Part 1: Division — 6 sessions

Objectives

- Divide a whole number by a unit fraction.
- Divide a fraction by a whole number.
- Divide a fraction by a unit fraction.
- Divide a whole number by a fraction.
- Divide a fraction by a fraction.

Materials

- Fraction circles

Homework

- Workbook Exercise 1
- Workbook Exercise 2
- Workbook Exercise 3

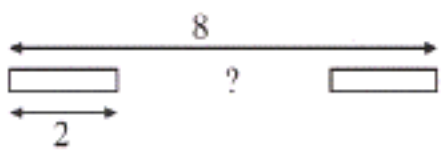
Notes

In *Primary Mathematics 4A*, students learned how to multiply a fraction by a whole number. In *Primary Mathematics 5A*, they learned how to multiply a fraction by a fraction, relate division to fractions, and divide a fraction by a whole number.

In this section, students review dividing a fraction by a whole number, and also learn to divide a fraction by a fraction, starting with division by a unit fraction (a fraction with 1 in its numerator).

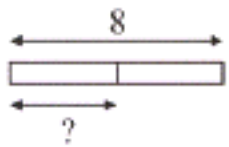
Division of whole numbers can be interpreted in two contexts: sharing or grouping.

In grouping, we are given the total number and the number that goes into each part, and want to find how many parts there are. In $8 \div 2$, we are finding how many 2's there are in 8, or 8 is how many 2's, that is, what number times 2 is 8?



$8 \div 2 = ?$ How many 2's in 8?, or, 8 is how many 2's?, or $? \times 2 = 8$
$8 \div 2 = \mathbf{4}$ There are **4** 2's in 8.

In sharing, we are given a total number and the number of parts, and need to find the value in each part. In $8 \div 2$, we are finding the "what" of "8 is 2 of what?"



$8 \div 2 = ?$ 8 is 2 of what? Or, $2 \times ? = 8$
$8 \div 2 = \mathbf{4}$ 8 is 2 **4**'s

Division of fractions can also be interpreted in two contexts:

Total ÷ ____ = ?

means

How many ___'s are there in the total? (? × ___ = total)

or

The total is ___ of what? (total = ___ of ? or, total = ___ × ?

Examples:

1. $8 \div \frac{1}{2} = ?$

(a) How many $\frac{1}{2}$'s are there in 8?

(e.g.: There are 8 apples. Each person gets $\frac{1}{2}$ of an apple. How many people are there?)

If we divide 8 by $\frac{1}{2}$, we can think of this as putting $\frac{1}{2}$ into each part (grouping by $\frac{1}{2}$), and finding how many parts there are. Since there are 2 halves in one whole, there would be 2×8 halves in 8 wholes.

1 whole $\longrightarrow$ 2 halves

8 wholes $\longrightarrow 8 \times 2$ halves

So, the answer can be found by multiplying by 2:

$8 \div \frac{1}{2} = 8 \times 2 = 16$

There are 16 halves in 8.

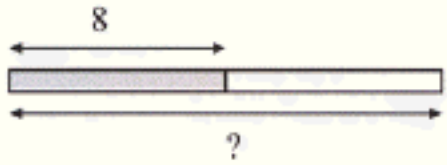
(b) 8 is $\frac{1}{2}$ of what?

(e.g.: If half of a carton of milk is 8 cups, how many cups are in the whole carton?)

If half of something is 8, then

$\frac{1}{2} \longrightarrow 8$

$1 \longrightarrow 8 \times 2$



So again, we can solve this by multiplying by 2.

$8 \div \frac{1}{2} = 8 \times 2 = 16$

8 is half of 16

2 is the *reciprocal* of $\frac{1}{2}$. The product of a number and its reciprocal is 1: $2 \times \frac{1}{2} = 1$

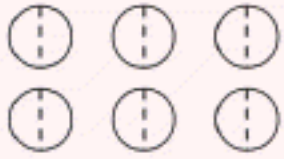
To divide by $\frac{1}{2}$, we multiply by its reciprocal, 2.

Activity 1.1a **Divide a whole number by a unit fraction**

1. Discuss the division of a whole number by a unit fraction as "How many ___'s are there in the total?"
   - Write the division expression $6 \div 2 = 3$ and illustrate its solution with circles as a grouping problem.
   - Tell students you have 6 oranges (apples, pizzas, cakes…) and want to put them into groups of 2. How many groups will there be? There will be 3 groups. There are 3 groups of 2 in 6, or there are 3 twos in 6. We can think of this division problem as finding how many groups of 2 make 6.

$6 \div 2 = ?$
How many 2's are in 6?
There are 3 groups of 2.
$6 \div 2 = 3$

   - Now write the expression $6 \div \frac{1}{2}$.
   - Tell students that now we want to put $\frac{1}{2}$ an orange into each group. Divide each of the 6 circles into half. How many groups will there be? There will be 12 groups. There are 12 halves in 6.
   - We divided each whole into $\frac{1}{2}$, so for each whole we formed 2 groups. For 6 wholes, we formed 6×2 groups. So $6 \div \frac{1}{2}$ is the same as 6×2.
   - Point out that when you divide by a number less than 1, the answer (quotient) will be larger than the number you are dividing. 12 is larger than 6.
   - Remind your students that division is related to multiplication.
     - So for $6 \div 2 =$ ____, we can think: ____ $\times 2 = 6$, or, how many 2's are there in 6.
     - For $6 \div \frac{1}{2} =$ ____, we can think: how many $\frac{1}{2}$'s are there in 6?



$6 \div \frac{1}{2} = ?$
How many $\frac{1}{2}$'s are in 6?
There are 12 groups of $\frac{1}{2}$ in 6.
$6 \div \frac{1}{2} = 12$
$6 \div \frac{1}{2} = 12 = 6 \times 2$

2. Discuss division of a whole number by a unit fraction as "The total is ___ of what?"
   - Tell students that $6 \div 2 = 3$ can also mean that we have 2 parts and want to find the value in each part. That is, $6 = 2 \times$ ____, or, 6 is 2 of *what*?
   - Now, tell students: we are told that $\frac{1}{2}$ of a container is 6 liters.
   - Draw a bar diagram on the board to illustrate this.
   - We want to find the amount in the whole container. That is, $\frac{1}{2}$ of *what* is 6, or $\frac{1}{2} \times$ ____ $= 6$. This problem