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2. Write a multiplication expression for

each question.

# Unit 4, Lesson 7: What Fraction of a Group?

Let's think about dividing things into groups when we can't even make one whole group.

### 7.1: Estimating a Fraction of a Number

- 1. Estimate the following quantities:
  - a. What is  $\frac{1}{3}$  of 7?
  - b. What is  $\frac{4}{5}$  of  $9\frac{2}{3}$ ?
  - c. What is  $2\frac{4}{7}$  of  $10\frac{1}{9}$ ?

## 7.2: Fractions of Ropes

m.openup.org/1/6-4-7-2

Here is a diagram that shows four ropes of different lengths.



1. Compare the lengths of Ropes B, C, and D to the length of Rope A, and complete each statement. Then use the measurements shown on the grid to write a multiplication equation and a division equation for each statement.

a. Rope B is \_\_\_\_\_ times as long as Rope A.

Multiplication equation:

Division equation:

b. Rope C is \_\_\_\_\_ times as long as Rope A.

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Multiplication equation:

Division equation:

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	c. Rope D is times as long a	as Rope A.		
	Multiplication equation:	Divisior	n equation:	

2. Each equation can be used to answer a question about Ropes C and D. What could each question be?

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a. ? \cdot 3 = 9 and 9 \div 3 = ?
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b.  $? \cdot 9 = 3 \text{ and } 3 \div 9 = ?$ 

### 7.3: Fractional Batches of Ice Cream

One batch of an ice cream recipe uses 9 cups of milk. A chef makes different amounts of ice cream on different days. Here are the amounts of milk she used:

- Monday: 12 cups Thursday: 6 cups
- Tuesday:  $22\frac{1}{2}$  cups Friday:  $7\frac{1}{2}$  cups
- 1. How many batches of ice cream did she make on each of the following days? Write a division equation and draw a tape diagram for the question about each day. Then answer the question.





b. Tuesday

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What fraction of a batch of ice cream did she make on each of the following days?
Write a division equation and draw a tape diagram for the question about each day.
Then answer the question.

#### a. Thursday

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b. Friday

3. Write a division equation, and draw a tape diagram for each question. Then answer the question.

#### a. What fraction of 9 is 3?

b. What fraction of 5 is  $\frac{1}{2}$ ?

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#### Lesson 7 Summary

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It is natural to think about groups when we have more than one group, but we can also have a *fraction of a group*.

To find the amount in a fraction of a group, we can multiply the fraction by the amount in the whole group. If a bag of rice weighs 5 kg,  $\frac{3}{4}$  of a bag would weigh ( $\frac{3}{4} \cdot 5$ ) kg.



Sometimes we need to find what fraction of a group an amount is. Suppose a full bag of flour weighs 6 kg. A chef used 3 kg of flour. What fraction of a full bag was used? In other words, what fraction of 6 kg is 3 kg?

This question can be represented by a multiplication equation and a division equation, as well as by a diagram.



We can see from the diagram that 3 is  $\frac{1}{2}$  of 6, and we can check this answer by multiplying:  $\frac{1}{2} \cdot 6 = 3$ .

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In *any* situation where we want to know what fraction one number is of another number, we can write a division equation to help us find the answer.

For example, "What fraction of 3 is  $2\frac{1}{4}$ ?" can be expressed as  $? \cdot 3 = 2\frac{1}{4}$ , which can also be written as  $2\frac{1}{4} \div 3 = ?$ .

The answer to "What is  $2\frac{1}{4} \div 3$ ?" is also the answer to the original question.



The diagram shows that 3 wholes contain 12 fourths, and  $2\frac{1}{4}$  contains 9 fourths, so the answer to this question is  $\frac{9}{12}$ , which is equivalent to  $\frac{3}{4}$ .

We can use diagrams to help us solve other division problems that require finding a fraction of a group. For example, here is a diagram to help us answer the question: "What fraction of  $\frac{9}{4}$  is  $\frac{3}{2}$ ?," which can be written as  $\frac{3}{2} \div \frac{9}{4} = ?$ .



We can see that the quotient is  $\frac{6}{9}$ , which is equivalent to  $\frac{2}{3}$ . To check this, let's multiply.  $\frac{2}{3} \cdot \frac{9}{4} = \frac{18}{12}$ , and  $\frac{18}{12}$  is, indeed, equal to  $\frac{3}{2}$ .

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# Unit 4, Lesson 7: What Fraction of a Group?

- 1. A recipe calls for  $\frac{1}{2}$  lb of flour for 1 batch. How many batches can be made with each of the following amounts?
  - a. 1 lb
  - b.  $\frac{3}{4}$  lb
  - c.  $\frac{1}{4}$  lb
- 2. Whiskers the cat weighs  $2\frac{2}{3}$  kg. Piglio weighs 4 kg. For each question, write a multiplication and a division equation, decide whether the answer is greater or less than 1, and then answer the question.
  - a. How many times as heavy as Piglio is Whiskers?

b. How many times as heavy as Whiskers is Piglio?

- 3. Andre is walking from home to a festival that is  $1\frac{5}{8}$  kilometers away. He takes a quick rest after walking  $\frac{1}{3}$  kilometers. In this situation, which question can be represented by the equation:  $? \cdot 1\frac{5}{8} = \frac{1}{3}?$ 
  - A. What fraction of the trip has Andre completed?
  - B. How many more kilometers does he have to walk to get to the festival?
  - C. What fraction of the trip is left?

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D. How many kilometers is it from home to the festival and back home?

4. Draw a tape diagram to represent and answer the question: What fraction of  $2\frac{1}{2}$  is  $\frac{4}{5}$ ?

5. How many groups of  $\frac{3}{4}$  are in each of the following quantities?

a.  $\frac{11}{4}$ 

b.  $6\frac{1}{2}$ 

(from Unit 4, Lesson 6)

6. Which question can be represented by the equation  $4 \div \frac{2}{7} = ?$ 

- A. What is 4 groups of  $\frac{2}{7}$ ?
- B. How many  $\frac{2}{7}$ s are in 4?
- C. What is  $\frac{2}{7}$  of 4?
- D. How many 4s are in  $\frac{2}{7}$ ?

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(from Unit 4, Lesson 4)
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