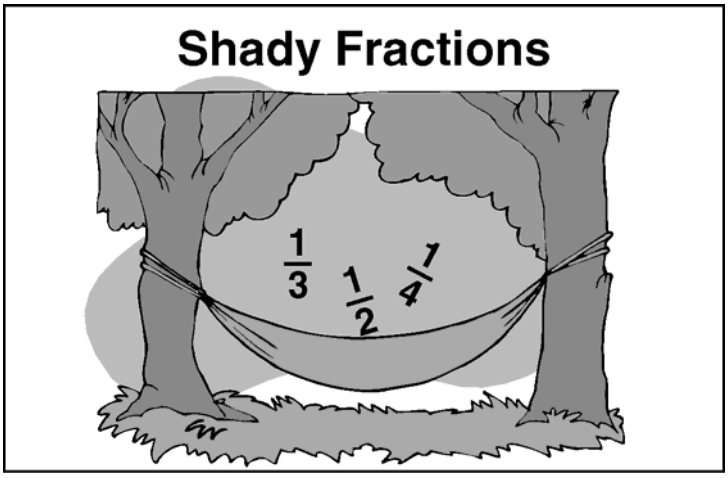
SITES-M Mathematics Challenge



Level: Grade Three

Standard: Number and Operations

Learning Target: Focus on Fractions

Grade Level Expectations

GLE 0306.2.6 Use various strategies and models to compare and order fractions and identify equivalent fractions.

Checks for Understanding

0306.2.11 Identify fractions as locations on number lines.
0306.2.12 Compare fractions using drawings, concrete objects, and benchmark fractions.

State Performance Indicators

SPI 0306.1.4 Match the spoken, written, concrete, and pictorial representations of fractions with denominators up to ten.
SPI 0306.2.13 Recognize, compare, and order fractions.

SITES-M Mathematics Challenge

Grade 3–Focus on Fractions
Shady Fractions

The purpose of the Mathematics Challenges is to provide opportunities for students to develop and demonstrate understanding of important mathematical concepts and standards. Each Challenge includes a set of tasks that require higher-order thinking skills. Because these types of tasks may be new for students and they will have varying levels of understanding, the student responses will vary. The Challenges and guiding questions were designed to help teachers plan their implementation and elicit, analyze, and act on evidence of student understanding.

You will be able to choose which Mathematics Challenge Packet to implement each month, according to the learning needs of your students and your teaching context. Each packet contains all the materials necessary to implement the Mathematics Challenge including a grade-appropriate Challenge, the Mathematics Challenge Meeting Protocol, and the Guiding Questions for Analyzing Student Responses to Mathematics Challenges.

For each Challenge, you will complete a six step process of planning, implementation, and analysis and reflection.

The Mathematics Challenge Process

Stage	Step	Task
Planning	Step 1.	Review the Mathematics Challenge Meeting Protocol
	Step 2.	Review and solve the Mathematics Challenge prior to your Professional Learning Community (PLC) meeting. Think about your responses to the guiding questions on the Meeting Protocol
	Step 3.	Hold your PLC meeting and discuss your responses to the Guiding Questions on the Meeting Protocol
Implementation	Step 4.	Implement the Mathematics Challenge with your class
Analysis and Reflection	Step 5.	For your own planning and documentation, respond to the Guiding Questions on the Analyzing Student Responses Protocol
	Step 6.	To help us improve the Challenges and to provide recommendations for teachers implementing them in future years, complete the Mathematics Challenge Feedback Log and provide copies of all student work to the Assessment Coordinator

SITES-M Mathematics Challenge

Grade 3–Focus on Fractions
Shady Fractions

Mathematics Challenge Meeting Protocol

Each month, your Professional Learning Community will meet to discuss the implementation of one Mathematics Challenge. In preparation for your monthly meeting, please print and review this month's Mathematics Challenge, solve all tasks within the Challenge, and think about the guiding questions below. These questions will be used to facilitate a group discussion regarding the implementation of the upcoming Mathematics Challenge.

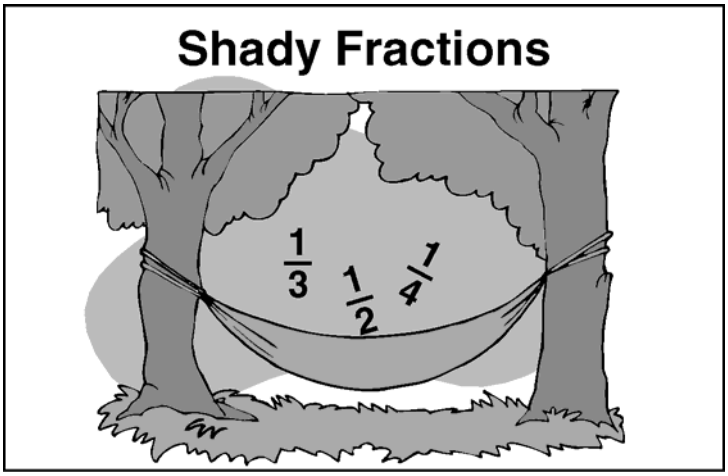
Guiding Questions for Implementing the Mathematics Challenges

1. What is the title of the Challenge that you will use this month?
2. What skills or standards is this Challenge measuring?
3. Where does this Challenge fit within your curriculum? Within which unit?
4. At what point during the unit will you administer this Challenge (e.g., At the beginning of a unit to determine what students do or do not know, at the end of a unit to assess what students have or have not learned, in the middle of a unit to determine where to go next instructionally)?
5. How will your students complete this Challenge (e.g., individually, one-on-one, in small groups, as a class)? Why?
6. Are there any prerequisite skills, common misunderstandings, or vocabulary needs that you will have to address? What are they?
7. What difficulties do you anticipate your students will have with the Challenge? How will you address them?
8. Are these skills and difficulties different for special needs students, ELL students, etc.? How? Will you do anything different for these students? What?
9. How will you evaluate student responses (e.g., grade responses with the provided rubric, scan responses to identify common mistakes/misconceptions, have students evaluate one another's responses, have students evaluate their own response)?
10. What will student responses to this Challenge tell you about student understanding?
11. How might you use this evidence of student understanding to adapt your teaching and learning?
12. What other materials, resources, or support might you need? Where can you get them?
13. How can your colleagues assist you in the analysis of student understanding?
14. What other questions or concerns do you have about this Mathematics Challenge?

After you have implemented the challenge with your class, be sure to respond to the Guiding Questions on the Analyzing Student Responses Protocol.

SITES-M Mathematics Challenge

Grade 3–Focus on Fractions



Standard: Number and Operations

Learning Target: Focus on Fractions

Claims:
Students should understand and be able to explain or demonstrate how to:

- ✓ Match the spoken, written, concrete, and pictorial representations of fractions with denominators up to ten;
- ✓ Use various strategies and models to identify equivalent fractions;
- ✓ Identify fractions as locations on number lines;
- ✓ Recognize, compare, and order fractions;
- ✓ Compare fractions using drawings, concrete objects, and benchmark fractions.

Task Preparation:
Each student will need a copy of the Student Response Sheet.

Stimulus Cards (Drawing or Word Description):
None

Manipulatives/Supplies:
Pencils

SITES-M Mathematics Challenge

Grade 3–Focus on Fractions

Cues/Directions:

Distribute student response sheets. Students should be directed to look carefully at each figure. Allow students time to answer.

1. Say: **Look at Square A and Square B below. Square A has been divided into parts of equal size. Square B also has been divided into parts of equal size. Square A is divided into how many parts? (TEACHER NOTE:** Students should write the correct number on the blank.**) How many parts of Square A are shaded? (TEACHER NOTE:** Students should write the correct number on the blank.**) Use your answers above to write the fraction of Square A that is shaded. (TEACHER NOTE:** Students should write the correct number on each blank in the fraction.**) Shade in the fraction of Square B that is equal to the fraction of Square A that is shaded. What fraction of Square B did you shade? (TEACHER NOTE:** Students should write the correct number on each blank in the fraction.**) How do you know the shaded fraction for Square A and the shaded fraction for Square B are equal to each other? (TEACHER NOTE:** Students should write their explanation in the box.**)**

2. **Look at Circle A and Circle B below. Circle A has been divided into parts of equal size. Circle B also has been divided into parts of equal size. Shade $\frac{1}{2}$ of Circle A. How many <u>parts</u> did you shade? (TEACHER NOTE:** Students should write the correct number on the blank.**) Shade $\frac{1}{2}$ of Circle B. How many <u>parts</u> did you shade? (TEACHER NOTE:** Students should write the correct number on the blank.**) What are the two fractions represented by your shadings in Circle A and Circle B? (TEACHER NOTE:** Students should write the correct number on each blank of each fraction.**) How do you know the two fractions in part c are equal? (TEACHER NOTE:** Students should write their explanation in the box.**)**

3. **Look at each rectangle below. For each one, check the box to answer the following question: Is $\frac{1}{3}$ of the rectangle shaded? (TEACHER NOTE:** Students should check the correct box.**) How do you know? (TEACHER NOTE:** Students should write their explanation in the box.**) (TEACHER NOTE:** Students should check the correct box for part b.**) How do you know? (TEACHER NOTE:** Students should write their explanation in the box.**) Is $\frac{1}{3}$ of the rectangle shaded? (TEACHER**

NOTE: Students should check the correct box for part c.**) How do you know? (TEACHER NOTE:** Students should write their explanation in the box.**) (TEACHER NOTE:** Students should check the correct box for part d.**) How do you know? (TEACHER NOTE:** Students should write their explanation in the box.**)**

4. **Points have been labeled on the number line below. On the number line above, how many parts has the section from 0 to 1 been divided into? (TEACHER NOTE:** Students should write the correct number on the blank.**) For each fraction in the table below, find its point on the number line. Write the letter for that point. The first one is done for you. (TEACHER NOTE:** Students should fill in the rest of the table, letters may be repeated in the table.**) Put an** X **on the number line where you think the fraction** $\frac{6}{10}$ **goes. How do you know where to put the** X **? (TEACHER NOTE:** Students should correctly place an X on the number line, and then write their explanation in the box.**)**

5. **Write an addition problem with fractions that is the same as the drawing above. (TEACHER NOTE:** Students should write their addition problem in the box.**) Show the same addition problem on the number line below. (TEACHER NOTE:** Students should correctly write their addition problem on the number line. This may be a stretch for some students.**)**

SITES-M Mathematics Challenge

Grade 3–Focus on Fractions

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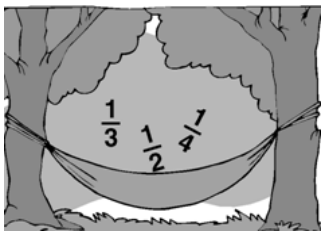
SITES-M Mathematics Challenge

Grade 3–Focus on Fractions

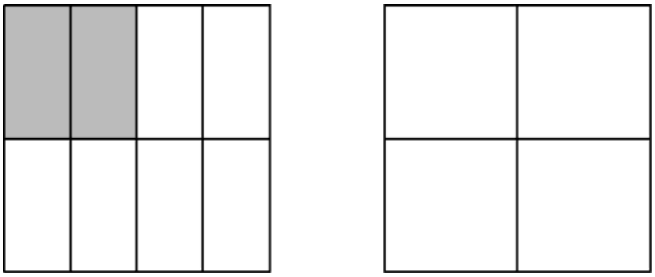


Student Response Sheet

Shady Fractions

Name: _____ **Date:** _____

1. Look at Square A and Square B below. Square A has been divided into parts of equal size. Square B also has been divided into parts of equal size.

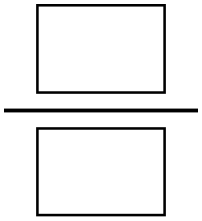


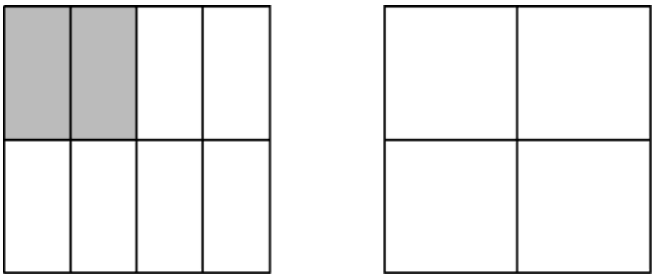
Square A **Square B**

a. Square A is divided into how many parts? _____

How many parts of Square A are shaded? _____

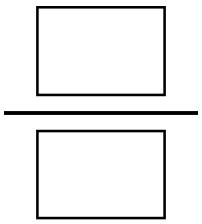
Use your answers above to write the fraction of Square A that is shaded.





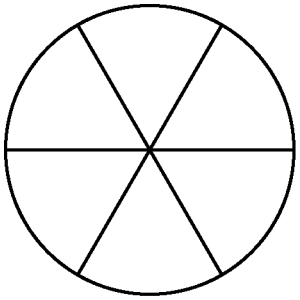
Square A **Square B**

b. Shade in the fraction of Square B that is equal to the fraction of Square A that is shaded. What fraction of Square B did you shade?

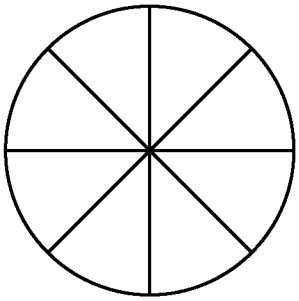


How do you know the shaded fraction for Square A and the shaded fraction for Square B are equal to each other?

2. Look at Circle A and Circle B below. Circle A has been divided into parts of equal size. Circle B also has been divided into parts of equal size.



Circle A



Circle B

a. Shade $\frac{1}{2}$ of Circle A. How many <u>parts</u> did you shade?

_____

b. Shade $\frac{1}{2}$ of Circle B. How many <u>parts</u> did you shade?

_____

c. What are the two fractions represented by your shadings in Circle A and Circle B?

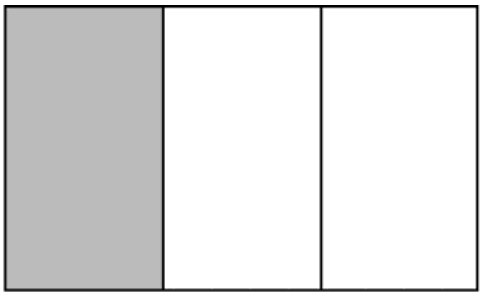
$\frac{\square}{\square}$ **and** $\frac{\square}{\square}$

Circle A **Circle B**

How do you know the two fractions in part c are equal?

3. Look at each rectangle below. For each one, check the box to answer the following question:

Is $\frac{1}{3}$ of the rectangle shaded?

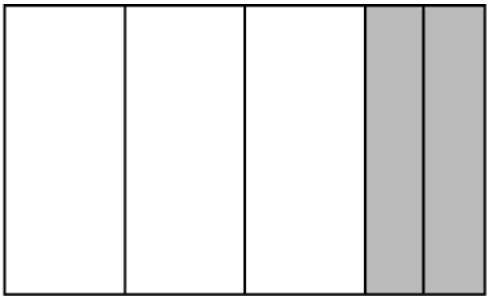
a.  ☐ **Yes** ☐ **No**

How do you know?

b.  ☐ **Yes** ☐ **No**

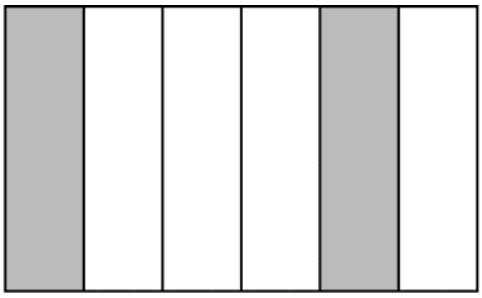
How do you know?

Is $\frac{1}{3}$ of the rectangle shaded?

c. 

☐ **Yes** ☐ **No**

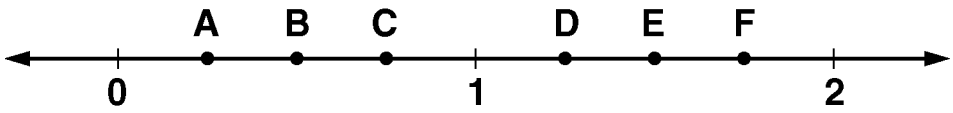
How do you know?

d. 

☐ **Yes** ☐ **No**

How do you know?

4. Points have been labeled on the number line below.



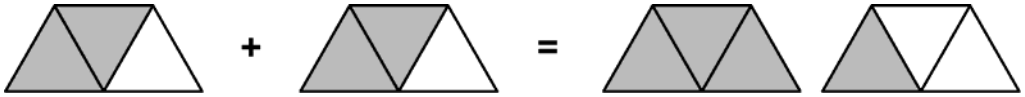
a. On the number line above, how many parts has the section from 0 to 1 been divided into?

_____

b. For each fraction in the table below, find its point on the number line. Write the letter for that point. The first one is done for you.

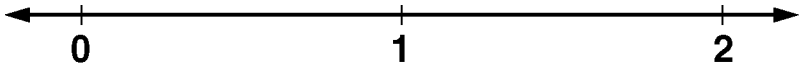
Fraction	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{5}{4}$	$\frac{2}{8}$	$\frac{6}{8}$	$\frac{3}{6}$	$\frac{3}{2}$	$\frac{5}{10}$	$\frac{14}{8}$	$\frac{15}{10}$	$\frac{6}{4}$
Point on Number Line	A										

c. Put an X on the number line where you think the fraction $\frac{6}{10}$ goes. How do you know where to put the X ?

5. 

a. Write an addition problem with fractions that is the same as the drawing above.

b. Show the same addition problem on the number line below.



Learning and Teaching Considerations

Task 1:

A) Be sure that students understand that fractional parts are equal shares or equal-sized portions of a whole or unit (unit as an object, in this case).

B) Be sure that students understand that fractional parts have special names that tell how many parts of that size are needed to make the whole. The denominator of a fraction indicates by what number the whole has been divided in order to produce the type of part under consideration. The numerator of a fraction counts or tells how many of the fractional parts (of the type indicated by the denominator) are under consideration.

C) If a student says or writes, "I just know," prompt him or her by saying something like "I'm glad you know, but it's important in math to be able to explain your answers so other people can understand what you're thinking."

D) If a student says or writes, "I don't know," say something positive like "Let's start with what you do know about this problem." Students often know more than they think or say, and encouraging them to vocalize or write about that knowledge is all they need.

E) The teacher could encourage students to use manipulatives that represent an area model, such as pattern blocks, to explore fractions.

Task 2:

A) Be sure that students understand that two equivalent fractions are two ways of describing the same amount by using different-sized fractions.

B) Students may indicate that both 3/6 and 4/8 are equal to 1/2.

C) Students may use 1/2 to express both fractions, rather than 3/6 and 4/8. This is not a misconception.

Task 3:

A) Be sure that students understand the equality of the parts (in size).

B) Students may have the misconception that task b represents 1/3 shaded because the rectangle is broken up into 3 parts.

C) Students may have the misconception that task c does not represent 1/3 shaded because the rectangle is broken up into 6 parts.

Task 4:

A) Be sure that students understand that fractional parts are equal shares or equal-sized portions of a whole or unit. The unit is counted as 1. On the number line, the distance from 0 to 1 is the unit.

B) Be sure that students understand that the more fractional parts used to make the unit, the smaller the parts. For example, eights are smaller than sixths.

C) The teacher could encourage students to use manipulatives that represent a linear model, such as Cuisenaire rods, to explore fractions.

D) Students may use benchmarks for fractions, such as 0, 1/2, or 1. Understanding why a fraction is close to 0, 1/2, or 1 is a good beginning for fraction number sense.

Task 5:

A) Be sure that students understand that the numerator tells the number of parts and the denominator tells the type of part.

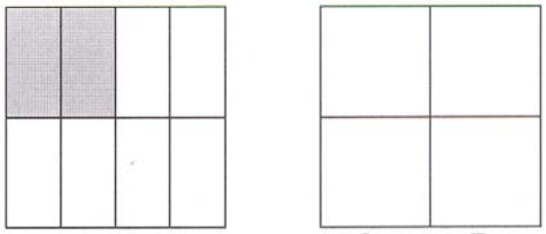
B) Be sure to give students ample opportunity to develop fraction number sense before starting to talk about rules of computation.

C) Students may have the misconception that the sum of the two fractions is 4/6 (using the two trapezoids to represent the unit).

D) Students may answer by using manipulatives, by creating their own pictures, or by using words or symbols. The teacher also can encourage them to link these strategies and/or representations to each other as a way to provide a convincing solution.

Name: ANSWER KEY Date: _____

1. Look at Square A and Square B below. Square A has been divided into parts of equal size. Square B also has been divided into parts of equal size.



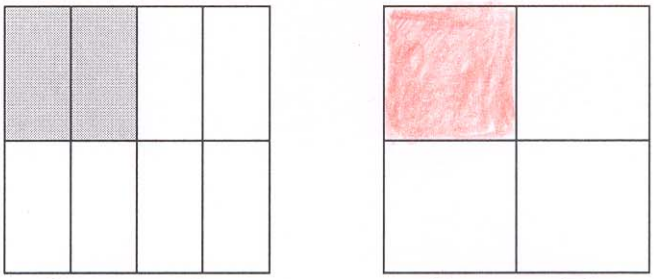
Square A Square B

a. Square A is divided into how many parts? 8

How many parts of Square A are shaded? 2

Use your answers above to write the fraction of Square A that is shaded.

$$\frac{2}{8}$$



Square A Square B

NOTE: ANY SECTION CAN BE SHADED

b. Shade in the fraction of Square B that is equal to the fraction of Square A that is shaded. What fraction of Square B did you shade?

$\frac{1}{4}$

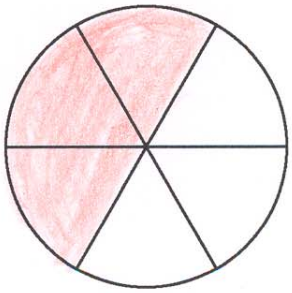
How do you know the shaded fraction for Square A and the shaded fraction for Square B are equal to each other?

$\frac{2}{8}$ AND $\frac{1}{4}$ TAKE THE SAME SPACE IN THE SQUARE.

OR IF YOU PUT 8 THINGS INTO 4 GROUPS OF EQUAL SIZE, THERE ARE 2 IN EACH GROUP. SO 2 PARTS OF 8 IS $\frac{1}{4}$.

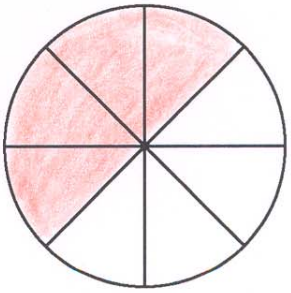
OR $\frac{2}{8} = \frac{1}{4}$ BECAUSE $\frac{2 \div 2}{8 \div 2} = \frac{1}{4}$

2. Look at Circle A and Circle B below. Circle A has been divided into parts of equal size. Circle B also has been divided into parts of equal size.



Circle A

ANY 3 SECTIONS IS OK.



Circle B

ANY 4 SECTIONS IS OK.

a. Shade $\frac{1}{2}$ of Circle A. How many <u>parts</u> did you shade?

3

b. Shade $\frac{1}{2}$ of Circle B. How many <u>parts</u> did you shade?

4

c. What are the two fractions represented by your shadings in Circle A and Circle B?

$\frac{3}{6}$ and $\frac{4}{8}$

Circle A Circle B

How do you know the two fractions in part c are equal?

SPACE REASON: 3 PARTS OF CIRCLE A TAKE UP THE SAME SPACE AS 4 PARTS OF CIRCLE B. BOTH TAKE UP $\frac{1}{2}$ THE SPACE, SO THE FRACTIONS BOTH = $\frac{1}{2}$.

PARTS REASON: HALF OF 6 IS 3 AND HALF OF 8 IS 4. SO BOTH FRACTIONS REPRESENT $\frac{1}{2}$.

EQUIVALENT FRACTIONS:

$\frac{3 \div 3}{6 \div 3} = \frac{1}{2}$

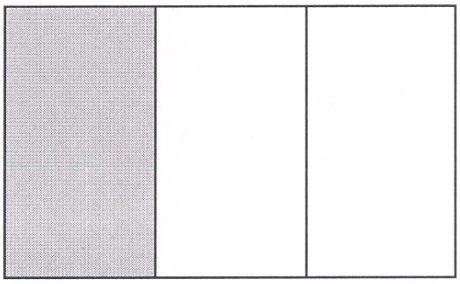
$\frac{4 \div 4}{8 \div 4} = \frac{1}{2}$

FRACTIONS ARE EQUIVALENT TO $\frac{1}{2}$

NOTE: STUDENTS CAN USE A VARIETY OF REASONS, SO ANSWERS WILL VARY.

3. Look at each rectangle below. For each one, check the box to answer the following question:

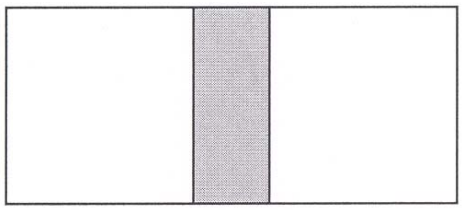
Is $\frac{1}{3}$ of the rectangle shaded?

a. 

☒ Yes ☐ No

How do you know?

THE RECTANGLE HAS BEEN DIVIDED INTO 3 PARTS OF EQUAL SIZE AND 1 PART IS SHADED.

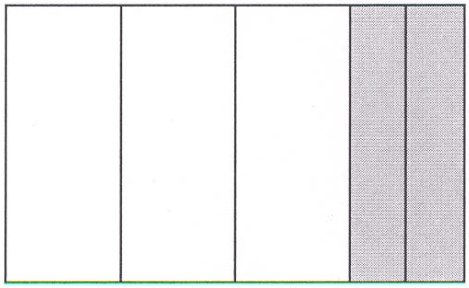
b. 

☐ Yes ☒ No

How do you know?

THE RECTANGLE IS NOT DIVIDED INTO 3 PARTS OF EQUAL SIZE.

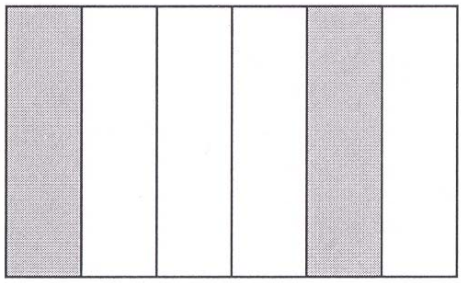
Is $\frac{1}{3}$ of the rectangle shaded?

c. 

☐ Yes ☒ No

How do you know?

THE RECTANGLE IS DIVIDED INTO 4 PARTS OF EQUAL SIZE, & ONE OF THE PARTS HAS BEEN DIVIDED AGAIN.

d. 

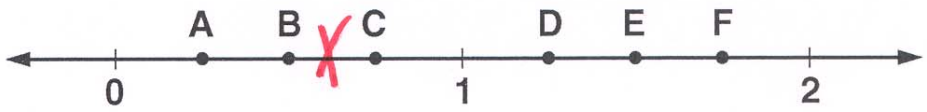
☒ Yes ☐ No

How do you know?

THE RECTANGLE IS DIVIDED INTO 6 PARTS OF EQUAL SIZE & TWO OF THE PARTS ARE SHADED.

$\frac{2}{6} = \frac{1}{3}$

4. Points have been labeled on the number line below.



a. On the number line above, how many parts has the section from 0 to 1 been divided into?

4

b. For each fraction in the table below, find its point on the number line. Write the letter for that point. The first one is done for you.

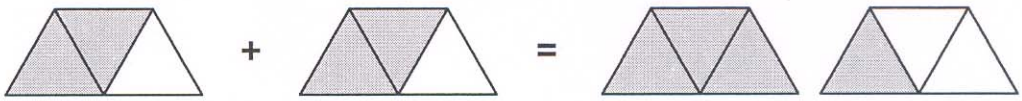
Fraction	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{5}{4}$	$\frac{2}{8}$	$\frac{6}{8}$	$\frac{3}{6}$	$\frac{3}{2}$	$\frac{5}{10}$	$\frac{14}{8}$	$\frac{15}{10}$	$\frac{6}{4}$
Point on Number Line	A	C	D	A	C	B	E	B	F	E	E

c. Put an **X** on the number line where you think the fraction $\frac{6}{10}$ goes. How do you know where to put the **X** ?

$\frac{6}{10}$ IS MORE THAN $\frac{5}{10}$ $(\frac{1}{2})$.

$\frac{6}{10}$ $(\frac{3}{5})$ IS LESS THAN $\frac{3}{4}$.

SO $\frac{6}{10}$ IS BETWEEN B & C.

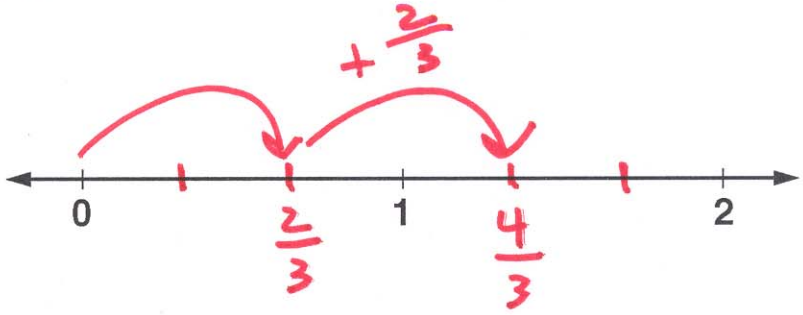
5.  + =

a. Write an addition problem with fractions that is the same as the drawing above.

$\frac{2}{3} + \frac{2}{3} = \frac{4}{3}$

$\left(\frac{2}{3} + \frac{2}{3} = 1\frac{1}{3}\right)$

b. Show the same addition problem on the number line below.



STUDENT SHOULD DIVIDE SECTION BETWEEN 0 & 1 INTO 3 EQUAL PARTS. SAME FOR SECTION BETWEEN 1 & 2.

SITES-M Mathematics Challenge

Grade 3–Focus on Fractions
Rubric

CATEGORY	4	3	2	1
Mathematical concepts	**Response shows complete understanding of the mathematical concepts used to solve the problem(s).**	**Response shows substantial understanding of the mathematical concepts used to solve the problem(s).**	**Response shows some understanding of the mathematical concepts needed to solve the problem(s).**	**Response shows very limited understanding of the underlying concepts needed to solve the problem(s), OR the response is not written.**
	Response shows evidence in ALL of the following tasks. **Task 1**. In part (a) student answers 8 and 2, and student puts 2 in top box and 8 in bottom box. In part (b) student shades any single square in B and answers 1/4. Student explains why 2/8 and 1/4 are equal. **Task 2**. Student shades any 3 parts of circle A and any 4 parts of circle B. Student answers 3 in part (a), 4 for part (b), and 3/6 and 4/8 in part (c). Student explains why 3/6 and 4/8 are equal. **Task 3**. In parts (a) and (d), student answers yes and gives correct reason. In parts (b) and (c), student answers no and gives correct reason. **Task 4**. Student answers 4 in part (a) and fills in table, as shown on answer sheet in part (b). In part (c) student places an X on the number line between points B and C and explains why it goes there. **Task 5**. Student gives a correct equation for part (a) and for part (b) is able to divide the number into thirds. (Thirds should look relatively equal.)	Response shows evidence in only 4 of the tasks described in category 4.	Response shows evidence in only 3 of the tasks described in category 4.	Response shows evidence in 2 or fewer of the tasks described in category 4.

SITES-M Mathematics Challenge

Grade 3–Focus on Fractions
Rubric

CATEGORY	4	3	2	1
Strategy and procedures	**Student typically uses an efficient and effective strategy to solve the problem(s).**	**Student typically uses an effective strategy to solve the problem(s).**	**Student sometimes uses an effective strategy to solve the problem(s), but not consistently.**	**Student rarely uses an effective strategy to solve the problem(s).**
	Response shows evidence in ALL of the following tasks. **Task 1**. Student indicates somewhere on paper that 8 things can be divided into 4 sets of 2 or shows how 2/8 is equivalent to 1/4. **Task 2**. Student indicates somewhere on paper that both 3/6 and 4/8 are equal to 1/2. **Task 3**. Student shows indications of dividing each rectangle into 3 equal parts. **Task 4**. Student writes the name of the fraction under each point of the number line, such as indicating that point B is 1/2. Student also may show somewhere on the paper that some of the fractions in the table can be written in a simpler form, such as 6/8 = 3/4. **Task 5**. Student indicates somewhere on paper that he or she is counting parts of the trapezoids. Student also indicates division of the number line into thirds and indicates in some way that counting by thirds on the number line is taking place.	Response shows evidence in only 4 of the tasks described in category 4.	Response shows evidence in only 3 of the tasks described in category 4.	Response shows evidence in 2 or fewer of the tasks described in category 4.

SITES-M Mathematics Challenge

Grade 3–Focus on Fractions
Rubric

CATEGORY	4	3	2	1
Explanation and communication	**Explanation is detailed and clear; uses appropriate terminology and/or notation.**	**Explanation is clear; uses some appropriate terminology and/or notation.**	**Explanation is a little difficult to understand, but includes critical components; shows little use of appropriate terminology and/or notation.**	**Explanation is difficult to understand, is missing several components, and does not use or include appropriate terminology and/or notation.**
	Response shows evidence in ALL of the following tasks. **Task 1**. In part (b) student explains why 2/8 is equal to 1/4. The explanation can use area, parts of whole numbers, or rewriting fractions as equivalent fractions. **Task 2**. In part (c) student explains why 3/6 and 4/8 are equal to each other using one of the methods described in task 1. **Task 3**. Student provides a correct explanation in each of the 4 parts on why or why not 1/3 has been shaded. The explanation must include whether or not the parts are equal in size. **Task 4**. Student explains why 6/10 should go between points B and C on the number line. The explanation must reference both points, that is, there must be reference to a point less than 6/10 and a point greater than 6/10.	Response shows evidence in only 3 explanations described in category 4.	Response shows evidence in only 2 explanations described in category 4.	Response shows evidence in 1 or fewer explanations described in category 4.

SITES-M Mathematics Challenge

Grade 3–Focus on Fractions
Rubric

CATEGORY	4	3	2	1
Mathematical accuracy	**All or almost all of the steps and solutions have no mathematical errors.**	**Most of the steps and solutions have no mathematical errors.**	**Some of the steps and solutions have no mathematical errors.**	**Few of the steps and solutions have no mathematical errors.**
	Student provides correct answers for ALL of the following tasks. **Task 1**. In part (a) student answers 8, 2, and 2/8, as shown on answer sheet. In part (b) student shades 1 part of square B and answers 1/4, as shown on answer sheet. **Task 2**. Student shades any 3 parts of circle A and any 4 parts of circle B. Student answers 3, 4, 3/6, and 4/8, as shown on answer sheet. **Task 3**. Student answers yes in parts (a) and (d) and no in parts (b) and (c). **Task 4**. Student answers 4 and completes table, as shown on answer sheet. Student places an X on the number line between points B and C. **Task 5**. Student provides a correct equation in part (a) and in part (b) is able to divide the number line into thirds.	Student provides correct answers for only 4 of the tasks described in category 4. There are no more than 2 errors in the table in task 4.	Student provides correct answers for only 3 of the tasks described in category 4. There may be more than 2 errors in the table in task 4. Student is unable to divide the number line into thirds in task 5.	Student provides correct answers for 2 or fewer of the tasks described in category 4.

Scoring notes checklist

Task	Check Yes	Category
Task 1		
In part (a) student answers 8 and 2, and student puts 2 in top box and 8 in bottom box. In part (b) student shades any single square in B and answers 1/4. Student explains why 2/8 and 1/4 are equal.		Concept
Student indicates somewhere on paper that 8 things can be divided into 4 sets of 2 or shows how 2/8 is equivalent to 1/4.		Strategy
In part (b) student explains why 2/8 is equal to 1/4. The explanation can use area, parts of whole numbers, or rewriting fractions as equivalent fractions.		Explanation
In part (a) student answers 8, 2, and 2/8, as shown on answer sheet. In part (b) student shades 1 part of square B and answers 1/4, as shown on answer sheet.		Accuracy
Task 2		
Student shades any 3 parts of circle A and any 4 parts of circle B. Student answers 3 in part (a), 4 for part (b), and 3/6 and 4/8 in part (c). Student explains why 3/6 and 4/8 are equal.		Concept
Student indicates somewhere on paper that both 3/6 and 4/8 are equal to 1/2.		Strategy
In part (c) student explains why 3/6 and 4/8 are equal to each other using one of the methods described in task 1.		Explanation
Student shades any 3 parts of circle A and any 4 parts of circle B. Student answers 3, 4, 3/6, and 4/8, as shown on answer sheet.		Accuracy
Task 3		
In parts (a) and (d), student answers yes and gives correct reason. In parts (b) and (c), student answers no and gives correct reason.		Concept
Student shows indications of dividing each rectangle into 3 equal parts.		Strategy
Student provides a correct explanation in each of the 4 parts on why or why not 1/3 has been shaded. The explanation must include whether or not the parts are equal in size.		Explanation
Student answers yes in parts (a) and (d) and no in parts (b) and (c).		Accuracy

Task 4		
Student answers 4 in part (a) and fills in table, as shown on answer sheet in part (b). In part (c) student places an X on the number line between points B and C and explains why it goes there.		Concept
Student writes the name of the fraction under each point of the number line, such as indicating that point B is 1/2. Student also may show somewhere on the paper that some of the fractions in the table can be written in a simpler form, such as 6/8 = 3/4.		Strategy
Student explains why 6/10 should go between points B and C on the number line. The explanation must reference both points, that is, there must be reference to a point less than 6/10 and a point greater than 6/10.		Explanation
Student answers 4 and completes table, as shown on answer sheet. Student places an X on the number line between points B and C.		Accuracy
Task 5		
Student gives a correct equation for part (a) and for part (b) is able to divide the number into thirds. (Thirds should look relatively equal.)		Concept
Student indicates somewhere on paper that he or she is counting parts of the trapezoids. Student also indicates division of the number line into thirds and indicates in some way that counting by thirds on the number line is taking place.		Strategy
Student provides a correct equation in part (a) and in part (b) is able to divide the number line into thirds.		Accuracy

Analyzing Student Responses Protocol

The purpose of the Mathematics Challenges is to provide opportunities for students to develop and demonstrate understanding of important mathematical concepts and standards. They include extended responses, open-ended tasks, and tasks that require higher-order thinking skills. Because these types of tasks may be novel for students and they will have varying levels of understanding, the student responses will vary.

The guiding questions below were designed to assist you in analyzing your class' response to the Challenge and determining appropriate next steps for your teaching and learning. Responses to these questions are for your reflection and documentation and will not be collected.

Guiding Questions for Analyzing Student Responses to the Mathematics Challenges

1. When completing the Challenge, what did your students do well? How do you know?

2. When completing the Challenge, what did your students struggle with? How do you know?

3. When your students completed the Challenge, did they implement multiple correct solutions strategies? What insightful approaches to problem solving did you observe?

4. What, if any, patterns (e.g., common errors/misconceptions) did you observe across your student responses?

5. What questions or concerns did your students have when working through this Challenge or a particular task? Are these things you should address for the class as a whole?

6. What, if any, feedback did you provide to your class? How did you provide it?

7. What did you learn about your students' mathematical understanding based on their responses to this Challenge?

Reminders:

1) After you have completed the Challenge with your class and responded to these Guiding Questions for Analyzing Student Responses, please complete the Challenge Feedback Log. A link to this Log is e-mailed to you each month. Responses will be used to improve the Challenges and to provide recommendations for teachers implementing the Challenges in future years.

2) Please provide copies of all student work to the Assessment Coordinator.