## Lesson 11: Using an Algorithm to Divide Fractions

### 11.1: Multiplying Fractions

Evaluate each expression.

1. $\frac{2}{3}⋅27$
2. $\frac{1}{2}⋅\frac{2}{3}$
3. $\frac{2}{9}⋅\frac{3}{5}$
4. $\frac{27}{100}⋅\frac{200}{9}$
5. $\left(1\frac{3}{4}\right)⋅\frac{5}{7}$

### 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.
	1.
	* $\frac{3}{4}÷\frac{1}{8}$
	* How many $\frac{1}{8}$s in $\frac{3}{4}$?
	* 
	1.
	* $\frac{9}{10}÷\frac{3}{5}$
	* How many $\frac{3}{5}$s 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.
	1. $\frac{3}{4}÷\frac{1}{8}$
	2. $\frac{9}{10}÷\frac{3}{5}$
1. What do you notice about the diagrams and expressions? Discuss with your partner.
2. 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 \_\_\_\_\_\_\_\_.
1. Select **all** the equations that represent the sentence you completed.
	* $n÷\frac{a}{b}=n⋅b÷a$
	* $n÷\frac{a}{b}=n⋅a÷b$
	* $n÷\frac{a}{b}=n⋅\frac{a}{b}$
	* $n÷\frac{a}{b}=n⋅\frac{b}{a}$

### 11.3: Using an Algorithm to Divide Fractions

Calculate each quotient. Show your thinking and be prepared to explain your reasoning.

1. $\frac{8}{9}÷4$
2. $\frac{3}{4}÷\frac{1}{2}$
3. $3\frac{1}{3}÷\frac{2}{9}$
4. $\frac{9}{2}÷\frac{3}{8}$
5. $6\frac{2}{5}÷3$
6. After biking $5\frac{1}{2}$ miles, Jada has traveled $\frac{2}{3}$ of the length of her trip. How long (in miles) is the entire length of her trip? Write an equation to represent the situation, and then find the answer.

#### Are you ready for more?

Suppose you have a pint of grape juice and a pint of milk. You pour 1 tablespoon of the grape juice into the milk and mix it up. Then you pour 1 tablespoon of this mixture back into the grape juice. Which liquid is more contaminated?

### Lesson 11 Summary

The division $a÷\frac{3}{4}=?$ is equivalent to $\frac{3}{4}⋅?=a$, so we can think of it as meaning “$\frac{3}{4}$ of what number is $a$?” and represent it with a diagram as shown. The length of the entire diagram represents the unknown number.



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.

The steps above can be written as: $a÷3⋅4$. Dividing by 3 is the same as multiplying by $\frac{1}{3}$, so we can also write the steps as: $a⋅\frac{1}{3}⋅4$.

In other words: $a÷3⋅4=a⋅\frac{1}{3}⋅4$. And $a⋅\frac{1}{3}⋅4=a⋅\frac{4}{3}$, so we can say that: $a÷\frac{3}{4}=a⋅\frac{4}{3}$

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.



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