

Feeling Hungry

One afternoon Mr. and Mrs. Baxter and their 3 children were busy working outside in their garden. Mrs. Baxter was feeling hungry so she went inside to the kitchen where there was a plate full of cookies. She ate $\frac{1}{6}$ of the cookies and then went back to work. Mr. Baxter was feeling hungry so he went inside and ate $\frac{1}{5}$ of the remaining cookies and then went back to work. Next, Anna was feeling hungry so she went inside and ate $\frac{1}{4}$ of the cookies that were left on the plate, and then went back to work. Then Tyler was feeling hungry so he went inside, ate $\frac{1}{3}$ of the cookies left on the plate and then went back to work. Finally, little Adam was feeling hungry and he went inside and ate $\frac{1}{2}$ of the remaining cookies, leaving 4 cookies on the plate. How many cookies were on the plate before anyone started feeling hungry?

Feeling Hungry

Suggested Grade Span

Grades 3–5

Grade(s) in Which Task Was Piloted

Grade 5

Task

One afternoon Mr. and Mrs. Baxter and their 3 children were busy working outside in their garden. Mrs. Baxter was feeling hungry so she went inside to the kitchen where there was a plate full of cookies. She ate $\frac{1}{6}$ of the cookies and then went back to work. Mr. Baxter was feeling hungry so he went inside and ate $\frac{1}{5}$ of the remaining cookies and then went back to work. Next, Anna was feeling hungry so she went inside and ate $\frac{1}{4}$ of the cookies that were left on the plate, and then went back to work. Then Tyler was feeling hungry so he went inside, ate $\frac{1}{3}$ of the cookies left on the plate and then went back to work. Finally, little Adam was feeling hungry and he went inside and ate $\frac{1}{2}$ of the remaining cookies, leaving 4 cookies on the plate. How many cookies were on the plate before anyone started feeling hungry?

Alternative Versions of Task

More Accessible Version:

Mr. Baxter baked cookies for his family. He made 2–dozen cookies. Mrs. Baxter ate $\frac{1}{4}$ of the cookies. Mr. Baxter’s daughter Anna ate $\frac{1}{6}$ of the remaining cookies. Mr. Baxter’s oldest son Tyler ate $\frac{1}{5}$ of what was left. Mr. Baxter’s youngest son Adam ate $\frac{1}{2}$ of what was left. How many cookies were left for Mr. Baxter to eat?

More Challenging Version:

The original version and...

Listed below are the ingredients Mr. Baxter uses to make a recipe for chocolate chip cookies. The recipe makes about 4–dozen cookies. Using your solution to the first part of the task, determine the amount of each ingredient he used to make the number of cookies that started inside on the table.

Chocolate Chip Cookies (from The Betty Crocker Cookbook)

3/4 cup of granulated sugar
3/4 cup of packed brown sugar
1 cup of butter
1 teaspoon of vanilla
1 large egg
2 and 1/4 cups of all-purpose flour
1 teaspoon baking soda
1/2 teaspoon salt
1 cup chopped nuts
2 cups semi-sweet chocolate chips

NCTM Content Standards and Evidence

Number and Operation Standard for Grades 3–5

Instructional programs from pre-kindergarten through grade 12 should enable all students to...

- Compute fluently and make reasonable estimates.
 - *NCTM Evidence:* Develop and use strategies to estimate computations involving fractions and decimals in situations relevant to students' experience.
 - *Exemplars Task Specific Evidence:* This task requires students to compute with fractions to determine the number of cookies on the plate.

Time/Context/Qualifiers/Tip(s) From Piloting Teacher

This is a short to medium length task.

Links

This task could link to cooking activities.

Common Strategies Used to Solve This Task

Most students will create diagrams to solve the task. Others may take a more numeric approach.

Possible Solutions

Original Version:

$$1/2 \text{ of } 8 = 4, 8 + 4 = 12$$

$$1/3 \text{ of } 12 = 4, 12 + 4 = 16$$

$$1/4 \text{ of } 16 = 4, 16 + 4 = 20$$

$$1/5 \text{ of } 20 = 4, 20 + 4 = 24 \text{ cookies to start with}$$

More Accessible Version:

Mrs. Baxter ate $24 \div 4 = 6$, $24 - 6 = 18$ cookies left

Anna: $18 \div 6 = 3$, $18 - 3 = 15$ cookies left

Tyler: $15 \div 5 = 3$, $15 - 3 = 12$ cookies left

Adam: $12 \div 2 = 6$, $12 - 6 = 6$ cookies left for dad

More Challenging Version:

See the solution to the original task, and...

4 dozen \div 24 cookies = 2 dozen, so half the recipe is needed:

$\frac{3}{4}$ cup of granulated sugar $\times \frac{1}{2} = \frac{3}{8}$ cup

$\frac{3}{4}$ cup of packed brown sugar $\times \frac{1}{2} = \frac{3}{8}$ cup

1 cup of butter $\times \frac{1}{2} = \frac{1}{2}$ cup

1 teaspoon of vanilla $\times \frac{1}{2} = \frac{1}{2}$ teaspoon

1 large egg $\times \frac{1}{2} = \frac{1}{2}$ egg

2 and $\frac{1}{4}$ cups of all-purpose flour $\times \frac{1}{2} = 1$ and $\frac{1}{8}$ cup

1 teaspoon baking soda $\times \frac{1}{2} = \frac{1}{2}$ teaspoon

$\frac{1}{2}$ teaspoon salt $\times \frac{1}{2} = \frac{1}{4}$ teaspoon

1 cup chopped nuts $\times \frac{1}{2} = \frac{1}{2}$ cup

2 cups semi-sweet chocolate chips $\times \frac{1}{2} = 1$ cup

Task Specific Assessment Notes**General Notes**

This task essentially requires the understanding of multiplying whole numbers by fractions, but students may be able to use problem-solving strategies and common sense to arrive at a correct solution.

Novice

The Novice will present some basic mathematical understanding about fractions, but understanding of the underlying mathematics in the task may be lacking. Some communication may be evident, but it may lead more to confusion than to clarification. No connections will be made and an incorrect answer will be achieved.

Apprentice

Some aspects of the Apprentice's work will be correct, but an incorrect answer will be achieved. Diagrams or computation may assist in communicating the approach used and reasoning errors may be present.

Practitioner

The Practitioner will achieve a correct answer. Supporting work will be shown and explained through communication with the audience. Relevant observations will be made and representations will be made to solve the problem and communicate the solution.

Expert

The Expert will achieve a correct answer and will use an efficient approach. The student may verify the solution and make other mathematically relevant observations. Math language may be used throughout to communicate. The student will analyze the situation in mathematical terms to draw additional conclusions and observations.

Exemplars

Novice

No fraction language or notation is referred to. Little or no communication is present.



8



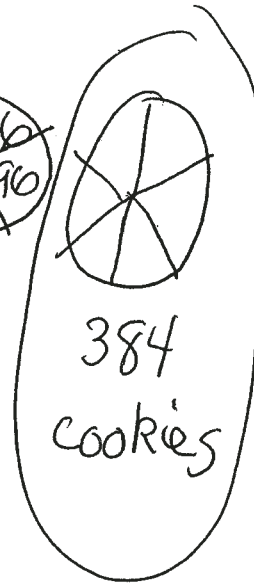
24



96



384



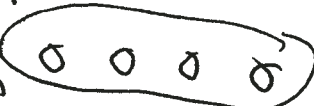

No words or symbols are used.
No connections are made

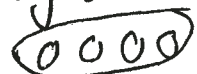
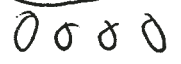

Some basic mathematical understanding about fractions is present, but that knowledge does not further the solution.

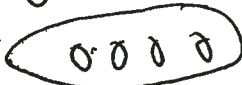

Apprentice


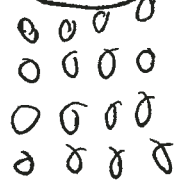
Diagrams assist in communicating the approach used.

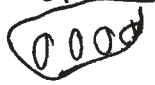
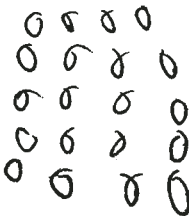
How many cookies on the plate?

Adam
ate $\frac{1}{2}$ 
Left 

Tyler
 ate $\frac{1}{3}$
 Left


Anna
ate $\frac{1}{4}$ 
Left 

Mr Baxter
ate $\frac{1}{3}$ 


Mrs. Baxter
ate $\frac{1}{6}$ 


The answer is 4

Some awareness of audience is present through annotations of the work.

Some aspects of the student's work is correct, but an incorrect answer is achieved due to reasoning errors.

Exemplars

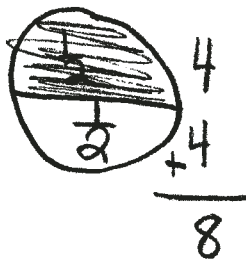
Practitioner

Representations are made to solve the problem and communicate the solution.

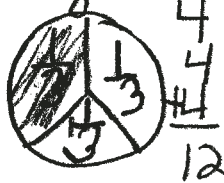
A correct answer is achieved. Relevant observations are made.

This problem requires using fractions and starting from Adam's turn. You know he had 4 cookies left. So if 4 is half, 8 was on the plate when Adam went inside.

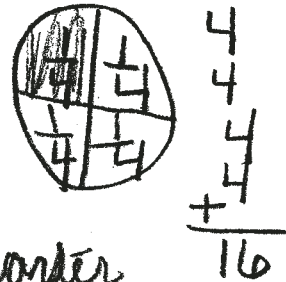
Adam



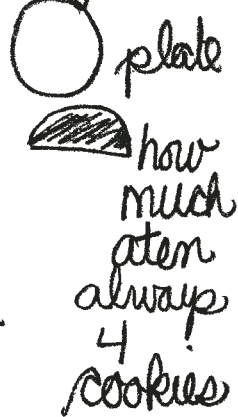
Tyler



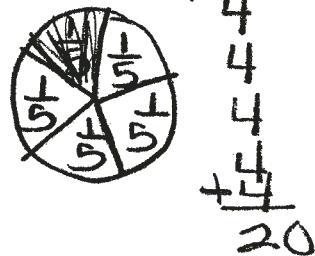
Anna



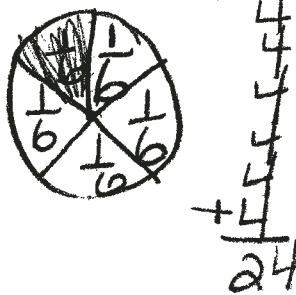
Key



Mr. Boyer



Mrs. Boyer



answer
24 cookies
& made pie graphs

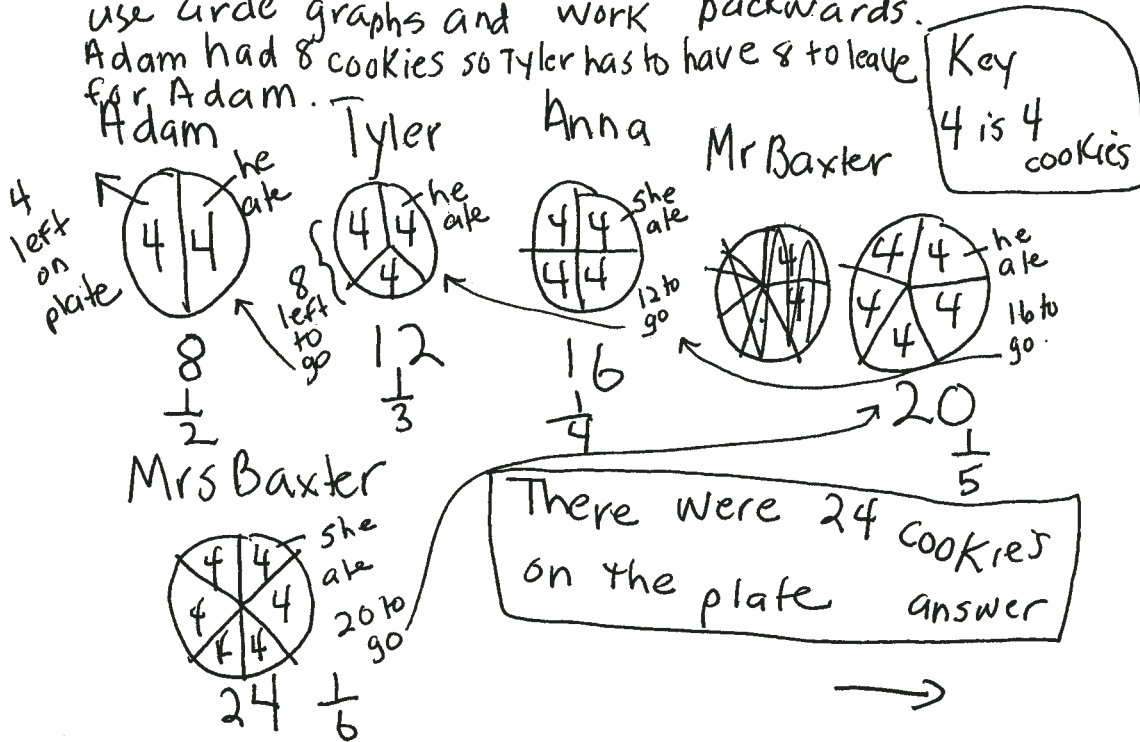
Supporting work is shown and explained through communication with the audience.

Work is well organized, and a detailed explanation is present.

Exemplars

Expert

I have to find out how many cookies were on the plate in the beginning. My plan is to use circle graphs and work backwards. Adam had 8 cookies so Tyler has to have 8 to leave for Adam.



Math language and notation are used to communicate the solution.

Representations are used to analyze phenomenon.

Exemplars

Expert cont.

The student demonstrates awareness of audience and a sense of purpose throughout the task.

I can check the ^{circle} graphs by going forward and a cookies at table.

| Person | fraction of cookies | cookies at table |
|------------|---------------------|------------------|
| Mrs Baxter | $\frac{1}{6}$ of 24 | 4 |
| Mr Baxter | $\frac{1}{5}$ of 20 | 4 |
| Anna | $\frac{1}{4}$ of 16 | 4 |
| Tyler | $\frac{1}{3}$ of 12 | 4 |
| Adam | $\frac{1}{2}$ of 8 | 4 |

4 left on plate so $4 \times 6 = 24$

my answer is right

I also used the fraction circle pieces I started with halves and worked back to 24 cookies. I got the same numbers again. 4 cookies for each person 24 to begin on the plate.

The student analyzes the solution and extends it to make relevant observations and conclusions.

