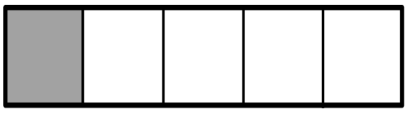
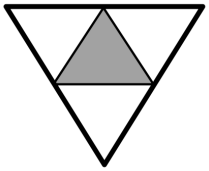
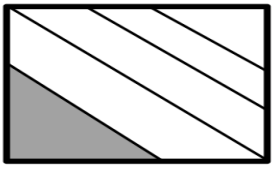
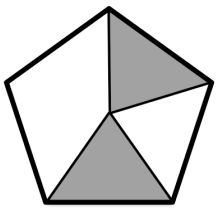
Name _____

Representing Fractions

For each problem, decide if the shaded part is equal to the fraction given.

Circle your choice:	Explain or show why you circled Yes or No:
A)  Does this represent $\frac{1}{4}$? Circle One: Yes No	
B)  Does this represent $\frac{1}{4}$? Circle One: Yes No	
C)  Does this represent $\frac{1}{5}$? Circle One: Yes No	
D)  Does this represent $\frac{2}{5}$? Circle One: Yes No	

Representing Fractions

This resource guides you in using the ACT cycle to implement this probe with your students and use the findings to plan instructional next steps.

Here is one example from this 4-item representation probe:

For each problem, decide if the shaded part is equal to the fraction given.

Circle your choice:	Explain or show why you circled Yes or No:
A)  Does this represent $\frac{1}{4}$? Circle One: Yes No	

Analyze the Assessment → What is the math?

This probe gathers information about the extent to which students can interpret an area model representation of a fraction. Successfully interpreting such representations involves considering equal sized parts and the number of parts shaded.

Do Students…		
▪ Recognize that equal sized parts are needed for interpreting a fraction representation and a whole can be further partitioned to make equal parts? ▪ Know that in a fraction the numerator represents the number of shaded parts and the denominator represents the total number of parts?	**OR**	▪ Count the number of parts shaded and the total number of parts regardless of the size of the parts? ▪ Use shaded for numerator and un-shaded for denominator?

Do Students…		
▪ Understand that fraction representations can have a variety of shapes and can be shaded in a variety of different ways.	**OR**	▪ Disregard area models with: ○ parts that could be further partitioned to create equal-size parts? ○ shaded parts positioned differently within the figure.

Oklahoma Academic Standards for Mathematics

Below are the associated standards related to the intended content of the probe. This may mean a direct relationship (the content directly addresses the standard), but the content focus may instead be foundational for the standard—that is, the target may be necessary before the standard can be addressed.

3.N.3.1 Read and write fractions with words and symbols.

3.N.3.2 Construct fractions using length, set, and area models.

Consider Students' Thinking → Examine their work

Each probe item requires a two-part response from the student: a selected response and a written explanation using words and/or pictures. Together, these two parts provide important information about the student's understanding and thinking. Four possible combinations of student responses are described below.

- correct selected response choice AND an explanation that provides sound reasoning
- correct selected response choice AND an explanation containing flawed or no reasoning
- incorrect selected response choice AND an explanation with reasoning that reflects some understanding
- incorrect selected response choice AND an explanation containing flawed or no reasoning

In preparation for examining your own student work, review the following:

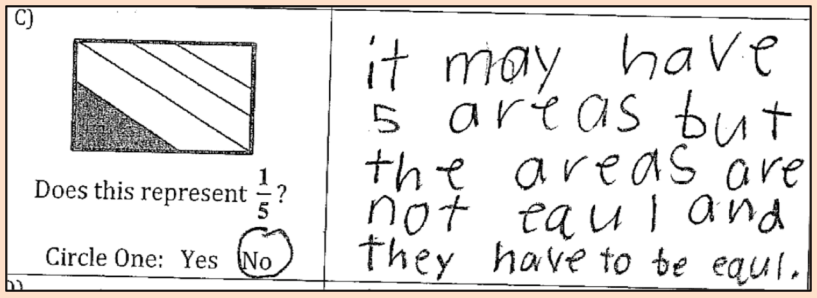
1. the correct selected response answers;
2. student work samples showing correct selected response choices supported by sound reasoning and/or successful strategies; and
3. student work samples to illustrate common misconceptions.

1. Correct selected response choices

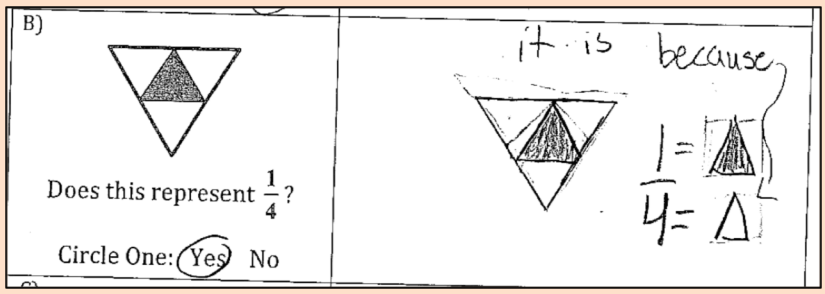
A) No B) Yes C) No D) Yes

2. Examples of correct selected response choices with sound reasoning and/or successful strategies

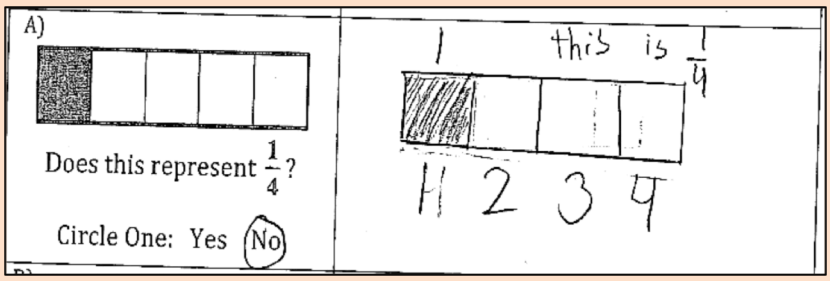
Student understands that in order to represent $\frac{1}{5}$, the shape must be partitioned into 5 equal-sized parts.



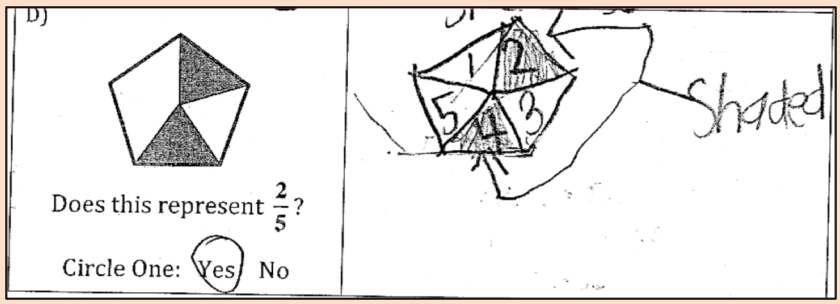
Student understands that although 1 part has a different orientation, the model shows equal-sized parts with 1 part shaded and 4 parts total.



Student understands that in order to represent $\frac{1}{4}$, the shape must be partitioned into 4 equal-sized parts with 1 part shaded.



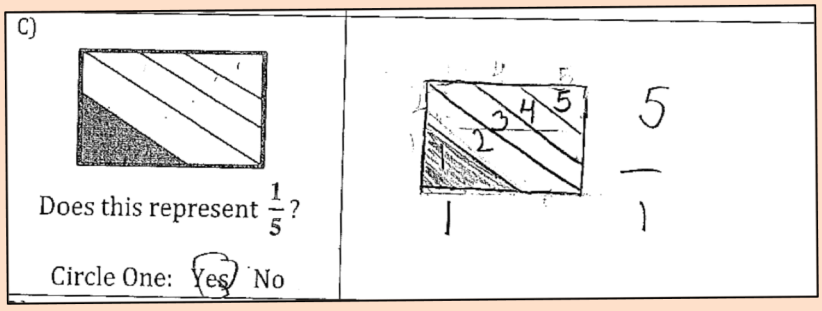
Student understands that although a partition is missing, the area model represents $\frac{2}{5}$, with 2 equal-sized parts shaded and 5 equal-sized parts total.

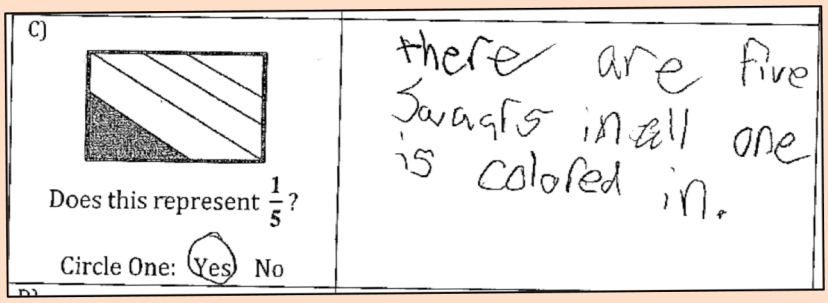


3. Examples that reflect common misconceptions

Counts shapes regardless of size

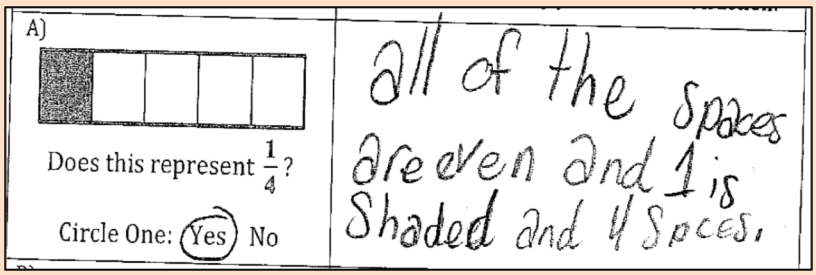
Students often associate the number of shaded parts with the numerator and the total number of parts with the denominator, but do not pay attention to the size of the pieces (or area).

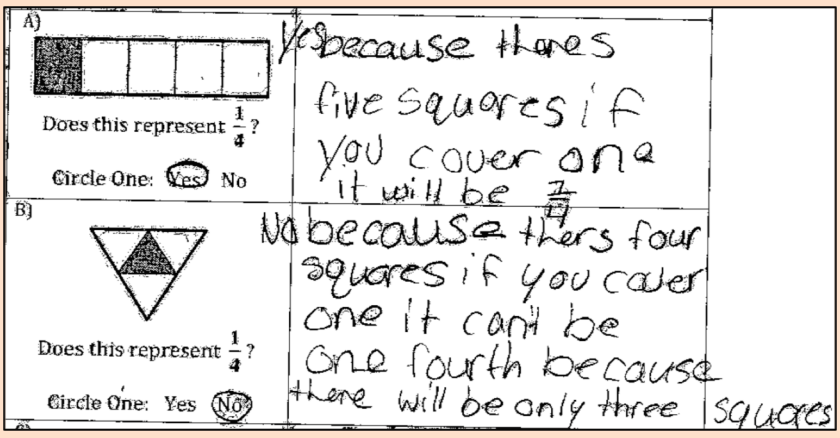




Incorrect denominator

Students may incorrectly associate the denominator with the number of un-shaded parts.

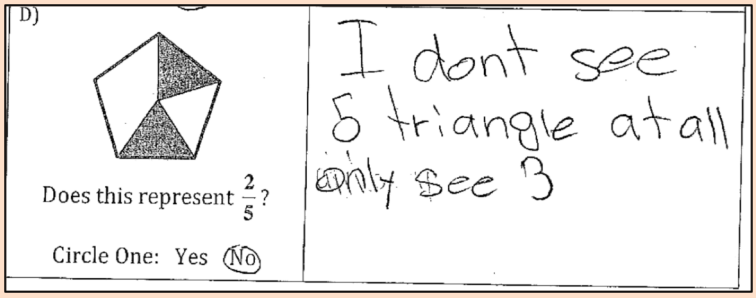


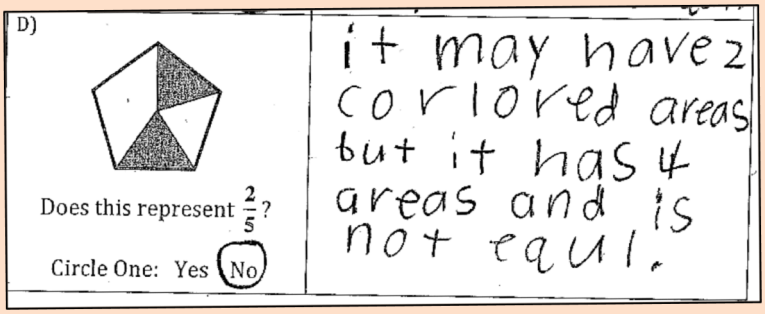


Examples that reflect common misconceptions

Focus on shape rather than size

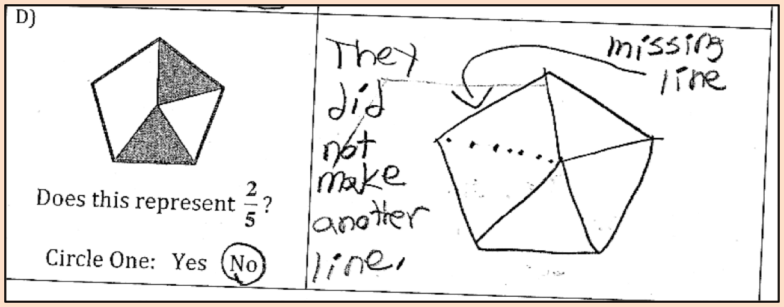
Students may focus on the shapes of the parts without considering whether a part can be further partitioned.

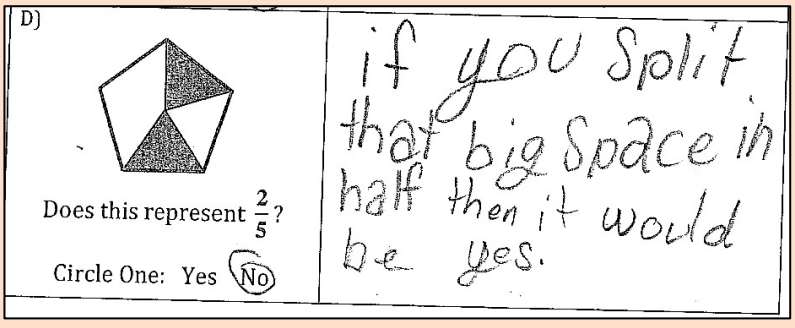




Partitions must be provided

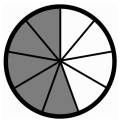
Some students see that a part can be further partitioned but indicate it is not a fifth part because the partition is not present in the problem.



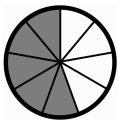
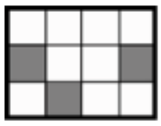


Instructional ideas to consider

- Students benefit from working with a variety of area model representations of fractions, including:
  - representations of fractions in which the parts are all the same size and shape as well as those with parts that have equal area but are different shapes.




  - representations in which the shaded parts are grouped together as well as those with shaded parts that are not grouped together.

  - representations in which the partitioning is clearly indicated, those in which the partitioning needs to be inferred from the shape, and those where the partitioning is unequal but can be further partitioned to create equal size parts.



- Opportunities to work with a variety of pictorial representations will deepen students' understanding of the meaning of the numerator and denominator as well as their understanding of the necessity of same-size (equal-area) parts.
- Provide examples and non-examples of area model representations for a given fraction.
- To prevent students from overgeneralizing about what fraction representations look like, ensure that they routinely encounter multiple representations of a fraction as well and have opportunities to construct different representations of the same fraction. Make explicit connections between area representations and linear representations.
- Providing contexts such as fair-sharing with friends can help students understand the importance of equal-sized parts.
- As always, consider which of the Mathematics Actions and Processes will be the focus of your instruction. (i.e. have students defend their choices to other students to support ability to communicate using mathematical reasoning)

Sample Hinge-point Question to Assess Progress

Here is one example. You will likely need to create additional hinge-point questions as you implement targeted instruction to address learning needs.

Which representations show $\frac{1}{4}$ of the whole?

a) 

b) 

c) 

d) 

Correct selected response choices for Hinge-point question.

a, c, d, e