5.NF How Much Pie?

Alignments to Content Standards: 5.NF.B.3

Task

After a class potluck, Emily has three equally sized apple pies left and she wants to divide them into eight equal portions to give to eight students who want to take some pie home.

a. Draw a picture showing how Emily might divide the pies into eight equal portions. Explain how your picture shows eight equal portions.

b. What fraction of a pie will each of the eight students get?

c. Explain how the answer to (b) is related the division problem $3 \div 8$.

IM Commentary

The purpose of this task is to help students see the connection between $a \div b$ and $\frac{a}{b}$ in a particular concrete example. The relationship between the division problem $3 \div 8$ and the fraction $\frac{3}{8}$ is actually very subtle.

$3 \div 8$ is the number you multiply 8 by to get 3.

$\frac{3}{8}$ is the number you get by taking 3 copies of the unit fraction $\frac{1}{8}$.

So $3 \div 8$ is defined in terms of multiplication, and $\frac{3}{8}$ is defined in terms of unit fractions. It is not obvious that these two numbers are the same, so students need

opportunities to see that they will necessarily always be the same. Note that if b people share a pies equally, then each person will get $\frac{a}{b}$ of a pie by the same kind of reasoning shown in the solution below.
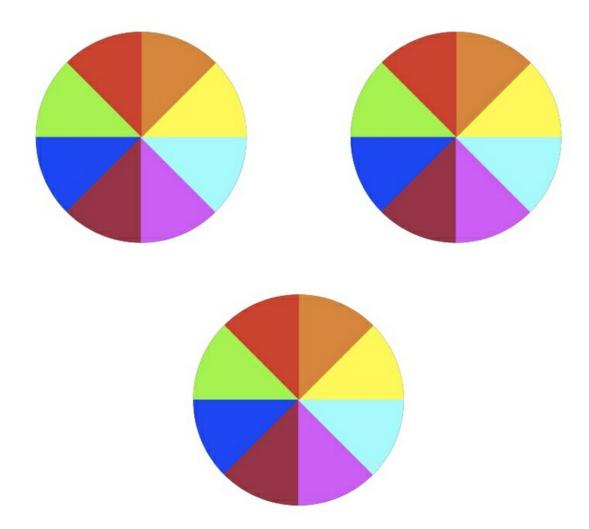
This task is probably best suited for instruction or formative assessment.

Solution

a. Below is a picture of how Emily might divide the three apple pies into eight equal portions. Here each color (yellow, orange, red, green, blue, dark purple, light purple, and light blue) represents one portion. So each portion consists of three pieces of pie and each piece of pie represents $\frac{1}{8}$ of a full pie:
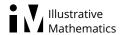
Because these pies are all the same size and they are all apple pies, Emily does not need to give each student one piece of each of the three pies: two or three pieces of the same pie could go to one student. This picture, however, shows clearly that the pies have been divided into eight equal portions. If multiple pieces of a particular pie were to go to the same student, it would be necessary to analyze the picture more closely and count how many slices of pie each student received to check that it has been divided evenly.

b. As the picture shows, each portion consists of three slices of apple pie. Since these slices represent $\frac{1}{8}$ of a pie, this means that each student gets $\frac{3}{8}$ of an apple pie.

c. If 3 pies are divided into 8 equal portions, then 8 of these portions makes 3 pies, a fact that is clearly illustrated in part (a). We can write this in symbols if we use a question mark to represent the amount of pie in one portion:

$$8 \times ? = 3$$

When we know a factor and the product, we can find the other factor by dividing:

$$3 \div 8 = ?$$

So one person's portion is whatever we get when we divide 3 by 8. In part (b), we saw that one portion is $\frac{3}{8}$. So that means that

$$3 \div 8 = \frac{3}{8}.$$