IES PRACTICE GUIDE

WHAT WORKS CLEARINGHOUSE

Developing Effective Fractions Instruction for Kindergarten Through 8th Grade

NCEE 2010-4039
U.S. DEPARTMENT OF EDUCATION

ies NATIONAL CENTER FOR EDUCATION EVALUATION AND REGIONAL ASSISTANCE
Institute of Education Sciences

Review of Recommendations

Recommendation 1.

Build on students' informal understanding of sharing and proportionality to develop initial fraction concepts.

- Use equal-sharing activities to introduce the concept of fractions. Use sharing activities that involve dividing sets of objects as well as single whole objects.
- Extend equal-sharing activities to develop students' understanding of ordering and equivalence of fractions.
- Build on students' informal understanding to develop more advanced understanding of proportional reasoning concepts. Begin with activities that involve similar proportions, and progress to activities that involve ordering different proportions.

Recommendation 2.

Help students recognize that fractions are numbers and that they expand the number system beyond whole numbers. Use number lines as a central representational tool in teaching this and other fraction concepts from the early grades onward.

- Use measurement activities and number lines to help students understand that fractions are numbers, with all the properties that numbers share.
- Provide opportunities for students to locate and compare fractions on number lines.
- Use number lines to improve students' understanding of fraction equivalence, fraction density (the concept that there are an infinite number of fractions between any two fractions), and negative fractions.
- Help students understand that fractions can be represented as common fractions, decimals, and percentages, and develop students' ability to translate among these forms.

Recommendation 3.

Help students understand why procedures for computations with fractions make sense.

- Use area models, number lines, and other visual representations to improve students' understanding of formal computational procedures.
- Provide opportunities for students to use estimation to predict or judge the reasonableness of answers to problems involving computation with fractions.
- Address common misconceptions regarding computational procedures with fractions.
- Present real-world contexts with plausible numbers for problems that involve computing with fractions.

Recommendation 4.

Develop students' conceptual understanding of strategies for solving ratio, rate, and proportion problems before exposing them to cross-multiplication as a procedure to use to solve such problems.

- Develop students' understanding of proportional relations before teaching computational procedures that are conceptually difficult to understand (e.g., cross-multiplication). Build on students' developing strategies for solving ratio, rate, and proportion problems.
- Encourage students to use visual representations to solve ratio, rate, and proportion problems.
- Provide opportunities for students to use and discuss alternative strategies for solving ratio, rate, and proportion problems.

Recommendation 5.

Professional development programs should place a high priority on improving teachers' understanding of fractions and of how to teach them.

- Build teachers' depth of understanding of fractions and computational procedures involving fractions.
- Prepare teachers to use varied pictorial and concrete representations of fractions and fraction operations.
- Develop teachers' ability to assess students' understandings and misunderstandings of fractions.

Multiplying Fractions with Pattern Blocks

In this lesson, students will use pattern blocks to explore the relationship between repeated addition and multiplication of a whole number and a fraction.

NC Mathematics Standard:
Numbers and Operations - Fractions
NC.4.NF.4 Apply and extend previous understandings of multiplication to:

- Model and explain how fractions can be represented by multiplying a whole number by a unit fraction, using this understanding to multiply a whole number by any fraction less than one.
- Solve word problems involving multiplication of a fraction by a whole number.

Additional/Supporting Standard:
Numbers and Operations – Fractions
NC.4.NF.3 Understand and justify decompositions of fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100.

- Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
- Decompose a fraction into a sum of unit fractions and a sum of fractions with the same denominator in more than one way using area models, length models, and equations.
- Add and subtract fractions, including mixed numbers with like denominators, by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
- Solve word problems involving addition and subtraction of fractions, including mixed numbers by writing equations from a visual representation of the problem.

Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.

Student Outcomes:

- I can identify unit fractions.
- I can relate addition to the multiplication of unit fractions.
- I can decompose fractions into unit fractions.
- I can multiply a whole number by a fraction.

Math Language:

- unit fraction
- decompose
- equation
- equivalent fractions

Materials:

- pattern blocks (Each student needs at least one yellow hexagon, 3 blue rhombi, 6 green triangles, and 2 red trapezoids.)
- Multiplying Fractions with Pattern Blocks recording sheet (1 per student)

Launch:

1. Pattern Block Fractions (5 minutes)

   Pass out the sheets and pattern blocks to students. Read the task aloud to students and clarify any questions. Note: For this activity, the yellow hexagon represents the whole. You can change this after this initial lesson.

Explore:

2. Solving the Problem (15 – 20 minutes)

   Give students time to work individually and with their group to solve the problems. As students work, observe students to see how they are solving the problems. Encourage students to share their strategies and describe how they are solving the problems. Identify strategies you would like to share at the end of class and let students know that you will be calling them up to share the specific strategy.

   Possible Questions:

   - What is the value of this block?
   - How could you model this problem?
   - How does your addition equation match the pattern blocks?
   - How does your addition equation support your multiplication equation?
   - Can you use pattern blocks to model/support your thinking?
   - Can you use your knowledge of the relationship between addition and multiplication to write the equation?

Discuss:

3. Discussion of Solutions (10 – 15 minutes)

   Bring the group back together and have the selected students share their strategies for solving the problems. The goal for the lesson is to match multiplication equations to mathematical representations. Be sure the discussion helps students to do this and see the relationship between repeated addition and multiplication of a whole number and a fraction.

   Possible points to address:

   - How did you use pattern blocks to model your thinking?
   - How does your addition equation match the pattern blocks?
   - How does your addition equation support your multiplication equation?
   - What multiplication equation matches the representation with the pattern blocks?
   - Describe the relationship between addition and multiplication.

- How do you know the representation matches the equation?

Close the lesson by having students complete the exit ticket. After answering both questions, have students respond to the following prompt on the back of the sheet: Describe how addition and multiplication related. If time, have a few students share their responses.

Evaluation of Student Understanding:

Informal Evaluation:

- Observe and monitor students as they solve the problems. How are they making sense of the problems? Are they connecting repeated addition to multiplication?

Formal Evaluation/Exit Ticket:

- Exit Ticket: 1 - If a trapezoid equals one whole, write an addition equation and multiplication equation for 4 green triangles. 2 - Write a multiplication sentence to match ¼ + ¼ + ¼.

Possible Misconceptions/Suggestions:

Possible Misconceptions:	Suggestions:
• Students struggle finding the product when multiplying fractions.	• Encourage students to skip count or list the multiples when multiplying by fractions.

Special Notes:

- The mathematical goal of this activity is for students to match multiplication equations to mathematical representations and use these representations to make connections between addition and multiplication. All of the activities focus on only one type of pattern block (one denominator) at a time. The tasks at the end of the activity sheet add rigor while still allowing students to stay within the Grade 4 expectations of the standards.

Answers:

Activity Sheet:

- 4 rhombuses = *4 x 1/3 and 1/3 + 1/3 + 1/3 + 1/3 = 4/3 or 1 1/3*
- 3 hexagons = *3 x 1 and 1 + 1 + 1 = 3*
- 9 triangles = *9 x 1/6 and 1/6 + 1/6 + 1/6 + 1/6 + 1/6 + 1/6 + 1/6 + 1/6 + 1/6 = 9/6 or 1 3/6 or 1 1/2*
- 4 triangles = *4 x 1/6 and 1/6 + 1/6 + 1/6 + 1/6 = 4/6 or 2/3*
- 11 trapezoids = *11 x ½ and ½ + ½ + ½ + ½ +½ + ½ +½ + ½ +½ + ½ + ½ = 11/2 or 5 ½.*
- Which is larger: 7 triangles or 4 rhombuses? *4 rhombuses*
- Which is larger: 5 trapezoids or 14 triangles? *5 trapezoids*
- Which is larger: 9 rhombuses or 6 trapezoids? *equal*

Exit Ticket:

- 1/3 + 1/3 + 1/3 + 1/3 = 4/3 or 1 1/3 and 4 x 1/3
- 3 x ¼ = ¾

Multiplying Fractions with Pattern Blocks

The yellow hexagon is equal to 1 whole. Write an addition equation using unit fractions for each given set of pattern blocks. Next, write a multiplication equation to represent the problem and show the total value of each.

- 4 rhombuses
- 3 hexagons
- 9 triangles
- 4 triangles
- 11 trapezoids
- Which is larger: 7 triangles or 4 rhombuses?
- Which is larger: 5 trapezoids or 14 triangles?
- Which is larger: 9 rhombuses or 6 trapezoids?

Exit Ticket

1. If a trapezoid equals one whole, write an addition equation and multiplication equation for 4 green triangles.

2. Write a multiplication sentence to match ¼ + ¼ + ¼.

Blueberry Pancake Party

In this lesson, students will multiply mixed numbers and fractions by a whole number.

NC Mathematics Standard:
Numbers and Operations - Fractions
NC.4.NF.4 Apply and extend previous understandings of multiplication to:

- Model and explain how fractions can be represented by multiplying a whole number by a unit fraction, using this understanding to multiply a whole number by any fraction less than one.
- Solve word problems involving multiplication of a fraction by a whole number.

Additional/Supporting Standards:

NC.4.NBT.6 Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors with place value understanding using rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division.

Standards for Mathematical Practice:

1. Make sense of problems and persevere to solve them.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Student Outcomes:

- I can use what I know about multiplication to multiply a fraction by a whole number.
- I can use pictures and numbers to show my understanding of multiplying fractions by a whole number.

Math Language:

- repeated addition
- decomposing an equation of fractions

Materials:

- Blueberry Pancake Party Activity Sheet (1 per student)
- Fractions tiles (for differentiated scaffolding)

Advance Preparation:

- Put students into partner pairs based on fraction understanding.

Launch:

1. Hook/Introduce Problem (5-7 minutes)
   Display a variety of pancakes and ask students what their favorite type of pancake is. Have

students turn and talk with their neighbor about their favorite pancake.

Read the problem aloud to students: "Todd is famous for his homemade blueberry pancakes. His recipe makes enough to serve 6 people. He has invited 24 people to enjoy his pancakes.
Recipe (http://allrecipes.com/recipe/20177/todds-famous-blueberry-pancakes/):

- 1 ¼ cup all-purpose flour
- ½ teaspoon of salt
- 1 tablespoon of baking powder
- 1 ¼ tsp of sugar
- 1 egg
- 1 cup milk
- ½ tbsp of butter melted
- ½ cup frozen blueberries (thawed)

How much of each ingredient would he need to give everyone a serving of pancakes?"

After reading the problem aloud, have students think about a strategy they could use to solve the problem. Students should give you a thumbs up if they have a way to solve. (Be sure to notice students who don't put a thumb up. Those would be students to monitor first.)

Explore:

2. Solving the Problem (15-25 minutes)
   Independent Time (5-10 minutes):
   Students will work independently to solve the problem. Have students show their thinking on their sheet. Teacher should monitor for understanding and scaffold as needed with fraction tiles. Be sure to make students write out their thinking.
   Questions:
   1. What equation did you write to determine your answers?
   2. How could you organize your paper so we would know which ingredient is which?
   3. How could you model your understanding with a picture?
   4. Does your picture match your equation?
   5. (If they used addition) Is there another way we could write that equation?
   6. (If they used multiplication) Is there another way we could write that equation?
   7. What have we learned about this year that might help us solve this problem?

   Partner Time (10-15 minutes):
   Students will work with their assigned partner pair. (Should be made ahead of time.) They will compare their answers to see if they agree or disagree. Do students have the same solutions and equations? Do they have the same pictures? If they do not have the same solution, students should work together to determine which solution is correct.
   Questions:
   - How did you organize your information?
   - How did your partner solve the problem?
   - If your solutions were different, how were they different? (Argue your solution to prove it's correct.)
   - If your solutions are the same, are your strategies different? How did you each show your understanding?

As students are working through the problem, be sure to look for students that could share out during the discussion.
Things to look for:

- Students who can explain how they understood the problem (ie. Multiplying by 4).
- Students with pictures or manipulatives (ex. fraction tiles) that can explain their solution visually.
- Students who solved the problem using repeated addition.
- Students who solved the problem using a multiplication equation and can justify why it works.
- Students who organized their work in a structured way that's easy to read (i.e. charts).

Discuss:

3. Group Discussion (20 minutes)
   During this section, students will share out their thinking. You should have a list of students ready to share out. (Have students share out in a way that would show a succession of strategies.)
   Sample Sharing Succession:
   - Students who can explain how they understood the problem (i.e. Multiplying by 4)
     - Should understand that 24 people divided by 6 pancakes = 4 batches made.
   - Students with pictures or manipulatives (ex. fraction tiles) that can explain their solution visually. Students can show their notebook with pictures or their manipulatives to model their understanding.
     Questions to ask:
     -How does this picture show multiplying by four?
     -Where do you see the 4 represented in the picture?
     -Where is the fraction represented in the picture?
     -Does this picture show the solution to the problem?
   - Students who solved the problem using repeated addition. Students can show their notebooks with their repeated addition.
     Questions to ask:
     -How does your repeated addition show your solution?
     -How did the pictures relate to repeated addition?
     -Where is the 4 represented in the repeated addition?
     -Where is the fraction of ingredient represented in the equation?
   - Students who solved the problem using a multiplication equation and can justify why it works. (If no one supplies this equation and solution, discuss what other operation might could be used to solve this problem.)
     Questions to ask:
     -How does your equation relate to the picture?
     -How does your equation relate to the repeated addition equation?
     -How does the multiplication equation work? Why?
     -Where is the 4 represented in the equation?
     -Where is the fraction of ingredient represented in the equation?
     -How is multiplying a fraction or mixer number by a whole number similar to multiplying a whole number by a whole number?
   - Students who organized their work in a structured way that's easy to read. (This sharing

can happen throughout the lesson. You might be able to combine this aspect during the entire lesson, discussing how organization helped students keep track of their information. Look specifically for organized charts with labels.)

Questions to ask:

-How did you organize your information to show all your solutions?

-Were you able to keep up with the information you solved in a precise way?

-What could have been a way to organize your information if you didn't?

After students have shared, have them go back to their seats and reflect on the learning targets in their math journals.

Evaluation of Student Understanding:

Informal Evaluation:

- Walk around and monitor student understanding while they are working. Be sure to ask questions that will lead them to a deeper understanding (see discussion questions).

Formal Evaluation/Exit Ticket:

- Independent Practice: Give students the following problem. They will use their understanding learned from the discussion to solve the follow-up problem.
  Problem: Todd gets several phone calls and found out that only 18 people are coming. How much of each ingredient will he need to have to make enough for 18 people?
  Take up the independent practice to assess understanding of multiplying fractions.

Meeting the Needs of the Range of Learners:

Intervention:

- Pull in manipulatives (fraction tiles) to help students see the 4 times a fraction.
- Pull in students' knowledge of repeated addition and multiplication to discuss a multiplication equation.

Extension:

- Can students use pictures, addition, and multiplication to solve the problem?
- If he combined all the total ingredients together, how much would he have in his bowl?

Possible Misconceptions/Suggestions:

Possible Misconceptions	**Suggestions**
When multiplying a mixed number by a whole number you only have to multiply the fraction.	Be sure to discuss with your students the breaking apart of the mixed number. So they should be multiplying by both the whole number and the fraction. (ie. $1\frac{1}{2}$ x 4= 1 x 4 and $\frac{1}{2}$ x 4)
When multiplying a whole number by a fraction you multiply both the numerator and denominator by the whole.	Be sure students understand that the number of parts hasn't changed so their denominator will not change. Also explain that the number of pieces of the whole should be multiplied by the whole.

Special Notes:

- If you decide to use this as an assessment task, take away the partner time and make completely independent. If you are introducing this standard, give students only partner time and no independent time.

Possible Solutions:

Ingredient	*Equation	Amount Needed
All Purpose Flour	$1\frac{1}{2}$ x 4=	6 cups
Salt	$\frac{1}{2}$ x 4=	2 cups
Baking Powder	1 x 4=	4 cups
Sugar	$1\frac{1}{4}$ x 4=	5 cups
Eggs	1 x 4=	4 cups
Milk	1 x 4=	4 cups
Butter	$\frac{1}{2}$ x 4=	2 cups
Blueberries	$\frac{1}{2}$ x 4=	2 cups

*Scaffolding could be repeated addition or pictures (both are valuable but this is what is needed to master 4th grade standard).

Blueberry Pancake Party
Activity Sheet

Todd is famous for his homemade blueberry pancakes. His recipe makes enough to serve 6 people. He has invited 24 people to enjoy his pancakes.

Recipe (http://allrecipes.com/recipe/20177/todds-famous-blueberry-pancakes/):

- $1\frac{1}{2}$ cup all-purpose flour
- $\frac{1}{2}$ teaspoon of salt
- 1 tablespoon of baking powder
- $1\frac{1}{4}$ tsp of sugar
- 1 egg
- 1 cup milk
- $\frac{1}{2}$ tablespoon of butter melted
- $\frac{1}{2}$ cup frozen blueberries (thawed)

How much of each ingredient would he need to give everyone a serving of pancakes?

Independent Practice

Todd gets several phone calls and found out that only 18 people are coming. How much of each ingredient will he need to have to make enough for 18 people?

Zach's Zoo Adventure

Building Fluency: multiply whole number by a fraction

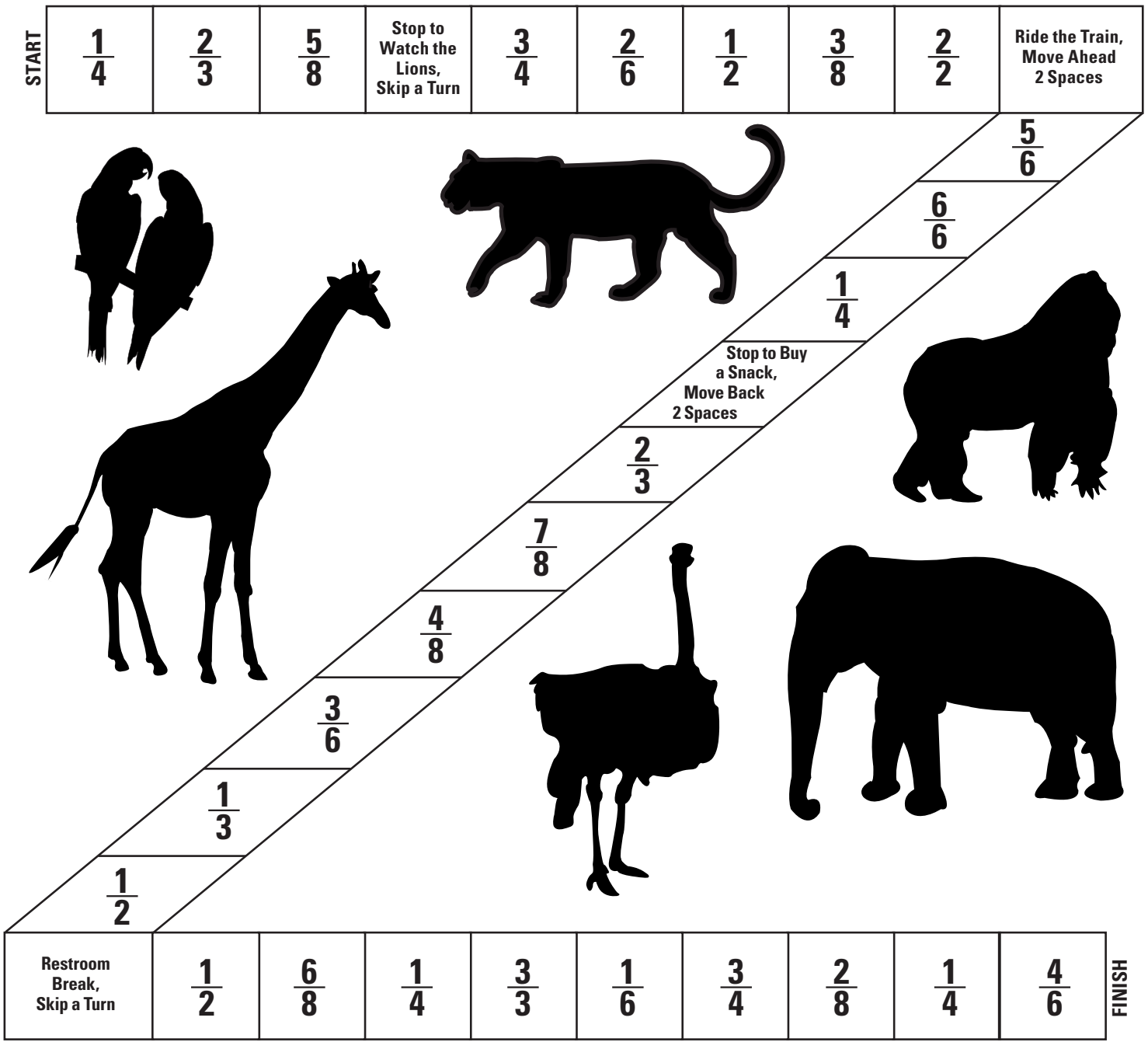
Materials: die, gameboard, game marker, calculator -optional

Number of Players: 2-4

Directions: Zach is visiting the Asheboro Zoo for the day. He needs your help to navigate his way through the zoo.

1. All players begin on "Start". Player 1 rolls the die and multiplies the digit on the die by the fraction their game piece is on.
2. If it is correct (may use calculator to check your work) Player 1 moves forward the number of spaces shown on the die.
3. Players take turns rolling the die and multiplying the digit on the die by the fraction their game piece is on.
4. The first player to cross the finish line wins. Play until every player crosses the finish line. You've helped Zach visit the entire zoo!

Variation/Extension: Students can create their own gameboard and/or use a die with larger numbers. Student can record their work on a piece of paper of in math notebook.



Parts of a Whole

Building Fluency: multiplication of whole number by a fractions

Materials: whole number die (1-6), fraction circle, and fraction cards or fraction die or spinner

Number of Players: 2

Directions:

1. Player rolls a standard whole number die, and spins the spinner.
2. The standard die represents the number of groups, and the spinner represents the fraction in each group.
   Example: A roll of 3 on the standard die, and spin $\frac{1}{4}$ on the spinner would be represented 3 groups with $\frac{1}{4}$.
3. Use fraction circles to help determine the product for each round.
4. If your result is 1 or more, you receive a star.
5. Play several rounds and count the stars you have collected.
6. The player with the most stars collected is the winner.

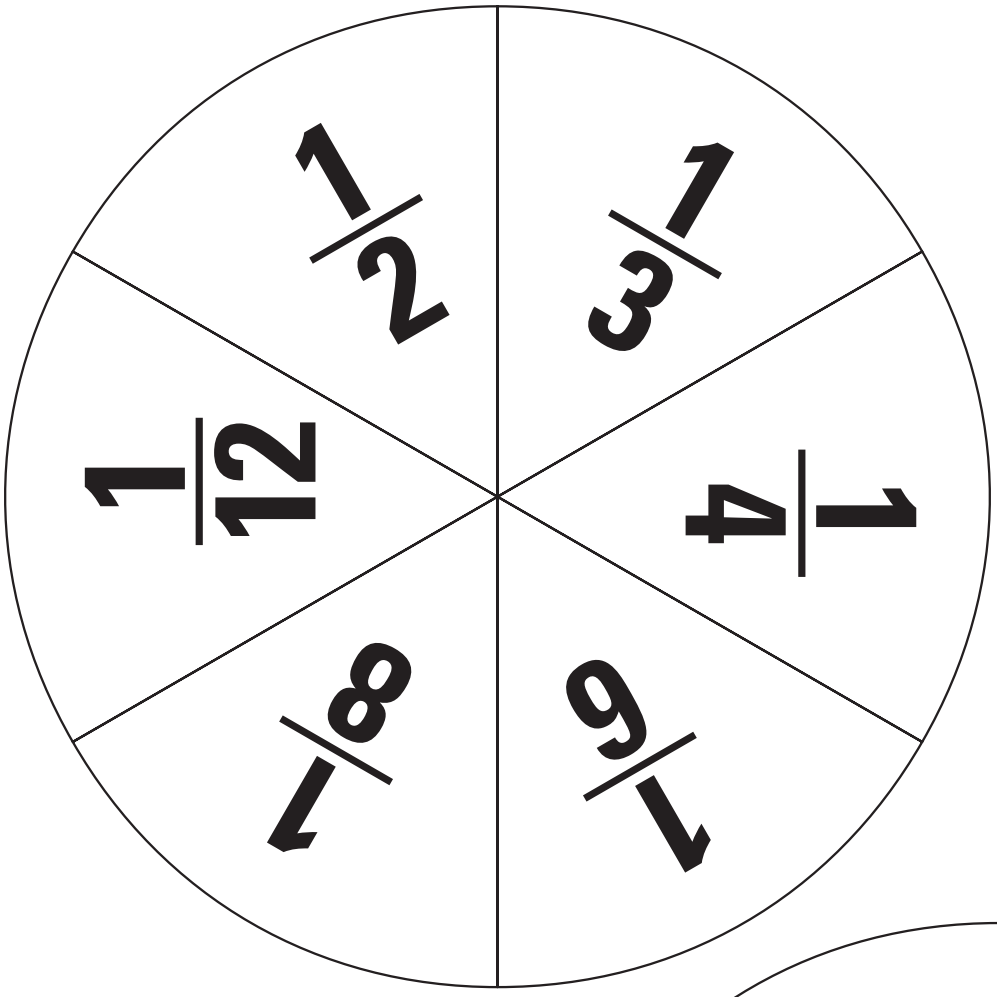
Variation/Extension: Student may want to modify fractions on spinner or use a die 0-9. A blank spinner and fraction circles are added for your convenience. Teacher may also want students to add the products. Students may want to write coordinating problems to fit each equation.

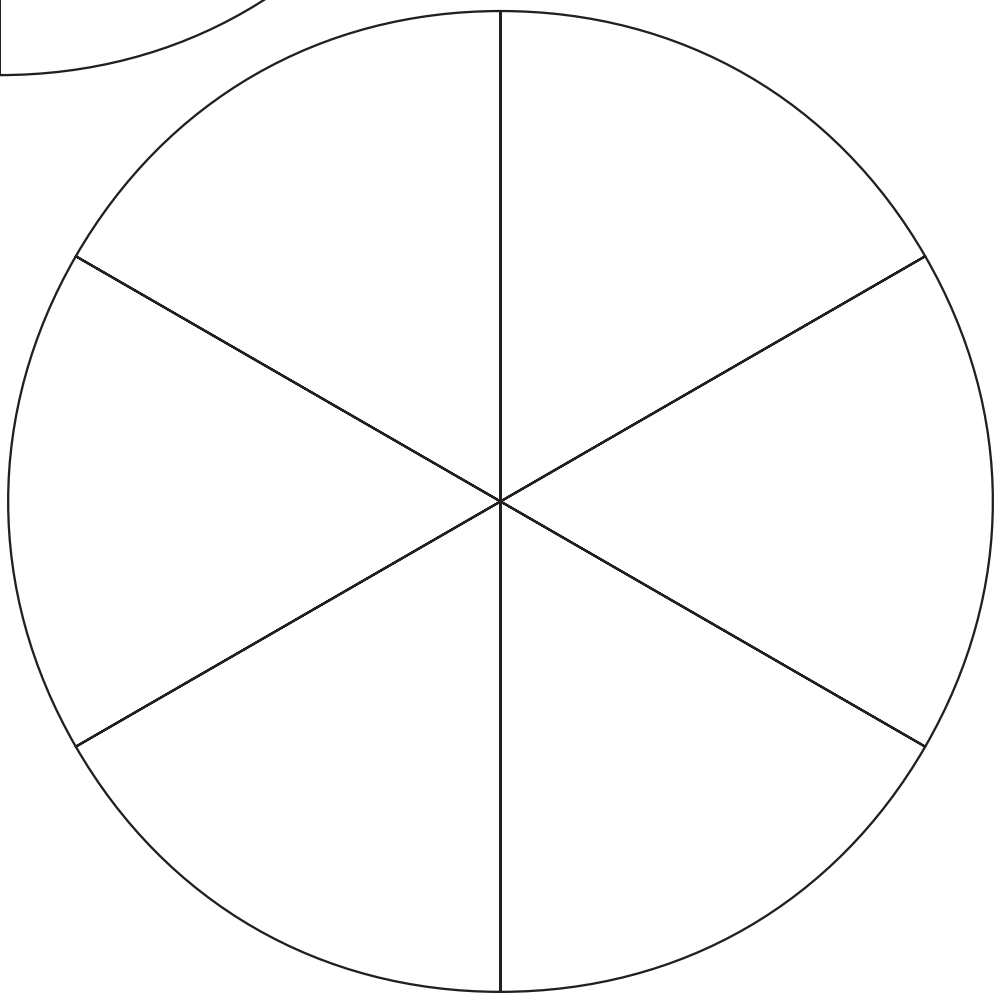
PLAYER 1

ROLL	SPIN	EQUATION

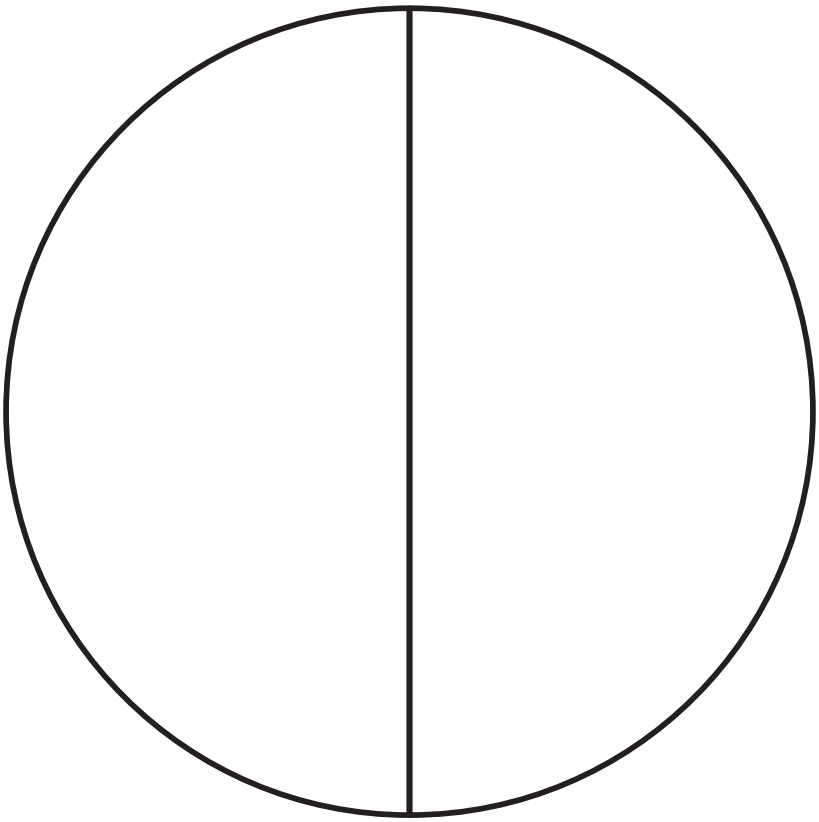
PLAYER 2

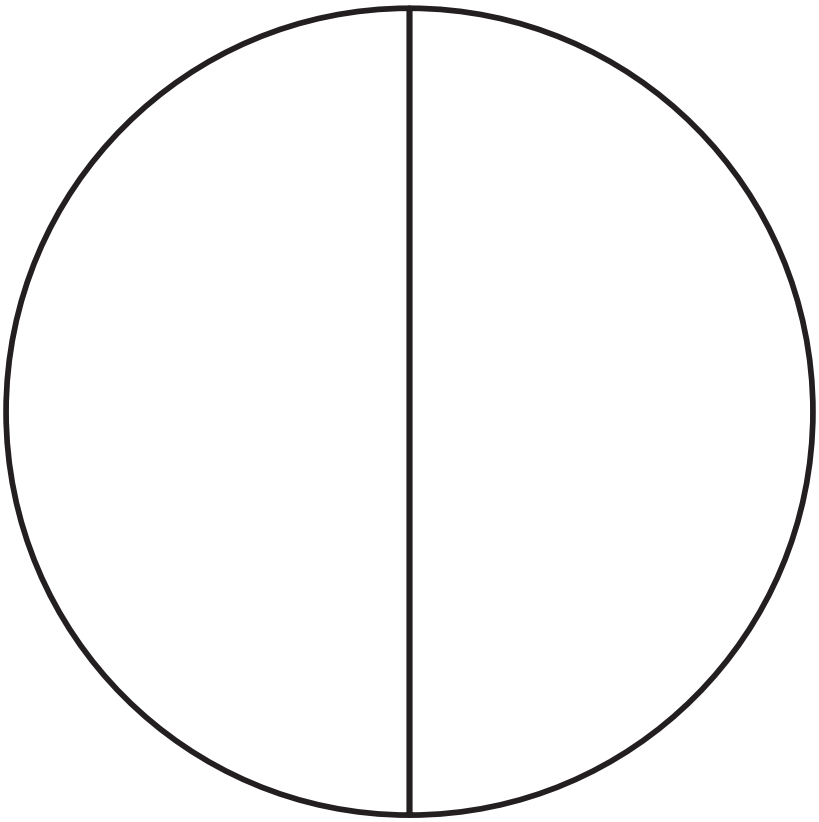
ROLL	SPIN	EQUATION

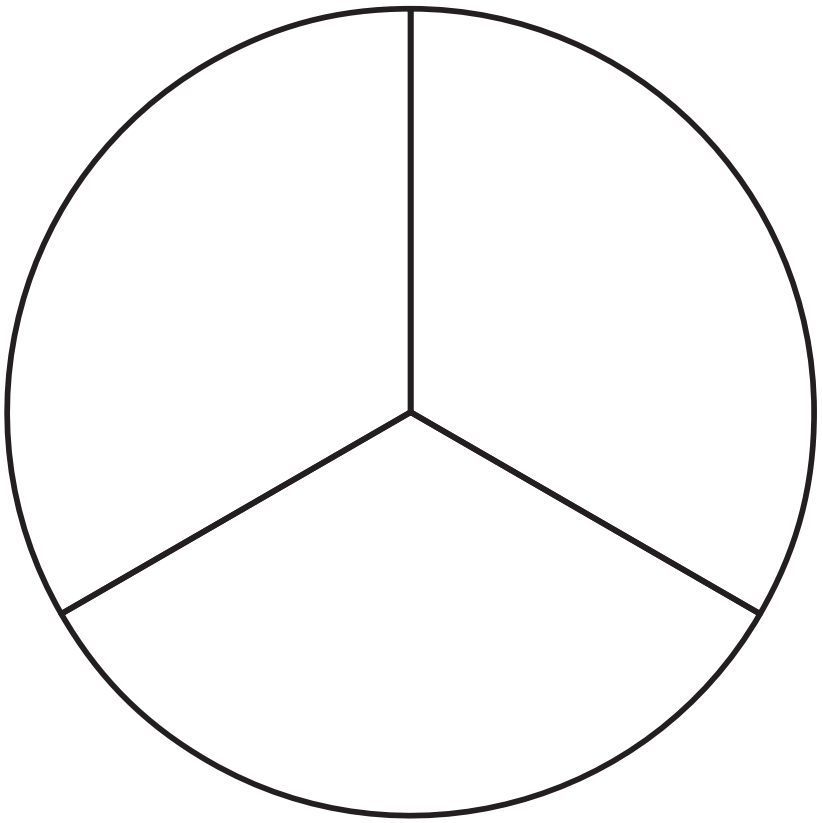

1/2
1/3
1/12
1/4
1/8
1/9

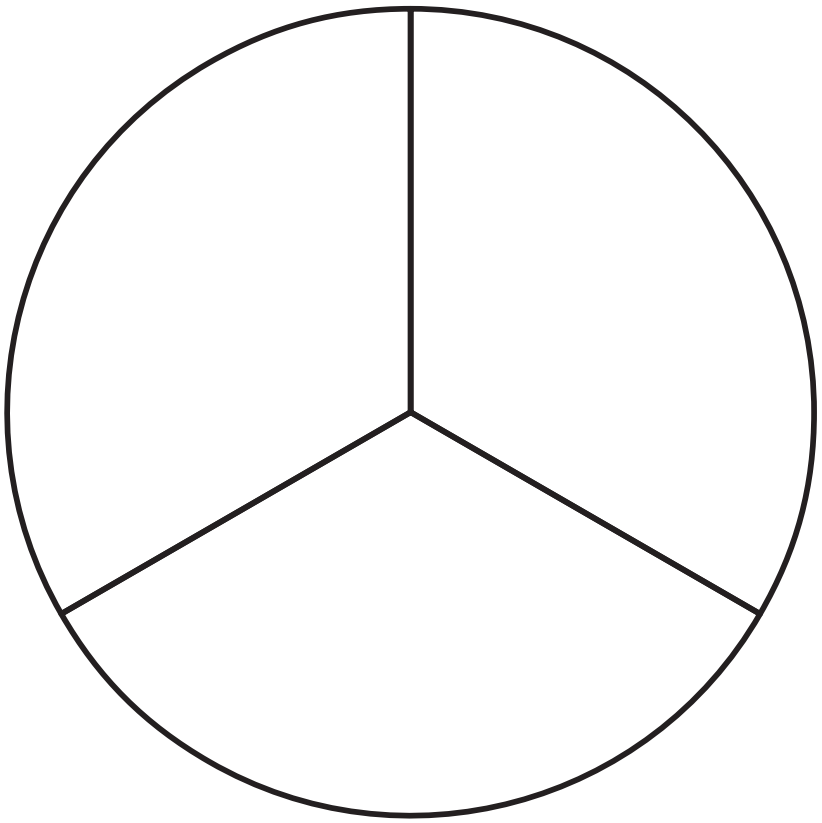


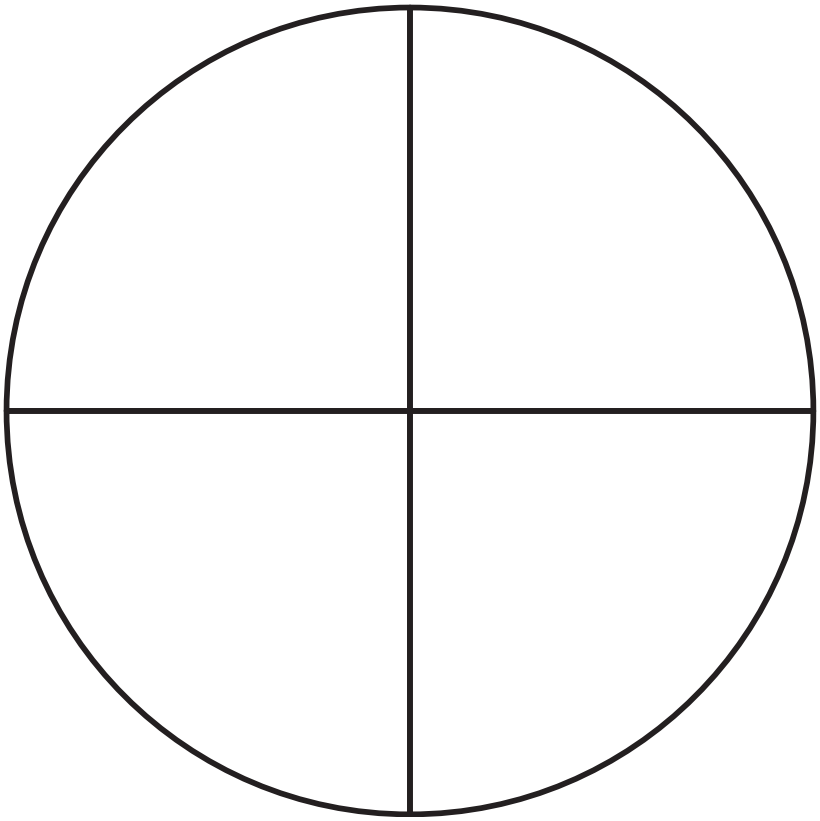
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$
$\frac{1}{6}$	$\frac{1}{8}$	$\frac{1}{12}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$
$\frac{1}{6}$	$\frac{1}{8}$	$\frac{1}{12}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$
$\frac{1}{6}$	$\frac{1}{8}$	$\frac{1}{12}$

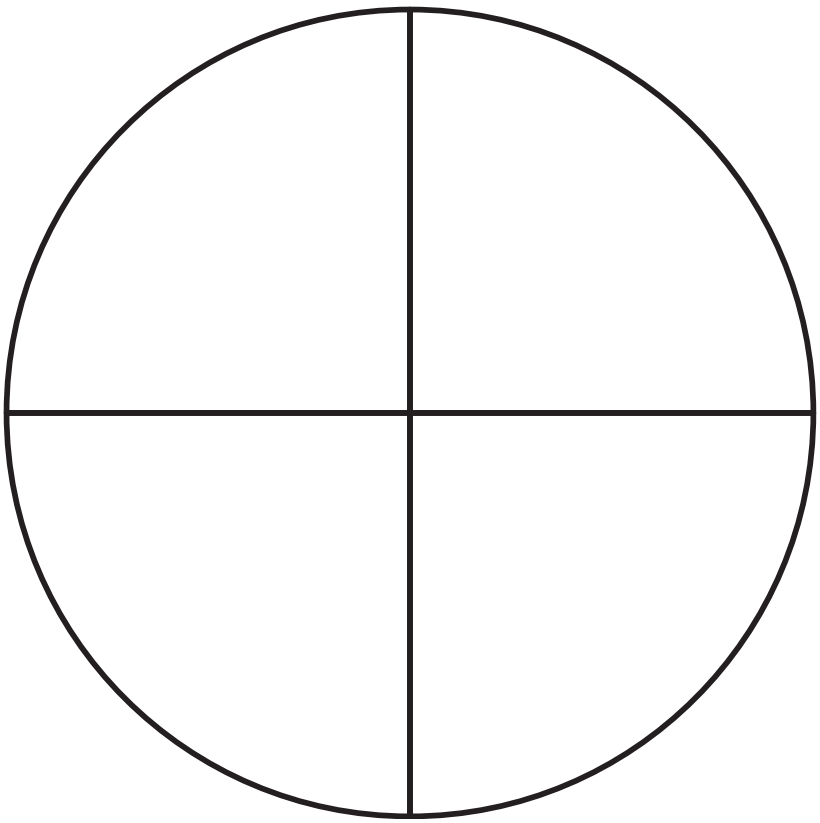


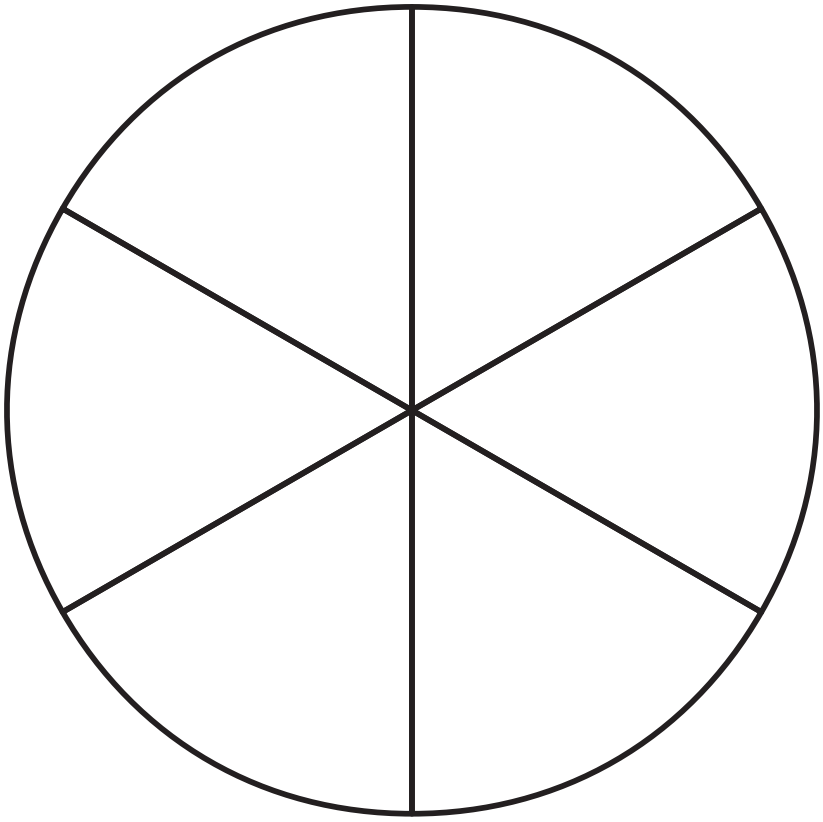


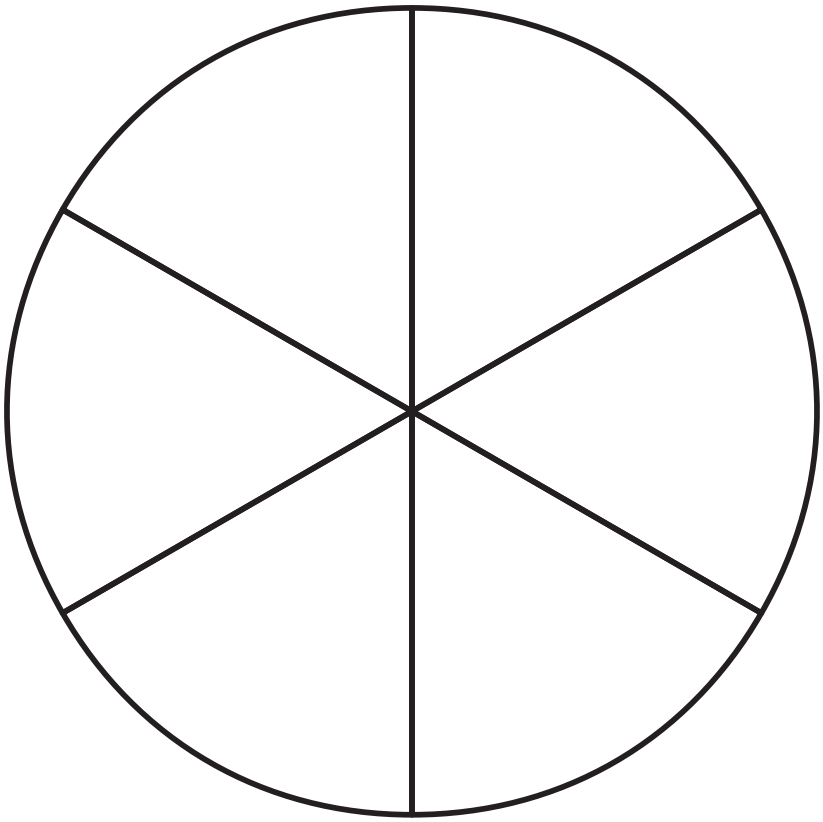


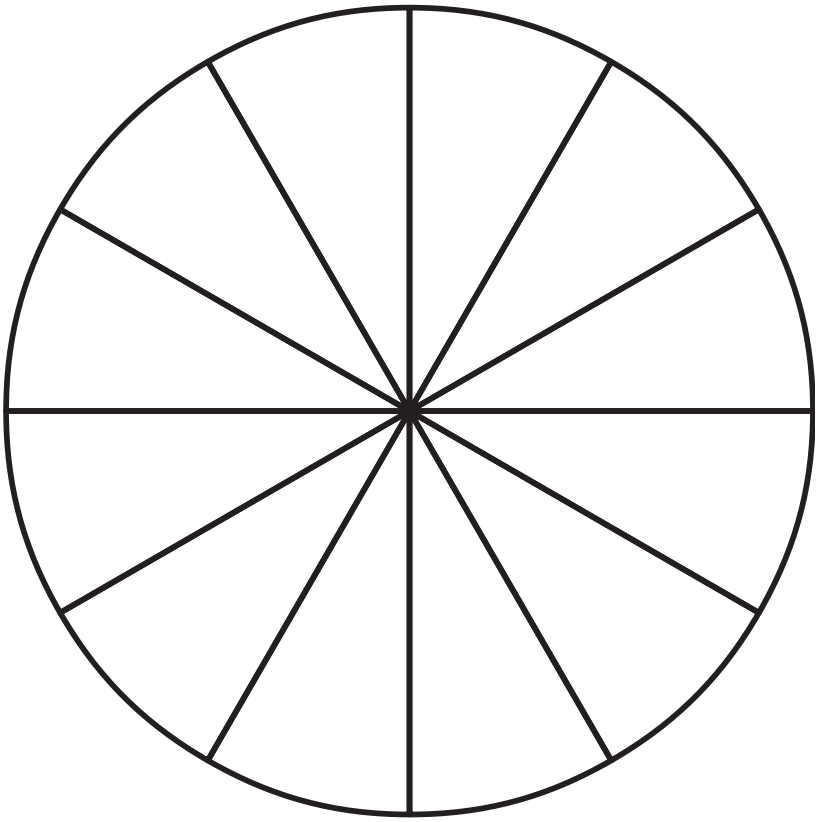


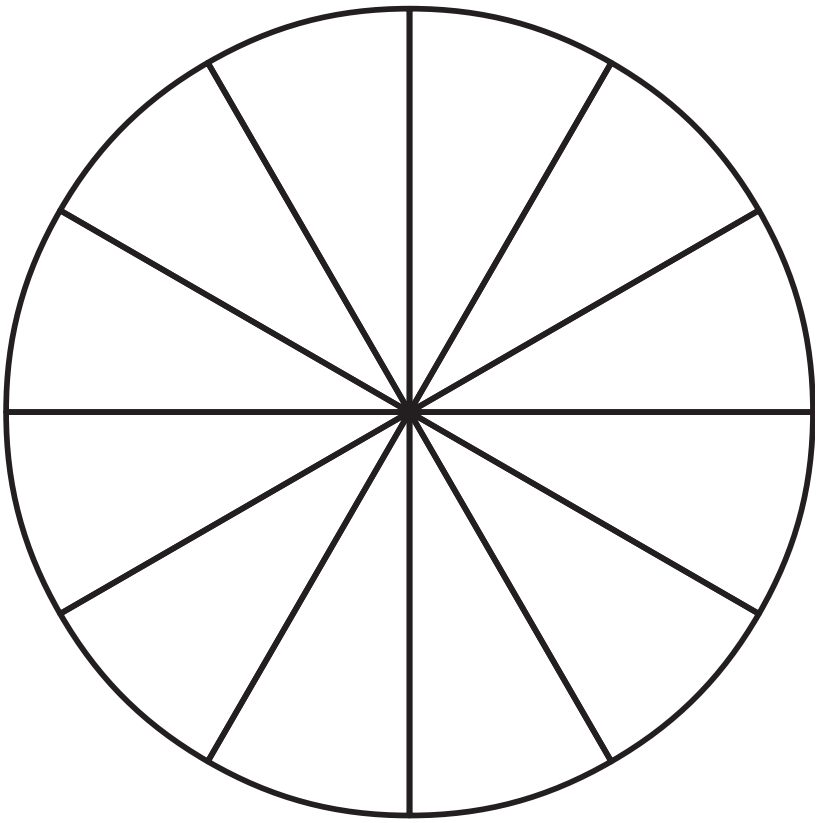


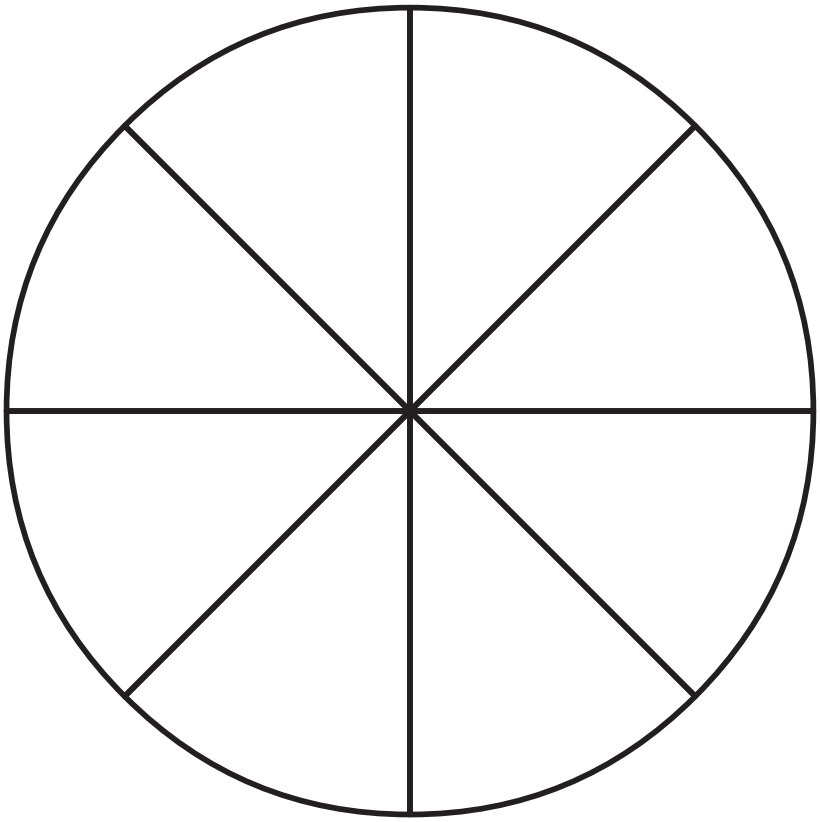


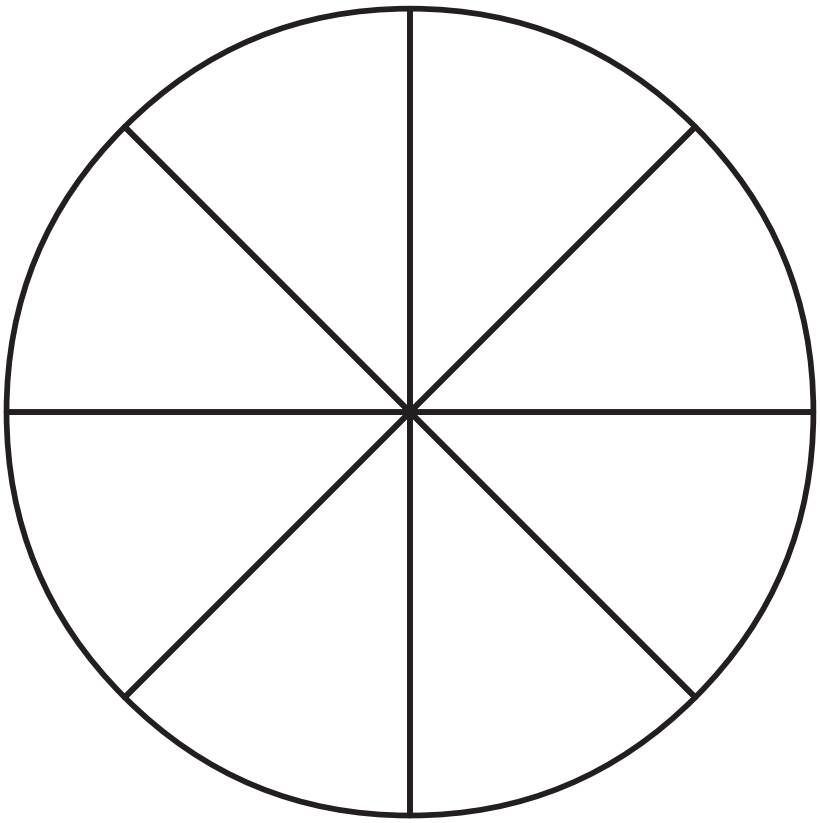












Formative Instructional and Assessment Tasks

NC.4.NF.4 Training for a 5K	
Domain	Number and Operations - Fractions
Cluster	Use unit fractions to understand operations of fractions.
Standard(s)	**NC.4.NF.4** Apply and extend previous understandings of multiplication to: • Model and explain how fractions can be represented by multiplying a whole number by a unit fraction, using this understanding to multiply a whole number by any fraction less than one. • Solve word problems involving multiplication of a fraction by a whole number.
Materials	activity sheet, pencil
Task	**Training for a 5K** Molly is training for a 5K. Her goal is to run 10 miles by the end of this week. On Monday, the distance she runs is ¼ of her goal. Part 1: How far did Molly run on Monday? Draw a model to show your work. *Solution: 2 ½ miles* Part 2: After Monday's run, how far is Molly away from her goal? *Solution: 7 ½ miles* Part 3: If Molly runs this same distance each day, when will she reach her goal? *Solution: Thursday*

Rubric		
Level I **Not Yet**	**Level II** **Progressing**	**Level III** **Meets Expectation**
Student is unable to answer any parts of the problem completely and correctly.	Student answers 1-2 parts of the problem completely and correctly.	Student is able to solve each part correctly and is able to use a number line or other model to correctly show a solution strategy for Part 1.

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks

Training for a 5K

Molly is training for a 5K. Her goal is to run 10 miles by the end of this week. On Monday, the distance she runs is ¼ of her goal.

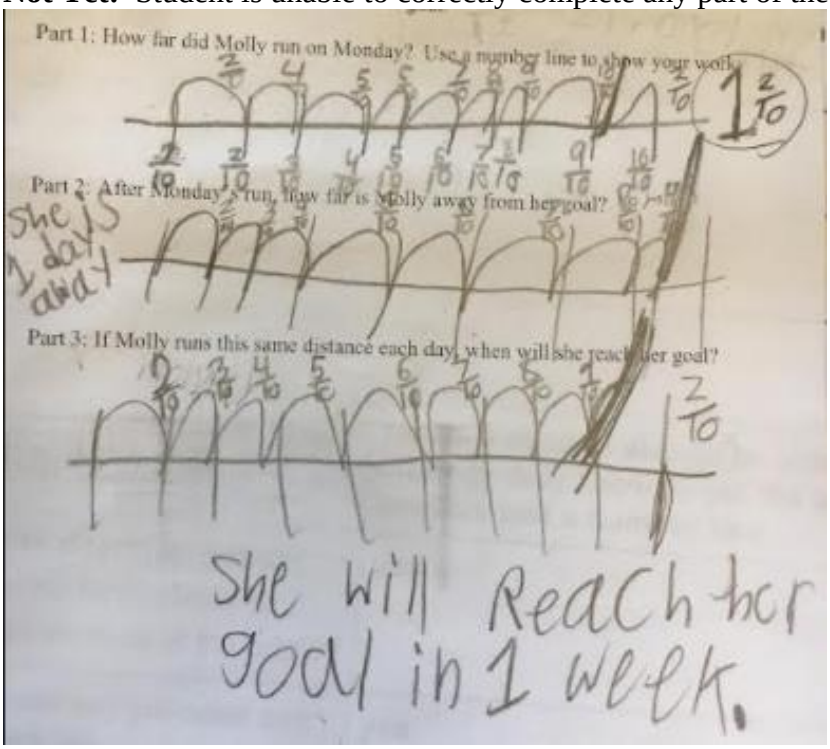
Part 1: How far did Molly run on Monday? Draw a model to show your work.

Part 2: After Monday's run, how far is Molly away from her goal?

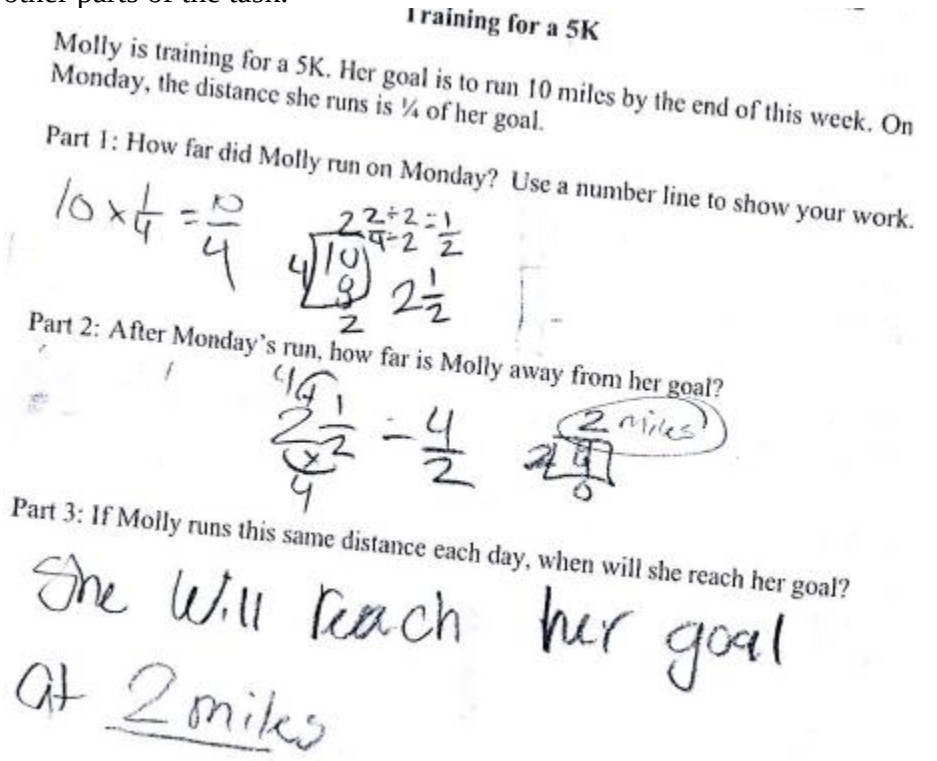
Part 3: If Molly runs this same distance each day, when will she reach her goal?

Formative Instructional and Assessment Tasks
Scoring Examples

Not Yet: Student is unable to correctly complete any part of the task.

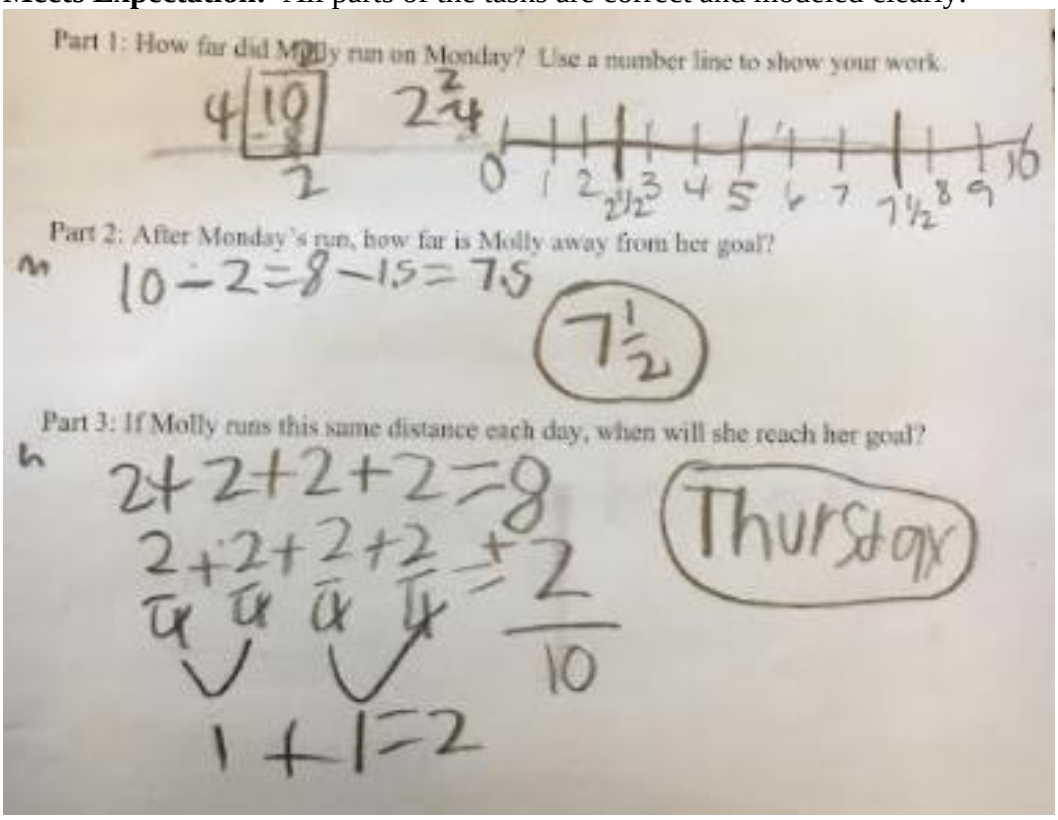


Progressing: This student is able to complete Part 1 of the tasks, but does not correctly apply the answer to the other parts of the task.



Formative Instructional and Assessment Tasks

Meets Expectation: All parts of the tasks are correct and modeled clearly.



Formative Instructional and Assessment Tasks

NC.4.NF.4 Chris's Cookies	
Domain	Number and Operations - Fractions
Cluster	Use unit fractions to understand operations of fractions.
Standard(s)	**NC.4.NF.4** Apply and extend previous understandings of multiplication to: • Model and explain how fractions can be represented by multiplying a whole number by a unit fraction, using this understanding to multiply a whole number by any fraction less than one. • Solve word problems involving multiplication of a fraction by a whole number.
Materials	activity sheet, pencil
Task	**Chris's Cookies** On Saturday, Chris bakes a batch of 24 cookies. He uses ¾ of the batch of cookies in treat bags for his birthday party. Part 1: How many cookies did Chris use in treat bags? Draw a picture and write a sentence to explain your strategy. *Solution: 18 cookies* Part 2: Does he have enough cookies left to put one cookie in his lunch box each day next week? Why or why not? *Teacher note: Some students may interpret a week as 5 days and others may interpret it as 7 days. Both are acceptable, as long as students can justify their answer and their thinking appropriately.* *Solution: 6 cookies left (If student interprets a week as 5 days of packing a lunch, they should justify why there ARE enough cookies. If the student interprets a week as 7 days, they should justify why there ARE NOT enough cookies).*

Rubric		
Level I Not Yet	**Level II Progressing**	**Level III Meets Expectation**
Student's solutions, pictures, and explanations are incorrect.	Student is able to solve the problem, but pictures and explanations are unclear or incorrect. OR Pictures are correct, but the solution and explanation are incorrect.	Student solves the problems correctly, and the picture and explanations match the problem.

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks

Chris's Cookies

On Saturday, Chris bakes a batch of 24 cookies. He uses ¾ of the batch of cookies in treat bags for his birthday party.

Part 1:
How many cookies did Chris use in treat bags? Draw a picture and write a sentence to explain your strategy.

Part 2:
Does he have enough cookies left to put one cookie in his lunch box each day next week? Why or why not?

Formative Instructional and Assessment Tasks
Scoring Examples

Not Yet: Student correctly draws a model, but does not understand how to represent ¾ with a set of 24 in Part 1. Part 2 shows a lack of understanding for what the question is asking.

On Saturday, Chris bakes a batch of 24 cookies. He uses ¾ of the batch of cookies in treat bags for his birthday party.

Part 1:

How many cookies did Chris use in treat bags? Draw a picture and write a sentence to explain your strategy.

I drew a tape diagram that represents 24 batch of cookies and then I shaded 3 and left me with 21 cookies

Part 2:

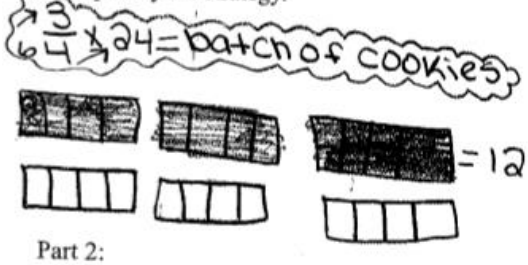
Does he have enough cookies left to put one cookie in his lunch box each day next week? Why or why not? No because 21 is a odd number and you can not also because their not going to get the same amout of cookies.

Progressing: This student correctly solves for Part 1, but in Part 2, the explanation reflects a misunderstanding as to what the question is asking. The student fails to see that the leftover cookies are the ones being worked with in Part 2.

On Saturday, Chris bakes a batch of 24 cookies. He uses ¾ of the batch of cookies in treat bags for his birthday party.

Part 1:

How many cookies did Chris use in treat bags? Draw a picture and write a sentence to explain your strategy.



Chris used 18 cookies in the treat bag's

how many used 18

Part 2:

Does he have enough cookies left to put one cookie in his lunch box each day next week? Why or why not?

1x5=5 yes because he have's 18 cookie's
7x1=7 and onley needs 5 for the week and 7 for the week and week end.

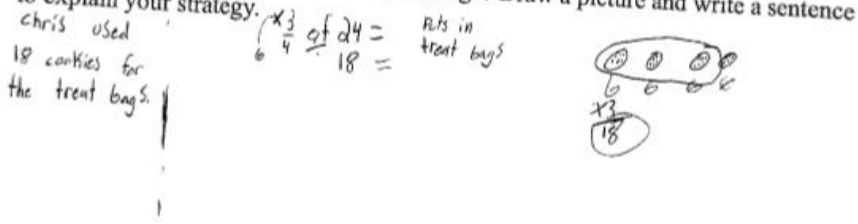
Formative Instructional and Assessment Tasks

Meets Expectation: The student correctly solves all aspects of the task, and explanation is clear and accurate.

On Saturday, Chris bakes a batch of 24 cookies. He uses ¾ of the batch of cookies in treat bags for his birthday party.

Part 1:

How many cookies did Chris use in treat bags? Draw a picture and write a sentence to explain your strategy.



Part 2:

Does he have enough cookies left to put one cookie in his lunch box each day next week? Why or why not?