Tennessee Department of Education: Instructional Task Guide

Task:	
12 Cookies Task Josh and Nathan shared a package of 12 cookies. Josh ate ¼ of the package and Nathan ate 1/3 of the package. 1. Josh says he ate more than Nathan. Draw a diagram and write an inequality to show who ate more cookies. 2. Explain with words, a diagram, and an equation what fraction of the cookies are left in the package.	
Common Core State Standards for Mathematical Content	**Common Core State Standards for Mathematical Practice**
4.NF. 1 Explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. **4.N.F.2** Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as ½. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. **4.NF.3a** Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. **4.NF.4** Apply and extend previous understanding of multiplication to multiply a fraction by a whole number.	MP1 Make sense of problems and persevere in solving them. MP2 Reason abstractly and quantitatively. MP3 Construct viable arguments and critique the reasoning of others. MP4 Model with mathematics. MP6 Attend to precision. MP7 Look for and make use of structure.
Essential Understandings/NCTM Resources	
A fraction can be named in more than one way and the fractions will be equivalent as long as the same portion of the set or area of the figure is represented. When comparing two fractions with different numerators and different denominators, recognize that comparisons are only valid when the fractions refer to the same whole. Adding fractions and subtracting fractions refers to joining or separating parts of the same whole. Multiplying a fraction by a whole number, results in a product that is part of the original whole number. Multiplication by a fraction is similar to division of whole numbers.	

Explore Phase	
Possible Solution Paths	**Assessing and Advancing Questions**
Students draw fraction bars or other model to compare the fractions ¼ and 1/3 but do not write an inequality using <, =, or > to compare fractions.	**Assessing Questions:** Tell me about your work. Are ¼ and 1/3 equal amounts? How do you know who ate more? How can you use what you know about ¼ and 1/3 to determine who ate more? What symbols do you use to compare number amounts? **Advancing Questions:** How can you use your model to write an inequality to show who ate the larger amount of cookies? Use fractions and symbols to show who ate more cookies.
Students use a number line or two separate number lines to compare the fractions 1/4 and 1/3.	**Assessing Questions:** Tell me about your number line. How did you determine where to place the fractions ¼ and 1/3? Did you use a benchmark number to help you? How did the benchmark number help you to place fractions on the number line? **Advancing Questions:** How will you use this information to help you answer part 2 of the problem? Does this number line help you to determine how much of the cookies are left? What other model can you use to compare ¼ and 1/3?
Students draw an array, circling and labeling the amount of cookies eaten by both Josh and Nathan and labeling the amount of cookies left.	**Assessing Questions:** Explain your work. How many cookies did Josh eat? How many cookies did Nathan eat? Who ate more? How many more? **Advancing Questions:** What inequality can you write to show who ate more cookies? What equation(s) can you write to show the number cookies eaten and the fraction of cookies that are left? Show me with fractions how much more Nathan ate than Josh.
Students use equivalent fractions to add ¼ and 1/3 for a sum of 7/12 then subtract this from 12/12 to determine that 5/12 of the cookies are left.	**Assessing Questions:** Explain how you renamed ¼ to 3/12 and 1/3 to 4/12. How did this affect the amount of cookies that were eaten by each person?

	What does 7/12 represent? What does 5/12 represent? **Advancing Questions:** How much more did Nathan eat than Josh? Is there another method for solving this problem? Is there a way for Nathan and Josh to divide the remaining cookies evenly?
Students multiply ¼ x 12 = 3 and 1/3 x 12 = 4 then add for a sum of 7 cookies. They then subtract 7 from 12 to determine that 5 out of the 12 cookies are left or 5/12.	**Assessing Questions:** Tell me about your work. Why did you choose to multiply? How did you multiply a fraction by a whole number? Explain how you determined that Nathan ate more cookies. **Advancing Questions:** How much more did Nathan eat than Josh? How is multiplying a fraction by a whole number similar to division? How would your solution change if Josh and Nathan each had their own package of 12 cookies?
Possible Student Misconceptions	
Students add both the numerators and the denominators resulting in 2/7.	**Assessing Questions:** What do you know about denominators? What do you know about numerators? **Advancing Questions:** Show me using manipulatives how you can add ¼ and 1/3.
Students misinterpret how many cookies have been eaten as how many cookies are left. e.g. 7/12 = cookies leftover	**Assessing Questions:** What does ¼ represent? What does 1/3 represent? How many cookies are there in all? What does 7/12 represent? **Advancing Questions:** How can you determine the fraction of cookies that are left after Josh and Nathan eat their share? What do you know about the whole? How many are in the whole? How can you use this information to determine the fraction of cookies that are left?
Entry/Extensions	**Assessing and Advancing Questions**
If students can't get started….	**Assessing Questions:** Tell me what information you know. What is the problem asking you to do? What do you know about fractions? What does the denominator tell you?

	What does the numerator tell you? **Advancing Questions:** What will you try first to determine who ate more cookies? What other model could you use?
If students finish early….	**Assessing Questions:** Tell me about your work. Prove to me that Nathan ate more cookies than Josh. Explain how you know that there are 5/12 cookies leftover. How many cookies is that? **Advancing Questions:** Is your answer of 5/12 cookies leftover reasonable? How can you justify it? How would your solution change if Josh and Nathan each had their own package of 12 cookies? Is there another way to solve this problem? How much more was leftover than was eaten by Josh and Nathan combined? Change the problem so that there are only 3 cookies leftover.

Discuss/Analyze
Whole Group Questions
A fraction can be named in more than one way and the fractions will be equivalent as long as the same portion of the set or area of the figure is represented. What does it mean for fractions to be equivalent? How can we use equivalent fractions to compare ¼ and 1/3? Does anyone agree or disagree? Explain how you renamed ¼ to 3/12 and 1/3 to 4/12. How did this affect the amount of cookies that were eaten by each person? What does 7/12 represent? What does 5/12 represent?
When comparing two fractions with different numerators and different denominators, recognize that comparisons are only valid when the fractions refer to the same whole. Did anyone compare these fractions a different way? What diagrams did you use to compare ¼ and 1/3? How did these help you to compare the fractions? What inequality can you write to show who ate more cookies?
Adding fractions and subtracting fractions refers to joining or separating parts of the same whole. When adding these fractions, what did you need to do first? When you renamed ¼ and 1/3, you found equivalent fractions, how did this affect the amount of cookies eaten by each person? Why didn't you add the denominators?

What does 7/12 represent? What does 5/12 represent?
Multiplying a fraction by a whole number, results in a product that is part of the original whole number. **Multiplication by a fraction is similar to division of whole numbers.** How could we use multiplication to solve this problem? How did you multiply a fraction by a whole number? Usually when we multiply we get a product that is larger than the number we started with, for example 4 x 6 = 24. When multiplying ¼ x 12 we got a product of 3, which is smaller than what we started with? Is this always true when multiplying a whole number by a fraction? How is multiplying a fraction by a whole number similar to division?