multiplication

4. You can reverse the order of the factors and the product stays the same.

$$6 \times 4 = 4 \times 6$$

5. You can break numbers apart to make multiplying easier.

$$6 \times 4 = (5 \times 4) + (1 \times 4) = 20 + 4 = 24$$

$$14 \times 7 = (10 \times 7) + (4 \times 7) = 70 + 28 = 98$$

Create a context  
for the expression below

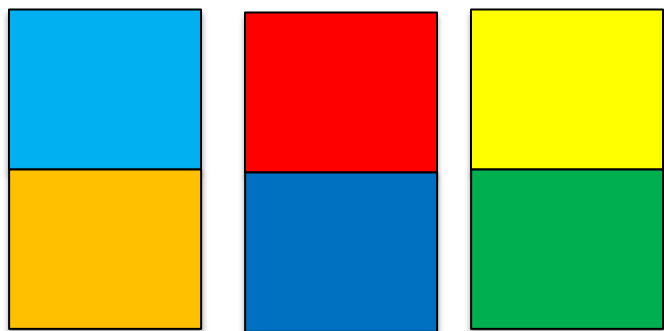
$$6 \times 4$$

# Your task

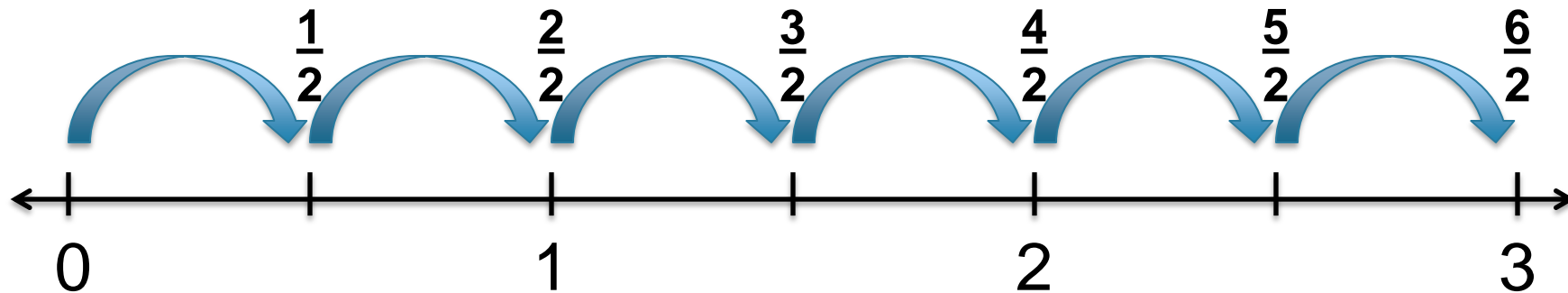
- Create a context for the expression

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

# Representing $6 \times \frac{1}{2}$



$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 3$$





# Group task

1. Create two contexts for your problem.
2. Write the contexts on the construction paper and show at least two different ways to represent each of them.

# Processing

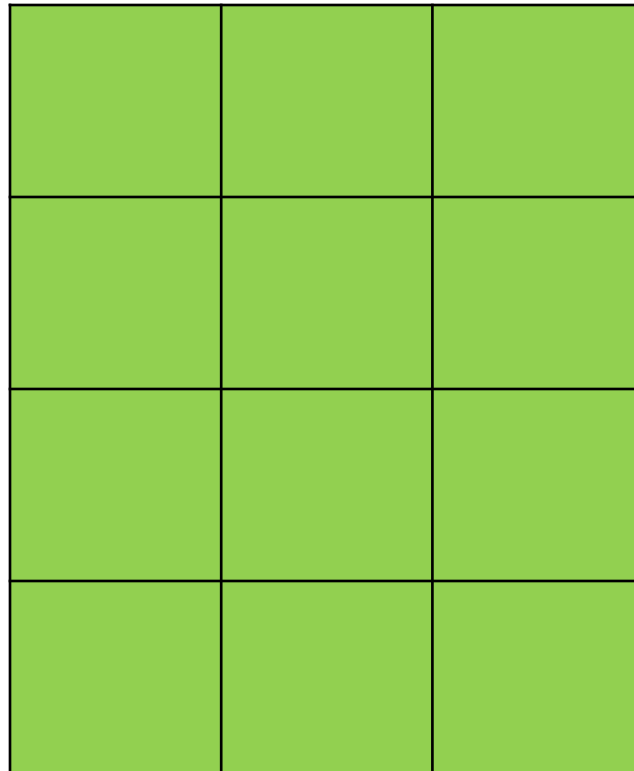
- What insights have you gained about using contexts to teach fraction multiplication?

# Number and Operations—Fractions

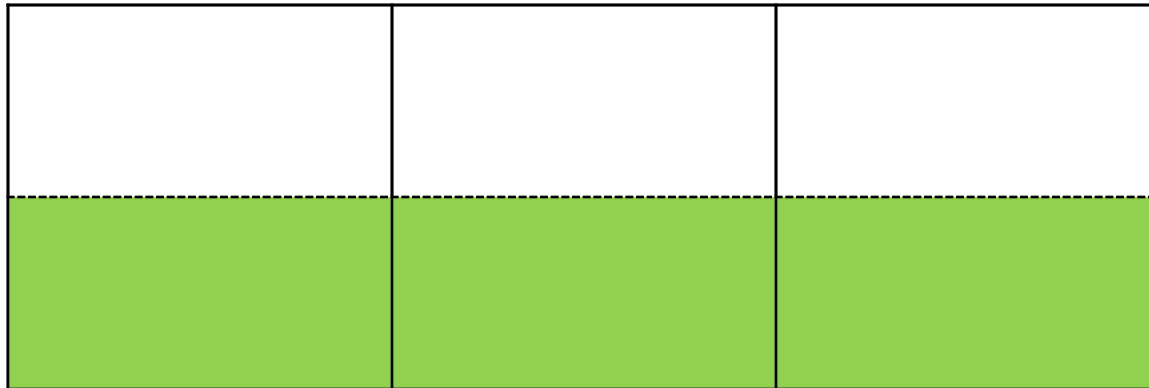
## Grade Five

Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

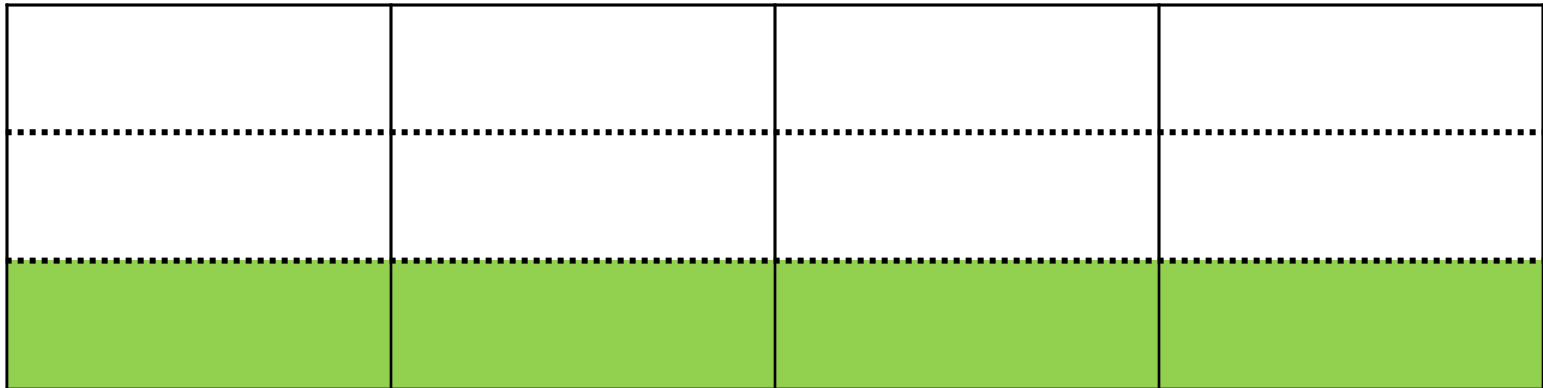
Find the area of a rectangle with side lengths 4 units by 3 units



Find the area of a rectangle with side lengths  $\frac{1}{2}$  unit by 3 units



Find the area of a rectangle with side lengths  $\frac{1}{3}$  unit by 4 units

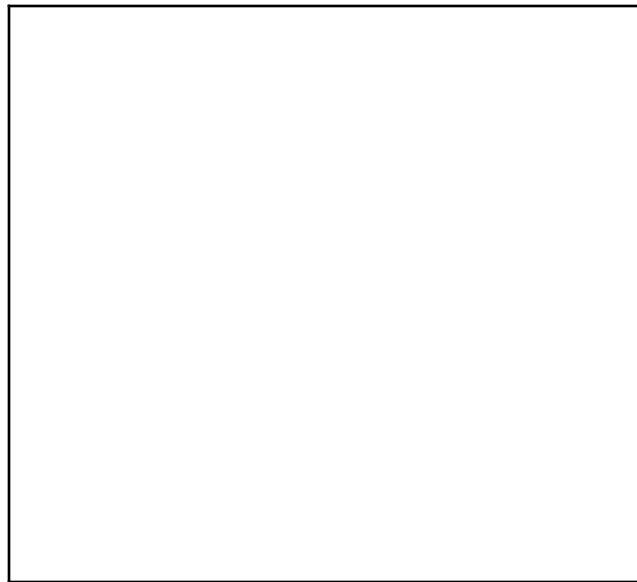


$$\frac{1}{3} \times 4 = \frac{4}{3}$$

# Find the area of rectangles with the following dimensions:

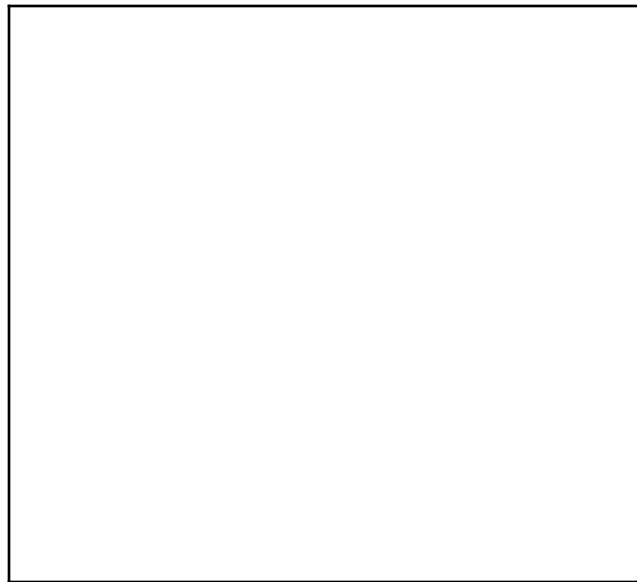
- $\frac{1}{2}$  unit x 5 units
- 3 units x  $\frac{1}{3}$  unit
- 2 units x  $\frac{1}{4}$  unit
- $\frac{1}{5}$  unit x 4 units

Find the area of a rectangle with side lengths  $\frac{1}{4}$  unit by  $\frac{1}{3}$  unit





Find the area of a rectangle with side lengths  $\frac{3}{5}$  unit by  $\frac{2}{3}$  unit



## Your task

Write an expression to represent the situation below:

I have 4 yards of ribbon. I need  $\frac{1}{2}$  yard to make one bow. How many bows can I make?

# Types of Division Contexts

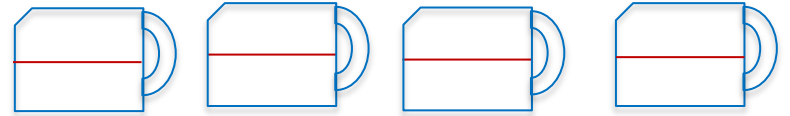
- Quotitive Division: The number in each group is known but the number of groups is unknown (may also be called measurement division)

# Contexts for $4 \div \frac{1}{2}$

How many half-dollars (50¢ pieces) can I get with \$4?



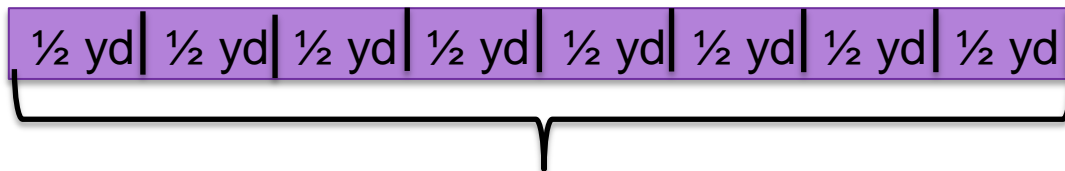
How many half-cups of flour are in 4 cups?



$$\begin{aligned} 4 - \frac{1}{2} &= 3 \frac{1}{2} \\ 3 - \frac{1}{2} &= 2 \frac{1}{2} \\ 2 - \frac{1}{2} &= 1 \frac{1}{2} \\ 1 - \frac{1}{2} &= \frac{1}{2} \end{aligned}$$

$$\begin{aligned} 3 \frac{1}{2} - \frac{1}{2} &= 3 \\ 2 \frac{1}{2} - \frac{1}{2} &= 2 \\ 1 \frac{1}{2} - \frac{1}{2} &= 1 \\ \frac{1}{2} - \frac{1}{2} &= 0 \end{aligned}$$

How many  $\frac{1}{2}$  yard long bows can I get from 4 yards of ribbon?



## Consider This Situation

I have  $\frac{1}{2}$  pound of candy to share equally among me and my two brothers. How much candy will each of us get?

1	
2	
3	

Each of us gets  $\frac{1}{6}$  pound of candy.

$$3 \times \frac{1}{6} = \frac{1}{2}$$

# Types of Division Contexts

- Quotitive Division: The number in each group is known but the number of groups is unknown (may also be called measurement division)
- Partitive Division: The number of groups is known but the number in each group is unknown (may also be called fair-sharing)

# Group task

1. Create several contexts for your problem.
2. Create a poster showing different ways to represent your problem.

# Processing

- What insights have you gained about using contexts to teach fraction division?



# Number and Operations—Fractions

## Grade Four

Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

## Grade Five

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

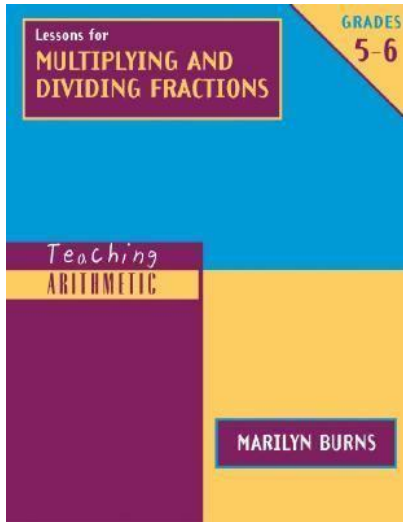
“An explanation is meaningless if it depends on knowledge unknown to students.”

*Ming Wu, University of California Berkeley*



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