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OBJECTIVE

To review solving word problems involving multiplication and division of fractions

FOCUS LESSON

The Focus Lesson question leads students to interpret a word problem requiring dividing a fraction by a whole number. Help students to recognize that the situation calls for division. Students should be able to tell which number is the dividend and which is the divisor before using their knowledge of dividing fractions to find the quotient.

GUIDED PRACTICE

Students will use the model to help them find the product of two fractions. Discuss how they can shade the two fractions on the model to find the product. Review as necessary the steps to multiplying fractions without the use of a model.

Common Core Learning Standards

5.NF.6: Solve real world problems involving multiplication of fractions and mixed number, e.g., by using visual fraction models or equations to represent the problem.

5.NF.7: Apply and extend previous understanding of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

c. Solve real world problems involving division of unit fractions by nonzero whole numbers and division of whole numbers by unit fraction, e.g., by using visual fraction models and equations to represent the problem.

Lesson 18 Word Problems with Fractions

Focus Lesson

To solve word problems with fractions, determine which operation is needed to answer the problem.

Multiplication of fractions is used:

- to find the area of rectangles and
- to find what fraction of one amount is equal to another amount.

Division of fractions is used:

- to find a dimension of a rectangle when the area and another dimension are known and
- to find fractional amounts that are shared equally among groups.

When dividing fractions, the order the numbers are divided makes a difference. A fraction divided by a whole number does not give the same quotient as the whole number divided by the fraction.

ian has $\frac{1}{2}$ liter of a fruit smoothie in a container. He pours an equal amount of the entire fruit smoothie into 3 glasses. What part of the liter of fruit smoothie is in each glass? Write your answer as a fraction.

5.NF.7.c

$\frac{1}{2}$ liter

1 What operation is used to find the part of the liter of fruit smoothie that is in each glass?
division

2 Explain how you know. Division is used to find fractional amounts that are shared equally among groups.

3 Write an expression that can be used to find the part of the liter of fruit smoothie that is in each glass. $\frac{1}{2} \div 3$

4 Write the whole number in your expression in step 3 as a fraction. $\frac{3}{1}$

What part of the liter of fruit smoothie is in each glass?

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Number and Operations—Fractions UNIT 3 89

Guided Practice

In a survey, $\frac{1}{3}$ of the responders said they read before going to bed the night before. Of those that read, $\frac{2}{3}$ said they read a nonfiction book.

5.NF.7.c

The model shown below represents the total number of responders surveyed.

Use the model to show this situation. Label the part of the model that shows what fraction of the total responders surveyed read a nonfiction book before going to bed the night before.

1 Write an expression to represent the fraction of the total responders surveyed that read a nonfiction book before going to bed the night before. $\frac{1}{3} \times \frac{2}{3}$

2 How many boxes in the grid represent $\frac{1}{3}$ of the model?
3

3 If boxes in the model are shaded for each fraction, in how many boxes would the shading overlap? 2
How many total boxes are in the model? 9

Use the model to show the situation described in this problem.

What operation is used to combine the given fractions?

Shade $\frac{1}{3}$ of the model to represent the responders who said they read before going to bed.

Think of one fraction as rows in the model and the other as columns.

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Independent Practice

Solve the following problems.

- 1 Saul has 6 essay questions to answer. He has at most $\frac{1}{4}$ hour to answer each essay question. The model shown below can be used to determine the greatest number of hours Saul has to answer all 6 essay questions.



What is the greatest number of hours Saul has to answer all 6 essay questions?

$\frac{6}{4}$ hour(s) or equivalent

5.NF.6

DOK: 2

- 2 A bag of dog food contains 12 pounds of food. Reba's dog eats $\frac{1}{4}$ pound of this food each day. How many days can Reba feed her dog this food?

48 days

5.NF.7.c

DOK: 2

- 3 The length of a rectangular rug is $2\frac{2}{3}$ yards. The width of the rug is $\frac{2}{3}$ yard.

Circle an option in each set to make the following statement true.

The area of the rug is $(1\frac{2}{9}, 2, 2\frac{4}{9}, 3\frac{1}{3}, 4)$ square yards because this is the [sum, difference, product, quotient] of $2\frac{2}{3}$ and $\frac{2}{3}$.

5.NF.6

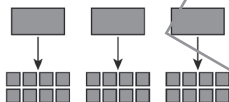
DOK: 2

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Independent Practice

- 4 A baker has 3 bags of flour to make bread. Each loaf of bread uses $\frac{1}{8}$ bag of flour. This model shows the greatest number of loaves of bread that can be made with all 3 bags of flour.



Based on this model, write a number sentence that shows the greatest number of loaves of bread that can be made with all 3 bags of flour.

$3 \div \frac{1}{8} = 24$

5.NF.7.c

DOK: 2

- 5 Two-fifths of the students in the school orchestra are in the fifth grade. Of these students, $\frac{1}{2}$ of them play a string instrument. Which of the following equations shows the fraction of students in the entire school orchestra that are fifth graders who play a string instrument? Select all that apply.

☒ A $\frac{1}{2} \times \frac{2}{5} = \frac{1}{5}$

B $\frac{1}{2} \div \frac{2}{5} = \frac{5}{4}$

☒ C $\frac{2}{5} \times \frac{1}{2} = \frac{1}{5}$

D $\frac{2}{5} \div \frac{1}{2} = \frac{4}{5}$

E $\frac{2}{5} \times \frac{2}{1} = \frac{4}{5}$

5.NF.6

DOK: 2

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ANSWER RATIONALE

- 1 Add all of the shaded areas of $\frac{1}{4}$ together, or multiply $\frac{1}{4}$ by 6 questions: $\frac{1}{4} \times 6 = \frac{6}{4}$.
- 2 Divide the total weight by the serving amount to find the total days: $12 \div \frac{1}{4} = 12 \times \frac{4}{1} = 48$.
- 3 Area is equal to the product of the length and the width: $2\frac{2}{3} \times \frac{2}{3} = \frac{8}{3} \times \frac{2}{3} = \frac{16}{9} = 1\frac{7}{9}$. So, the area of the rug is $1\frac{7}{9}$ square yards because this is the product of $2\frac{2}{3}$ and $\frac{2}{3}$.
- 4 The model shows that dividing 3 bags of flour by $\frac{1}{8}$ bag for each loaf results in 24 loaves of bread: $3 \div \frac{1}{8} = 3 \times \frac{8}{1} = 24$.
- 5 Multiply the two fractions to find the fraction of students in the entire orchestra that are in the fifth grade and play a string instrument. Options A and C show this, so they are correct. Options B and D show division instead of multiplication, so they are not correct. Option E shows multiplying by a reciprocal, so that is not correct.



- 6 Area is equal to length times width. So, the area, in square inches, of the sticker is shown by the equation $1\frac{3}{4} \times \frac{3}{4} = \frac{7}{4} \times \frac{3}{4} = \frac{21}{16}$.
- 7 The total amount of ribbon divided by the number of gifts is equal to the fraction of the entire spool of ribbon used for each gift. This is shown by $\frac{1}{6} \div 3 = \frac{1}{18}$, so option F is correct. To rewrite division as multiplication, multiply the first number by the reciprocal of the second number: $\frac{1}{6} \times \frac{1}{3} = \frac{1}{18}$, so option E is correct. Option A is not correct because the numbers are multiplied instead of divided. Option B is not correct because the numbers are in the wrong order and are multiplied. Option C is not correct because the numbers being divided are in the wrong order. Option D is not correct because the reciprocal of the wrong number is used and the numbers are in the wrong order.
- 8 Multiplication is used to find the fraction of the entire pie Evan ate today. A correct model will show $\frac{3}{4}$ shaded one color. Then, $\frac{1}{3}$ will be shaded a second color, and the solution, $\frac{1}{4}$ is shown by the overlap. This is shown in options B and E, so they are correct. Option A shows a solution of $\frac{1}{12}$, so this is not correct. Option C shows a solution of $\frac{1}{3}$, so this is not correct. Option D shows a solution of $\frac{3}{4}$, so this is not correct.

Hands-On Extension Activity

Present students with the following information:

Some students are walking to raise money for a charity. They walk around a track that is $\frac{1}{4}$ mile long. It takes an average of 5 minutes to walk one lap. Adam plans to walk for 8 miles. Breanna plans to walk for 60 minutes. Chris plans to walk for $1\frac{1}{2}$ hours. Danya plans to walk for $10\frac{3}{4}$ miles.

Have students work in pairs to write word problems involving multiplying and dividing fractions that use the information presented above. Have students exchange word problems and solve.

Independent Practice

- 6 The figure below shows the dimensions of a rectangular sticker.



5.NF.6
DOK: 2

Circle an option in each set to make the following statement true.

The area, in square inches, of the sticker is shown by the equation

$1\frac{3}{4} [+, \times, \div] \frac{3}{4} = [\frac{5}{2}, \frac{18}{4}, \frac{13}{3}, \frac{21}{16}, \frac{25}{16}]$.

- 7 Danielle had $\frac{1}{6}$ of a spool of ribbon. She wrapped 3 gifts using all this ribbon. Each gift used the same amount of ribbon. Which **two** of the following equations show the fraction of the entire spool of ribbon Danielle used for each gift? Select the two that apply.

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

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

C $3 \div \frac{1}{6} = \frac{18}{1}$

D $3 \times \frac{6}{1} = \frac{18}{1}$

E $\frac{1}{6} \times \frac{1}{3} = \frac{1}{18}$

F $\frac{1}{6} \div 3 = \frac{1}{18}$

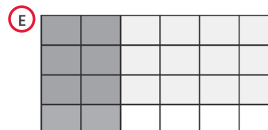
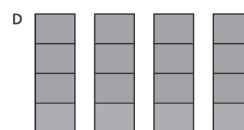
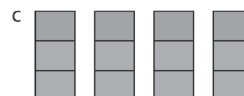
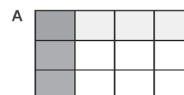
5.NF.7.c
DOK: 2

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Independent Practice

- 8 Evan had $\frac{3}{4}$ of a bag of popcorn. He ate $\frac{1}{3}$ of the bag today. Which **two** of the following models show the fraction of the entire bag of popcorn that Evan ate today? Select the two that apply.



5.NF.6
DOK: 2