

5.NF Sharing Lunches

Alignments to Content Standards: 5.NF.A.2 5.NF.B.3 5.NF.B.4.a

Task

Alex, Bryan, and Cynthia are about to eat lunch, and they have two sandwiches to share.

- Draw a picture to show how they could equally share the sandwiches. How much of a sandwich does each person get?
- Write an equation involving addition to show how together these parts make up the 2 sandwiches. Explain how the equation you wrote represents this situation.
- Write an equation involving multiplication to show how all the parts make up the 2 sandwiches. Explain how the equation you wrote represents this situation.
- Write an equation using multiplication to show the fraction of a sandwich each student gets. Explain how the equation you wrote represents this situation.
- Write an equation using division to show the fraction of a sandwich each student gets. Explain how the equation you wrote represents this situation.

IM Commentary

This task requires students to think about how a single situation involving fractions can be accurately represented using addition or multiplication.

Students are first asked to draw a picture in **part a** showing this situation to reinforce

the fact that the same situation can be modeled using three different operations. Students are asked to divide two sandwiches into three equal pieces, and must reason what that will look like. Students should be able to realize fairly easily that each student will get $\frac{2}{3}$ of the sandwich, and to model this using in addition in **part b**. As students' facility with operations on fractions matures, they should not be expected to always draw a picture.

In **part c**, students are asked to represent the situation using multiplication, and to explain their representation. Teachers may want to show multiple correct explanations, including interpretations of products as partitions of equal parts, visual displays (such as a number line or fraction diagram), or a mathematical statement such as $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} = 3 \times \frac{2}{3} = 2$. If students struggle, the teacher can tell the students to think of the problem as 2 sandwiches = $3 \times$ a fraction of a sandwich. A teacher might also want to ask students to demonstrate multiple correct explanations, particularly if they notice students relying only on one method and being confused by others.

Parts d and e shift the focus away from using operations to represent all of the sandwiches, instead using operations to focus on each student's share of the sandwiches. In **part d**, students may notice that each person will get $\frac{1}{3}$ of the 2 sandwiches, since there are 3 people sharing them equally. Students may then need help realizing that since they will get $\frac{1}{3}$ of *each* of the two sandwiches, they then will get $\frac{1}{3} \times 2$ sandwiches, which equals $\frac{2}{3}$. The second diagram in the solution to part a may help, as each of the two sandwiches is divided into three equal parts (therefore, $\frac{1}{3} \times 2$).

Finally, students are asked to consider the meaning of a fraction in **part e**— that is, the division of a numerator by a denominator. This task reinforces the concept that any fraction can be described as dividing a whole number into the number of pieces specified in the denominator. The explanations that the students produce for each of the three tasks may be slightly different, but will result in the same conclusion (that each student gets $\frac{2}{3}$ of a sandwich). If students struggled with this concept, the teacher might note that if there were six sandwiches and each person got the same amount, we would use division to determine that each person gets two sandwiches ($6 \div 3 = 2$). The situation here is the same, except instead of 6 wholes, the unit is 6 thirds.

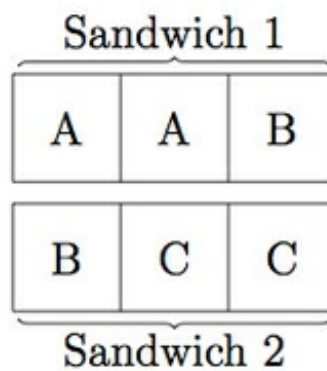
This task was written as part of a collaborative project between Illustrative Mathematics, the Smarter Balanced Digital Library and the Teaching Channel.

Solutions

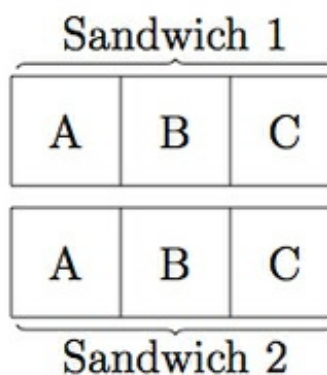
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Solution: Solution to part A

A. Students should say that each person gets $\frac{2}{3}$ of one sandwich. The picture could be anything that shows the sandwiches being divided equally three ways. For example:



Or



The second solution has a few advantages. First, this type of picture prepares students for the tape diagrams they will see in the sixth grade when they study ratios. Secondly, this method of division into equal parts would apply if, for example, one of the sandwiches were tuna fish and the other was grilled cheese. Each person would receive an equal part of each type of sandwich. Third, for a more complex fraction such as $\frac{3}{5}$ the equal portions can be seen very readily (without counting) with this type of model.

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Solution: Solution to part B

B. $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{6}{3} = 2$. Other reasonable equations, such as $\frac{2}{3} + \frac{2}{3} + \frac{1}{3} + \frac{1}{3} = \frac{6}{3} = 2$, could be acceptable. Each person gets $\frac{2}{3}$ of a sandwich and there are three people so if you add up these three pieces of size $\frac{2}{3}$ you get a total of 2.

[Edit this solution](#)

Solution: Solution to part C

C. $3 \times \frac{2}{3} = 2$. Acceptable explanations include accurate descriptions (e.g. "You add two-thirds three times, which is the same as multiplying it by 3"), a number line model (showing $\frac{2}{3}$, $\frac{4}{3}$, and 2) or a visual fraction diagram.

[Edit this solution](#)

Solution: Solution for part D

D. $2 \times \frac{1}{3} = \frac{2}{3}$. Each person gets $\frac{1}{3}$ of each sandwich and there are two sandwiches so two groups of $\frac{1}{3}$ is equal to $\frac{2}{3}$.

[Edit this solution](#)

Solution: Solution for part E

E. $2 \div 3 = \frac{2}{3}$. Acceptable explanations include accurate descriptions (e.g. "You divide two wholes into three equal parts, and each part will be $\frac{2}{3}$ "), a number line model (focusing on the dividing two wholes into three parts), or a visual fraction diagram.



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