

## Focus Standards and Claim

Claim 4






CCSS.MATH.CONTENT.  
3.NF.3.

Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

## Stimulus

### Clay Pottery

Lizzie and Zela are interested in making pottery. The following chart shows how much clay is needed to make different projects.

Project	Pounds of Clay Needed
 <b>Small Plate</b>	$2\frac{1}{2}$
 <b>Small Bowl</b>	$1\frac{1}{2}$
 <b>Large Bowl</b>	$3\frac{1}{4}$
 <b>Dinner Plate</b>	$4\frac{1}{2}$
 <b>Mug</b>	$\frac{3}{4}$

## Item Prompt

Zela is making a plan to use her 12 pounds of clay. She still wants to make 6 mugs. She also wants to make 6 small bowls.

Lizzie says:

"12 pounds is not enough to make 6 mugs and 6 small bowls. I know because I did the math."

Zela says:

"It is enough if I make the bowls smaller!"

Make a plan for Zela to use no more than 12 pounds of clay to make 6 mugs and 6 bowls that are **smaller** than the bowls in the chart.

In the plan, state how much clay she should use for each of her smaller bowls. Her bowls should all be the same size.

Zela does **not** care about using **exactly** 12 pounds, but she does want to use as much of the clay as possible.

## Scoring Guide

SCORE	2 POINTS	1 POINT	0 POINTS
	<p>The student describes an amount of clay that meets the criteria (6 mugs <math>\times</math> <math>\frac{3}{4}</math> and 6 bowls times a value between 1 and <math>1\frac{1}{2}</math>) AND gives a valid explanation for how this value meets the criteria.</p> <p><b>Note:</b> If the student uses an incorrect amount of clay from item #3 in the response to determine the amount of clay needed, the response can still earn full credit.</p>	<p>The student's response contains some of the attributes of an appropriate response but lacks convincing evidence that the student fully comprehends the essential mathematical ideas addressed by this task. Such deficits may include evidence of insufficient mathematical knowledge; errors in fundamental mathematical procedures; and/or lack of explanation or clarity in the response.</p> <p><b>Note:</b> If the student uses an incorrect amount of clay from item #3 in the response to determine the amount of clay needed, the response can still earn full credit.</p>	<p>All other responses.</p>

## Sample Responses

### Student Sample A



6 mugs = 4.5 lbs

7.5 lbs of clay left

$$1.25 + 1.25 + 1.25 + 1.25 + 1.25 + 1.25 = 7.5$$

Zela would have to make six mugs and six bowls that are 1.25 pound each.

#### SCORE RATIONALE

The response begins with a statement of how much clay is used by the 6 mugs and how much clay remains (from an implicit total of 12 pounds). The student reduced the bowls to 1.25 pounds of clay, and provided a calculation to show that 6 bowls using the reduced amount of clay would use exactly the remaining amount of 7.5 pounds of clay. The response concludes with a statement of the plan, including which projects to make, how many of each, and the reduced amount of clay for the bowls. The response earns full credit.

### Student Sample B



6 mugs = 4 1/2

$$12 + 4 \frac{1}{2} = 7 \frac{1}{2} \text{ pounds}$$

$$1 + 1 + 1 + 1 + 1 + 1 = 6$$

$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 3$$

$$6 + 3 = 9$$

bigger 6 mugs = 5 pounds

$$9 + 5 = 14$$

If Zela doesn't make the bowls smaller she'll get 14 pounds.

12 pounds would be enough if Zela made the bowls smaller. If the bowls were 1 1/4 pounds you could use 12 pounds. Small bowl = 1 1/4 pounds

#### SCORE RATIONALE

The student's calculations show a thinking process about the total amount of clay used by projects that are different sizes. This thinking appears to include consideration of bigger mugs, which use 5 pounds in total, rather than 4 1/2 pounds. The response shows a reasoning process that leads to a conclusion that 12 pounds is enough to support the bowls if the bowls are smaller, specifically 1 1/4 pounds. Although circuitous, the response presents a plan that works for Zela. The response earns full credit.

## Student Sample C



She can make the bowls with 1 pound of clay and it will take 6 pounds to make 6. I added  $\frac{3}{4}$  6 times and got  $4\frac{1}{2}$ . In the end I added that and the 6 pounds and got  $10\frac{1}{2}$ .

**SCORE RATIONALE**

The student reduced the size of the bowls to 1 pound each and stated the total amount of clay used by 6 of these bowls. The student then reported adding this amount (6 pounds) to the total for the mugs ( $\frac{3}{4}$  added 6 times) and finding the overall pounds of clay used, which is less 12 pounds. Although this plan does not reflect a rigorous attempt to “use as much of the clay as possible,” it is perfectly reasonable within the context and fits the requirements to a degree appropriate for grade 5. The response includes both clear reasoning and the relevant specific values to support the plan. The response earns full credit.

## Student Sample D



$$1 + 1 + 1 + 1 + 1 = 6$$

$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 3$$

Each bowl will need  $1\frac{1}{4}$  pounds of clay. That would be under 12 for Zela.

**SCORE RATIONALE**

The student correctly determined that each bowl could be reduced to  $1\frac{1}{4}$  pounds of clay, and the response includes relevant, though partial, calculations. However, the explanation lacks clarity and makes a minimal and imprecise connection between the reduced size of the bowl and the 12 pounds of clay. The response receives partial credit of 1 point.

## Student Sample E



6 mugs =  $4 \frac{1}{2}$

$7 \frac{1}{2}$  pounds left over for the bowls

$1 \frac{1}{4} + 1 \frac{1}{4} + 1 \frac{1}{4} + 1 \frac{1}{4} + 1 \frac{1}{4} + 1 \frac{1}{4} = 7 \frac{1}{4}$

Zela could need to make the bowls  $\frac{1}{4}$  smaller so that she could make them so they are  $\frac{1}{4}$  smaller than 12 pounds. Which could make them  $11 \frac{3}{4}$  big.

**SCORE RATIONALE**

This response begins with correct statements about the amount of clay used and amount of clay remaining after 6 mugs are made. The student correctly determined that each bowl could be reduced to  $1 \frac{1}{4}$  pounds of clay. However, the student made a calculation error when finding the total amount of clay used by 6 of these bowls, and his/her explanation appears to confuse the  $\frac{1}{4}$  pound reduction of each bowl with a  $\frac{1}{4}$  pound reduction of the total amount of clay. Although there is some evidence that the student comprehended the essential mathematical idea of the problem, the explanation is unclear and is directly based on an error in a fundamental mathematical procedure. The response earns partial credit of 1 point.

## Student Sample F



$.75 + .75 + .75 + .75 + .75 + .75 = 4.50$

$1.25 + 1.25 + 1.25 + 1.25 + 1.25 + 1.25 = 7.50$

$4.50 + 7.50 = 12.00$

1.25 for smaller bowls

**SCORE RATIONALE**

The student converted the fractions into decimals and determined that the bowls should be reduced to 1.25 pounds in order for 6 bowls to equal 7.5 pounds. While the student's calculations are accurate and result in an appropriate amount of clay for each small bowl, the student did not provide a plan or an explanation of the calculations. The response earns 1 point.

**Student Sample G**

She should use  $\frac{1}{3}$  for each mug and bowl because it is 6 bowls and 6 mugs. Zela is correct because you could use  $\frac{1}{3}$  of clay.

**SCORE RATIONALE**

The student indicated that Zela “should use  $\frac{1}{3}$  for each mug,” but did not provide a calculation or plan indicating the new total amount of clay, or an explanation of how this reduction would meet the criteria for making 6 mugs and 6 bowls using no more than 12 pounds of clay. The response earns 0 points.

**Student Sample H**

Zela is write because she did the math. Zela does not care about using exactly 12 pounds.

**SCORE RATIONALE**

The student response does not provide clear evidence of understanding the mathematics of the problem.

**Student Sample I**

I know  $\frac{1}{4} \times 6 = 7 \frac{1}{2}$   
 $\frac{3}{4} \times 6 = 4 \frac{1}{2}$  then I added and got 12.

**SCORE RATIONALE**

The first calculation is incorrect, though the student may have intended to write  $1 \frac{1}{4} \times 6 = 7 \frac{1}{2}$ . The response does not include a clear statement of the new size of the bowls or an explanation of the size of the bowls. The response earns 0 points.