## Lesson 4: What Fraction of a Group?

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

### 4.1: Estimating a Fraction of a Number

1. Estimate the quantities:
	1. What is $\frac{1}{3}$ of 7?
	2. What is $\frac{4}{5}$ of $9\frac{2}{3}$?
	3. What is $2\frac{4}{7}$ of $10\frac{1}{9}$?
2. Write a multiplication expression for each of the previous questions.

### 4.2: Fractions of Ropes

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



1. Complete each sentence comparing the lengths of the ropes. Then, use the measurements shown on the grid to write a multiplication equation and a division equation for each comparison.
	1. Rope B is \_\_\_\_\_\_\_ times as long as Rope A.
	2. Rope C is \_\_\_\_\_\_\_ times as long as Rope A.
	3. Rope D is \_\_\_\_\_\_\_ times as long as Rope A.
2. Each equation can be used to answer a question about Ropes C and D. What could each question be?
	1. $?⋅3=9$ and $9÷3=?$
	2. $?⋅9=3$ and $3÷9=?$

### 4.3: 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
* Tuesday: $22\frac{1}{2}$ cups
* Thursday: 6 cups
* Friday: $7\frac{1}{2}$ cups
1. How many batches of ice cream did she make on these days? For each day, write a division equation, draw a tape diagram, and find the answer.
	1. Monday
	* 
	1. Tuesday
	* 
2. What fraction of a batch of ice cream did she make on these days? For each day, write a division equation, draw a tape diagram, and find the answer.
	1. Thursday
	* 
	1. Friday
	* 
3. For each question, write a division equation, draw a tape diagram, and find the answer.
	1. What fraction of 9 is 3?
	* 
	1. What fraction of 5 is $\frac{1}{2}$?
	* 

### Lesson 4 Summary

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 ($\frac{3}{4}⋅5)$ 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.

$?⋅6=3$ $3÷6=?$



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

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 $?⋅3=2\frac{1}{4}$, which can also be written as $2\frac{1}{4}÷3=?$.

The answer to “What is $2\frac{1}{4}÷3$?” 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 $\frac{3}{2}÷\frac{9}{4}=?$.



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



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