Lesson 6

DIVIDE FRACTIONS NY-6.NS.1

INTRODUCTION

Real-World Connection

At Bina's yogurt store, each sample serving is $\frac{1}{4}$ cup. Bina has $2\frac{2}{3}$ cups left of strawberry and she wants to find out how many samples she can serve.

Bina can find the answer by dividing fractions. Let's practice the skills in the **Guided Instruction** and **Independent Practice** and, at the end of the lesson, see how many samples Bina can serve!

What I Am Going to Learn

- How to divide a fraction by a fraction

- How to solve problems involving dividing fractions

What I May Already Know

- I know how to multiply fractions.

- I know how to divide a unit fraction by a whole number.

- I know how to divide a whole number by a unit fraction.

Vocabulary in Action

- There are different ways to think about dividing fractions.

- You can use models to represent the problem.

- You can use equations and multiply by the **reciprocal**, known as the **multiplicative inverse**.

- When you multiply by the reciprocal, the result is 1: The reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$ because $\frac{2}{3} \times \frac{3}{2} = 1$.
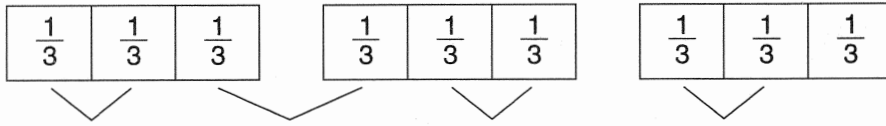
EXAMPLE

Divide: $3 \div \frac{2}{3}$

How many groups of $\frac{2}{3}$ are in 3?

A model can help you see the groups. Divide each whole into thirds.

$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$		$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$		$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

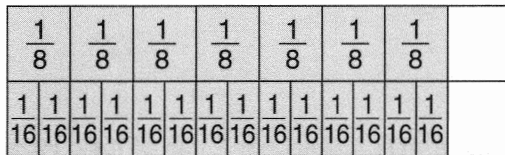There are 4 groups of $\frac{2}{3}$, with $\frac{1}{3}$ left.

One-third is half of a group of $\frac{2}{3}$, so there are $4\frac{1}{2}$ groups of $\frac{2}{3}$ in 3.

You can use a model to divide a fraction by a fraction.

EXAMPLE

Laura has $\frac{7}{8}$ gallon of juice at her birthday party. Each guest will get $\frac{1}{16}$ gallon of juice. How many guests can Laura serve?

In this problem, $\frac{7}{8}$ is divided by $\frac{1}{16}$. How many $\frac{1}{16}$s are there in $\frac{7}{8}$?

$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	
$\frac{1}{16}\frac{1}{16}$	$\frac{1}{16}\frac{1}{16}$	$\frac{1}{16}\frac{1}{16}$	$\frac{1}{16}\frac{1}{16}$	$\frac{1}{16}\frac{1}{16}$	$\frac{1}{16}\frac{1}{16}$	$\frac{1}{16}\frac{1}{16}$	

Each $\frac{1}{8}$ is made up of $\frac{2}{16}$, so there are 14 groups of $\frac{1}{16}$ in $\frac{7}{8}$.

So, Laura can serve 14 guests.

You can also divide a fraction by a whole number. If Laura knew she had 14 guests and $\frac{7}{8}$ gallon of juice, how much would each guest get?

$\frac{7}{8}$ gal $\div 14 = \frac{1}{16}$ gallon

When you divide by a number, you get the same answer by multiplying by the reciprocal of that number.

EXAMPLE

How wide is a rectangular sheet of wrapping paper that has a length of $\frac{3}{4}$ meter and an area of $\frac{1}{2}$ square meters?

Step One Since you are given the area and length, divide the area by the length to find the width.

$\frac{1}{2} \div \frac{3}{4}$

Step Two Multiply by the reciprocal of the divisor.

$\frac{1}{2} \div \frac{3}{4} = \frac{1}{2} \times \frac{4}{3} = \frac{4}{6} = \frac{2}{3}$

So, the width of the sheet of wrapping paper is $\frac{2}{3}$ meter.

GUIDED INSTRUCTION

1. A 2-pound wheel of cheese is divided into wedges, each weighing $\frac{2}{3}$ pound. How many wedges are there?

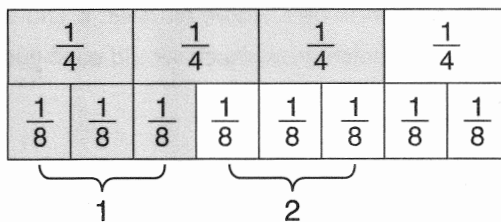**Step One** Show $2 \div \frac{2}{3}$ with a fraction model.

$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

     1   2   3
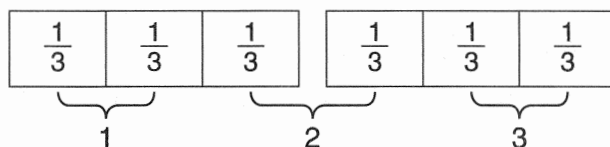
Step Two There are 3 groups of $\frac{2}{3}$ in 2.

$2 \div \frac{2}{3} = 3$

So, the wheel of cheese can be cut into [   ] wedges, each weighing $\frac{2}{3}$ pound.

2. A recipe uses $\frac{3}{4}$ cup of milk. Daniel has $\frac{3}{8}$ cup of milk. How much of the recipe can Daniel make?

Step One Make a fraction model dividing $\frac{3}{4}$ into eighths.

$\frac{1}{4}$		$\frac{1}{4}$		$\frac{1}{4}$		$\frac{1}{4}$	
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$

     1   2

Step Two There are 2 groups of $\frac{3}{8}$ in $\frac{3}{4}$.

Daniel has 1 group of $\frac{3}{8}$ cup of milk, not 2. So, he can make [   ] of the recipe.

$\frac{3}{8} \div \frac{3}{4} = \frac{1}{2}$, or [   ] is $\frac{1}{2}$ of [   ]

3. Which of the following represents $\frac{2}{3} \div \frac{3}{4}$?

(A) $\frac{2}{3} \times \frac{3}{4}$

(B) $\frac{2}{3} \times \frac{4}{3}$

(C) $\frac{3}{2} \times \frac{3}{4}$

(D) $\frac{1}{2}$

4. Scott says that $\frac{7}{10} \div 3 = \frac{7}{30}$ because $\frac{7}{30} \times 3 = \frac{7}{10}$. Is Scott correct? Why or why not?

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Learning Together

Working with a partner, write each of the fractions in the table below on a card. Also, make 30 equal signs. Then align all of the cards in sets that show these steps: division problems, equal signs, problems including the reciprocals of the divisors, equal signs, answers, and simplified answers (if applicable).

Example: $\frac{2}{3} \div \frac{1}{3} = \frac{2}{3} \times \frac{3}{1} = \frac{6}{3} = 2$

For cards:

$\frac{4}{5} \div \frac{5}{6}$	$\frac{3}{4} \times \frac{3}{2}$	$\frac{9}{8}$	$1\frac{3}{4}$
$\frac{4}{5} \div \frac{6}{5}$	$\frac{3}{4} \times \frac{2}{3}$	$\frac{35}{8}$	$4\frac{3}{8}$
$3 \div \frac{7}{12}$	$\frac{9}{10} \times \frac{4}{3}$	$\frac{40}{27}$	$1\frac{1}{8}$
$\frac{7}{12} \div \frac{1}{3}$	$\frac{1}{5} \times \frac{8}{7}$	$\frac{36}{7}$	$1\frac{13}{27}$
$\frac{3}{4} \div \frac{2}{3}$	$\frac{7}{8} \times \frac{5}{1}$	$\frac{36}{30}$	$5\frac{1}{7}$
$\frac{3}{4} \div \frac{3}{2}$	$\frac{10}{9} \times \frac{4}{3}$	$\frac{21}{12}$	$1\frac{1}{5}$
$\frac{10}{9} \div \frac{3}{4}$	$\frac{4}{5} \times \frac{6}{5}$	$\frac{6}{12}$	$\frac{1}{2}$
$\frac{9}{10} \div \frac{3}{4}$	$\frac{3}{1} \times \frac{12}{7}$	$\frac{7}{4}$	$\frac{2}{3}$
$\frac{1}{5} \div \frac{7}{8}$	$\frac{4}{5} \times \frac{5}{6}$	$\frac{8}{35}$	$\frac{24}{25}$
$\frac{7}{8} \div \frac{1}{5}$	$\frac{7}{12} \times \frac{3}{1}$	$1\frac{6}{30}$	
		$\frac{20}{30}$	

How Am I Doing?

Circle the sign that shows how you are doing with the skill.

What questions do you have?

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How can you divide a fraction by a fraction by multiplying by the reciprocal?

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Give an example of a situation in which you would divide a fraction by a fraction.

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STOP

I am stuck.

YIELD

I almost have it.

I understand the skill.

INDEPENDENT PRACTICE 1

1 Mrs. Roscoe can bake a batch of 8 cupcakes in $\frac{3}{4}$ hour. How many cupcakes can she bake in $5\frac{1}{4}$ hours?

    A   8

    B   28

    C   32

    D   56

2 Mr. Stephens has a board that is $8\frac{5}{6}$ feet long. He needs to cut it in $2\frac{1}{2}$-foot lengths. What is the greatest number of full lengths he can cut from the board?

    A   3

    B   4

    C   6

    D   10

3 A chef is making $22\frac{3}{4}$ cups of chowder. Each bowl of chowder holds $\frac{7}{8}$ cup. The restaurant charges $2.95 per bowl. How much money will the restaurant earn from selling all of the soup?

    A $26.00

    B $58.72

    C $67.11

    D $76.70

4 Noah is putting together a 27-minute radio show. How many $2\frac{1}{2}$-min interviews can he include, and how much time will be left over after the last interview?

Show your work.

Answer _____

INDEPENDENT PRACTICE 2

1   Which of the following represents $\frac{2}{5} \div \frac{3}{8}$?

A $\frac{2}{5} \times \frac{8}{3}$

B $\frac{6}{40}$

C $\frac{5}{2} \times \frac{3}{8}$

D $\frac{2}{5} \times \frac{3}{8}$

2   Which is the value of the expression $7 \div \frac{2}{3} = $?

A $\frac{2}{21}$ C $4\frac{1}{3}$

B $\frac{3}{14}$ D $10\frac{1}{2}$

3   If $\frac{136}{195} \times \frac{15}{17} = \frac{8}{13}$, which of the following equations is true?

A $\frac{8}{13} \times \frac{15}{17} = \frac{136}{195}$

B $\frac{136}{195} \div \frac{8}{13} = \frac{15}{17}$

C $\frac{8}{13} \div \frac{15}{17} = \frac{136}{195}$

D $\frac{136}{195} \div \frac{15}{17} = \frac{8}{13}$

4   Mr. Evans is canning pears. After processing the pears, he can fill 1 canning jar for every $2\frac{1}{2}$ pounds of fresh pears that he picked. If Mr. Evans picked 15 pounds of pears, how many canning jars can he fill after processing the pears?

A   5   C   12

B   6   D   17

5 Which of the following expressions can be used to find the quotient of $\frac{3}{4} \div \frac{2}{5}$?
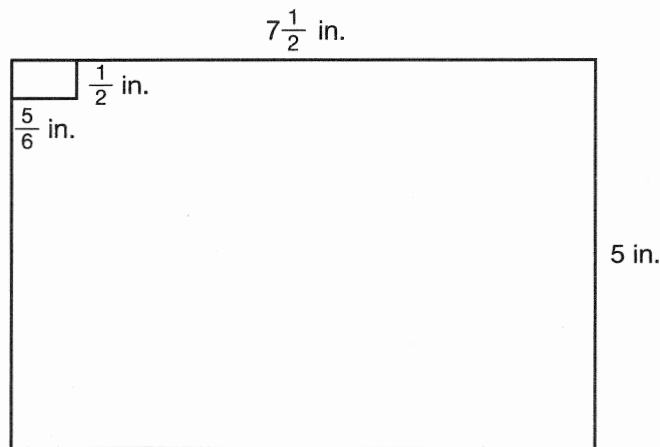
A $\frac{3+2}{4+5}$

C $\frac{3 \times 2}{4 \times 5}$

B $\frac{3-2}{4-5}$

D $\frac{3 \times 5}{4 \times 2}$

6 The image below shows the card on which Roberto will display stamps.

$7\frac{1}{2}$ in.

$\frac{1}{2}$ in.

$\frac{5}{6}$ in.

5 in.

Roberto puts same-sized stamps on the card with no gaps or overlaps.
How many stamps will fit on the card?

A 90

C 45

B 60

D 37

7 Connie divided $7\frac{2}{3}$ by $3\frac{1}{5}$ and found a quotient of $\frac{48}{115}$. What mistake, if any, did Connie make?

A   She converted the mixed numbers to fractions incorrectly.

B   She multiplied only the numerators and not the denominators.

C   She multiplied by the reciprocal of the dividend instead of the reciprocal of the divisor.

D   There is no mistake; her result is correct.

8   A rectangular rug has a length of $\frac{7}{8}$ yard and an area of $\frac{3}{4}$ square yard. What is its width? Use equations to find the answer.

Show your work.

Answer _____ yard

9   Represent $2 \div \frac{3}{4}$ in a word problem. Answer the problem.

Explain your answer.

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EXIT TICKET

Now that you have mastered dividing with fractions, let's solve the problem in the **Real-World Connection**.

At Bina's yogurt store, each sample serving is $\frac{1}{4}$ cup. Bina has $2\frac{2}{3}$ cups of strawberry yogurt left. How many more servings can she make?