Objective

Multiply a fraction by a whole number.

Common Core State Standards

■ **5.NF.4a** Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*

Number and Operations–Fractions

Multiplying Fractions by Whole Numbers

Using concrete models helps students develop the fundamental understanding that multiplying a fraction by a whole number can be represented as repeated addition. Models also can help them interpret the multiplication in different ways for different situations. Real-world situations and mathematical problems will provide students opportunities to practice these concepts.

Try It! *Perform the Try It! activity on the next page.*

Talk About It

Discuss the Try It! activity.

■ Write $\frac{2}{3} \times 4$ on the board. **Say:** *When we multiply a fraction by a whole number, we can multiply the numerator by the whole number and divide by the denominator. $\frac{2}{3} \times 4$ is the same as $2 \times 4 \div 3$. Write $\frac{2}{3} \times 4 = 2 \times 4 \div 3 = \frac{8}{3}$.*

■ **Say:** *When a fraction has a numerator that is larger than the denominator, it is an improper fraction and represents more than one whole.* **Ask:** *How many whole circles do you have in your model? How many thirds are remaining?* Write $\frac{8}{3} = 2\frac{2}{3}$.

Solve It

■ Reread the problem with students. Have them draw circles divided into thirds to answer the problem and write the multiplication sentence $\frac{2}{3} \times 4 = 2 \times 4 \div 3 = \frac{8}{3} = 2\frac{2}{3}$.

More Ideas

For other ways to teach multiplying a fraction by a whole number—

■ Have students use Fraction Tower® Equivalency Cubes to solve similar problems. Have them trace copies of a whole tower as needed.

■ Have students investigate different interpretations of the multiplication. For example, have them model $\frac{2}{3} \times 4 = 2 \times \frac{4}{3}$ by building the $\frac{4}{3}$ model first and doubling it.

Formative Assessment

Have students try the following problem.

Samira's cat spends about $\frac{5}{6}$ of each day napping. How many hours a day does Samira's cat sleep?

A. $\frac{5}{6} \times 24 = \frac{120}{144}$ **B.** $\frac{5}{6} \times 24 = \frac{96}{6}$ **C.** $\frac{5}{6} \times 24 = \frac{120}{6}$ **D.** $\frac{5}{6} \times 24 = \frac{144}{6}$

Try It! 20 minutes | Groups of 4

Here is a problem about multiplying fractions by whole numbers.

The fifth graders are making 4 batches of muffins for the school bake sale. They need $\frac{2}{3}$ cup of walnuts for each batch. How many cups of walnuts do they need?

Introduce the problem. Then have students do the activity to solve the problem. Distribute Fraction Circles, paper, and pencils to students.

Materials
- Deluxe Rainbow® Fraction Circles (1 set per group)
- paper (1 per group)
- pencils (1 per group)
- colored pencils (1 per group)
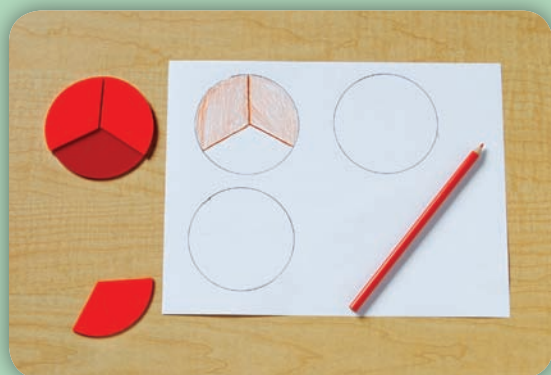
1. Say: *Find the Fraction Circle that represents thirds. Show how many cups of walnuts are needed for one batch of muffins.* **Ask:** *How many times do we need this amount?* Explain that since $\frac{2}{3}$ cup is needed for each of 4 batches, students need to show $\frac{2}{3}$ four times. Have students trace 3 whole circles onto a piece of paper, divide them into thirds, and color $\frac{2}{3}$ of the first circle orange.
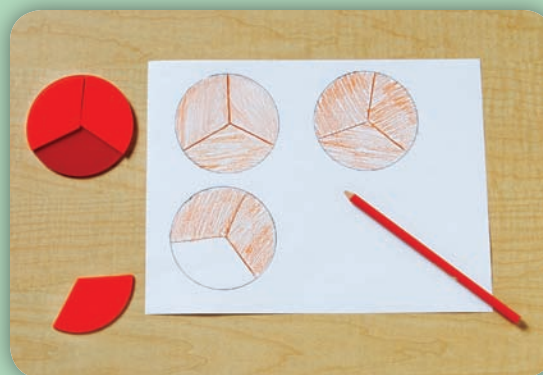
2. Say: *One way to multiply a fraction by a whole number is to multiply the numerator by the whole number and then divide by the denominator.* **Ask:** *What is our numerator? What is 2 times 4? How many more thirds do we need to add to the model?* Have students color 6 more thirds on their paper.
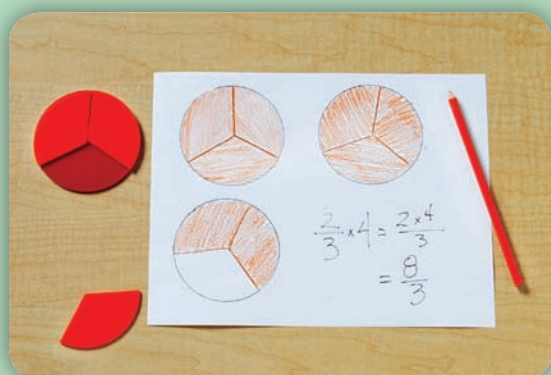
3. Ask: *How many equal parts do we have? What improper fraction does your model represent?* Have students write the number sentence, $\frac{2}{3} \times 4 = 2 \times 4 \div 3 = \frac{8}{3}$.

⚠ Look Out!

Watch for students who want to write the answer as 8 instead of $\frac{8}{3}$. Have them group their 2 thirds pieces into 4 groups and count them (one third, 2 thirds, etc.) to see they have 8 thirds. Then have them push 3 of the thirds pieces together two times to see that $\frac{8}{3} = 2\frac{2}{3}$.

Use the model to solve the problem. Write the answer as an improper fraction and as a mixed number. (Check students' work.)

1. Sarah ran 7 miles in one week. Her younger brother ran $\frac{3}{8}$ as far. How many miles did her brother run?
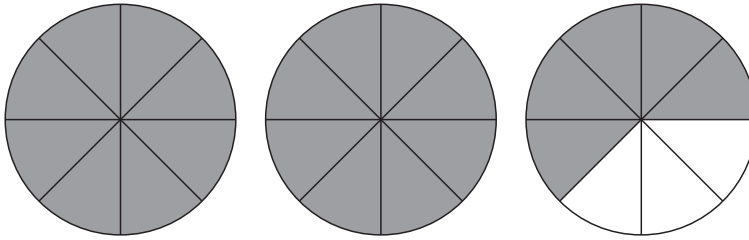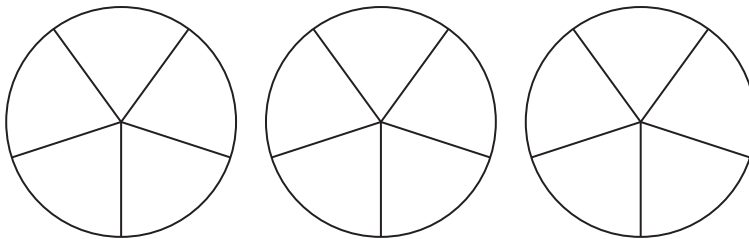
$\frac{3}{8} \times 7 = 3 \times 7 \div 8 =$ $\boxed{\frac{21}{8}}$ = $\boxed{2\frac{5}{8}}$ miles

Draw a model to solve the problem. Write the equation.

2. Jershom made 6 baskets in a basketball game. He got $\frac{2}{5}$ as many rebounds as baskets. How many rebounds did Jershom get?

(Check students' models.)

$\frac{2}{5} \times 6 =$ $\boxed{2 \times 6 \div 5}$ = $\boxed{\frac{12}{5}}$ = $\boxed{2\frac{2}{5}}$ rebounds

Multiply to complete the equations.

3. $\frac{2}{9} \times 6 =$ $\boxed{\frac{12}{9}}$ = $\boxed{1\frac{3}{9}}$

4. $\frac{3}{7} \times 21 =$ $\boxed{\frac{63}{7}}$ = $\boxed{9}$

5. $\frac{7}{8} \times 4 =$ $\boxed{\frac{28}{8}}$ = $\boxed{3\frac{4}{8}}$

6. $\frac{2}{5} \times 9 =$ $\boxed{\frac{18}{5}}$ = $\boxed{3\frac{3}{5}}$

7. $\frac{1}{7} \times 28 =$ $\boxed{\frac{28}{7}}$ = $\boxed{4}$

8. $\frac{2}{3} \times 27 =$ $\boxed{\frac{54}{3}}$ = $\boxed{18}$
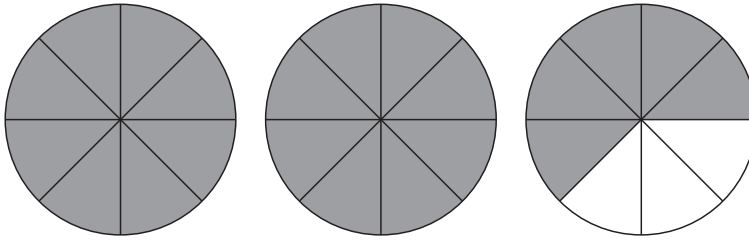
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Answer Key

Challenge! Create a story context for the expression $\frac{3}{8} \times 5$, and solve the problem.

Challenge: $\frac{3}{8} \times 5 = \frac{15}{8} = 1\frac{7}{8}$; stories will vary.

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Name _____

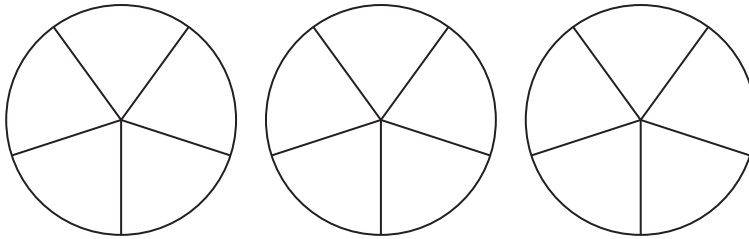**Use the model to solve the problem. Write the answer as an improper fraction and as a mixed number.**

1. Sarah ran 7 miles in one week. Her younger brother ran $\frac{3}{8}$ as far. How many miles did her brother run?

$\frac{3}{8} \times 7 = 3 \times 7 \div 8 =$ _____ = _____ miles

Draw a model to solve the problem. Write the equation.

2. Jershom made 6 baskets in a basketball game. He got $\frac{2}{5}$ as many rebounds as baskets. How many rebounds did Jershom get?

$\frac{2}{5} \times 6 =$ _____ = _____ = _____ rebounds

Multiply to complete the equations.

3. $\frac{2}{9} \times 6 =$ _____ = _____

4. $\frac{3}{7} \times 21 =$ _____ = _____

5. $\frac{7}{8} \times 4 =$ _____ = _____

6. $\frac{2}{5} \times 9 =$ _____ = _____

7. $\frac{1}{7} \times 28 =$ _____ = _____

8. $\frac{2}{3} \times 27 =$ _____ = _____

Name _____

Challenge!   Create a story context for the expression $\frac{3}{8} \times 5$, and solve the problem.

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