



# Using an Algorithm to Divide Fractions

Let's divide fractions using the rule we learned.

## 11.1

## Math Talk: Multiplying Fractions

Find the value of each product mentally.

$$\bullet \frac{1}{8} \cdot 8$$

$$\bullet \frac{1}{8} \cdot \frac{8}{3}$$

$$\bullet \frac{9}{8} \cdot \frac{4}{3}$$

$$\bullet 1\frac{1}{8} \cdot \frac{4}{9}$$



## 11.2

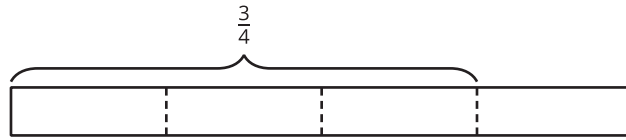
## Dividing a Fraction by a Fraction

Work with a partner. One person works on the questions labeled “Partner A” and the other person works on those labeled “Partner B.”

1. Partner A: Find the value of each expression by completing the diagram.

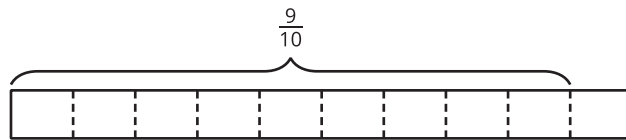
a.  $\frac{3}{4} \div \frac{1}{8}$

How many  $\frac{1}{8}$ s are in  $\frac{3}{4}$ ?



b.  $\frac{9}{10} \div \frac{3}{5}$

How many  $\frac{3}{5}$ s are in  $\frac{9}{10}$ ?



Partner B:

Elena said, “If I want to divide 4 by  $\frac{2}{5}$ , I can multiply 4 by 5 and then divide it by 2 or multiply it by  $\frac{1}{2}$ .”

Find the value of each expression using the strategy Elena described.

a.  $\frac{3}{4} \div \frac{1}{8}$

b.  $\frac{9}{10} \div \frac{3}{5}$

2. Discuss with your partner:

- a. Where in the diagram for  $\frac{3}{4} \div \frac{1}{8}$  can we see the multiplication by the denominator 8?
- b. Where in the diagram for  $\frac{9}{10} \div \frac{3}{5}$  can we see the division by the numerator 3?
- c. Where in each diagram do you see the quotient?

3. Complete this sentence based on what you noticed:

To divide a number  $n$  by a fraction  $\frac{a}{b}$ , we can multiply  $n$  by \_\_\_\_\_ and then divide the product by \_\_\_\_\_.

4. Select **all** the equations that represent the sentence you completed.

- $n \div \frac{a}{b} = n \cdot b \div a$
- $n \div \frac{a}{b} = n \cdot a \div b$
- $n \div \frac{a}{b} = n \cdot \frac{a}{b}$
- $n \div \frac{a}{b} = n \cdot \frac{b}{a}$



**11.3****Dividing with or without an Algorithm**

Calculate at least four quotients. Show your reasoning.

1.  $\frac{8}{9} \div 4$

2.  $\frac{9}{12} \div \frac{6}{12}$

3.  $3\frac{1}{3} \div \frac{2}{9}$

4.  $\frac{9}{2} \div \frac{3}{8}$

5.  $1\frac{2}{5} \div 3$

6.  $6\frac{1}{4} \div \frac{10}{3}$



## Are you ready for more?

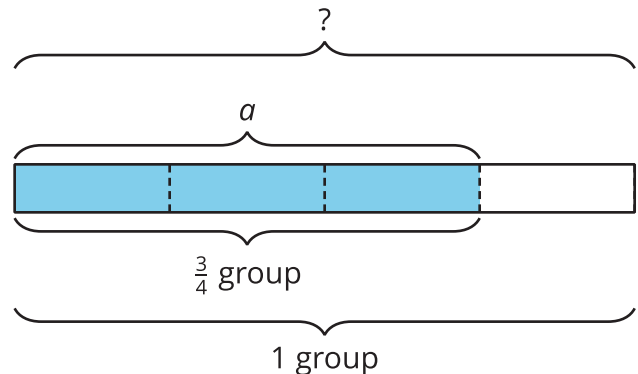
Suppose you have a quart of grape juice and a quart of milk. You pour 1 cup of the grape juice into the milk and mix it up. Then you pour 1 cup of this mixture back into the grape juice.

Which liquid is more contaminated? Explain how you know. (Note: 1 quart is equal to 4 cups.)

## Lesson 11 Summary

We can think of the division  $a \div \frac{3}{4} = ?$  in terms of finding the size of 1 group: “If there is  $a$  in  $\frac{3}{4}$  of a group, how much is in 1 group?” or “If  $\frac{3}{4}$  of a number is  $a$ , what is that number?”

On a tape diagram, we can show  $\frac{3}{4}$  of a group having a value of  $a$  and the whole group having an unknown value.



If  $\frac{3}{4}$  of a number is  $a$ , then to find the number, we can first divide  $a$  by 3 to find  $\frac{1}{4}$  of the number. Then we multiply the result by 4 to find the number.

These steps can be written as:  $a \div 3 \cdot 4$ . Dividing by 3 is the same as multiplying by  $\frac{1}{3}$ , so we can also write the steps as:  $a \cdot \frac{1}{3} \cdot 4$ , which is  $a \cdot \frac{4}{3}$ .

In other words:  $a \div \frac{3}{4} = a \cdot \frac{4}{3}$ .

In general, dividing a number by a fraction  $\frac{c}{d}$  is the same as multiplying the number by  $\frac{d}{c}$ , which is the **reciprocal** of the fraction. Reciprocals are numbers that when multiplied equal 1.