

USING THE *MATHLINKS* RUBRIC

MathLinks engages students in solving multi-part problems around a theme or context, often referred to as tasks or other “rubric-worthy” problems. Tasks may include: applying procedures, creating or using representations (e.g. pictures, words, numbers, symbols, graphs), interpreting data, constructing written responses, and explaining reasoning.

Specific, timely, descriptive feedback helps students improve the quality of their responses, but finding the time to do this on a regular basis can be challenging. This routine uses the *MathLinks* Rubric to promote class discussions and shift some responsibility for preparation and feedback to students. Student goals include (1) more investment in the learning of themselves and others in their community; (2) more self-reflection, and (3) having a deeper understanding of the mathematics with which they’re engaging.

Why: Encourage self-and peer-reflection. Improve students’ abilities to solve problems (SMP1), communicate mathematical ideas and critique the reasoning of others (SMP3), and attend to precision (SMP6). Provide ongoing practice for task assessments, such as those on PARCC and SBAC.

Materials / Prepare ahead: Distribute a copy of the *MathLinks* Task Rubric for student reference throughout the year. Make post-its available for feedback comments.

Launch: Use Brownie Problems provided here to establish the routine. Part 1 is collaborative and reflective, students become accustomed to the rubric, but no one’s papers are evaluated. In Part 2, students use the rubric to self-evaluate. In Part 3, students use the rubric to peer-evaluate.

Brownie Problem Part 1

Step 1	Students complete the task individually.
Step 2	Teacher discusses with the class what would make effective responses to this rubric-worthy problem, using the answer key as a sample if desired. Solicit as much input as possible from students in this process: <i>What do you think is correct or effective about the responses? How might the response be improved?</i>

Brownie Problem Part 2

Step 3	Students complete the task individually.
Step 4	Teacher discusses with the class what would make effective responses, using the answer key as a sample if desired. Solicit as much input as possible from students in this process (see questions above).
Step 5	Teacher shares the <i>MathLinks</i> Task Rubric with the class. Together, students and teacher decide on a few bullets for focused feedback and brainstorm useful questions or comments. <i>Which statements in the rubric are most relevant to this task? What would be excellent responses based on the bullets? What might be appropriate targeted comments or questions to give based on the relevant bullets?</i>

Brownie Problem Part 3

Step 6	Repeat steps 3 – 5 above.
Step 7	Students exchange papers, give each other feedback, and discuss further. <i>What do you think is correct or effective about the responses? How might the response be improved?</i>

This is the MathLinks Rubric. Many rubric-worthy problems are identified in the Student Packets and Tasks. Typically, questions on identified pages will benefit from feedback for at least two of these features. In some cases, it may be prudent to focus on one or two features of the rubric or selected problems on a page. It is not always necessary (or appropriate) to score a whole page using all three features.

THE *MATHLINKS* Rubric

Task requirements will vary. Choose bullets appropriately.

- Math (SMP6)
 - ✓ Computations and procedures are correct
 - ✓ Representations (numbers, symbols, diagrams) are created correctly
 - ✓ Vocabulary is used properly

- Context (SMP 1)
 - ✓ Solutions satisfy problem requirements, including quantities and units
 - ✓ Suitable representations are used
 - ✓ Data is interpreted appropriately within the problem context

- Reasoning (SMP 3)
 - ✓ Solutions and strategies are justified
 - ✓ Explanations are clear and flow logically

BROWNIE PROBLEM PART 1

Answer key

Mateo has 5 brownies. He keeps one brownie for himself, gives $\frac{1}{4}$ of a brownie to his dad, and then divides the remaining brownies among three friends.

Let M stand for Mateo, D for dad, and $F1$, $F2$, and $F3$ for the 3 friends.



1. How much brownie does each friend get? Show your work or explain your thinking.

Each friend will get $1\frac{1}{4}$ brownies (or $\frac{5}{4}$ brownie).



2. Suppose Mateo gives $\frac{1}{4}$ of a brownie to his dad first, keeps one brownie for himself, and then divides the rest of the brownies among his friends. Does this change the result? Explain.

No, the result is the same because subtracting 1 and then $\frac{1}{4}$ is the same as subtracting $\frac{1}{4}$ and then 1. Both give a difference of $3\frac{3}{4}$ brownies to be divided among the 3 friends.

BROWNIE PROBLEM PART 2

Mateo has 5 brownies. He keeps one brownie for himself, gives $\frac{1}{4}$ of a brownie to his dad, and then divides the remaining brownies among three friends.



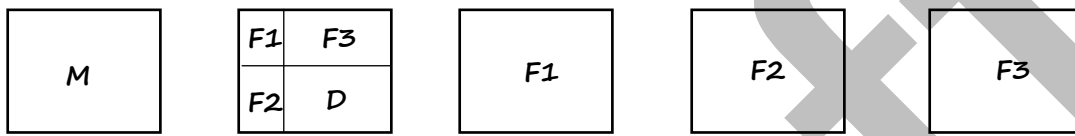
Mateo

3. To find how much brownie each friend gets, Zara drew this picture. Is Zara correct? Give positive, constructive feedback and suggestions to improve the response.



Zara

Zara lets M stand for Mateo, D for dad, and F1, F2, and F3 for the 3 friends.



Zara's picture is not correct because fourths must be parts with equal areas.

If Zara divided the second brownie into equal parts, it would be clear that each friend gets 1 brownie and $\frac{1}{4}$ brownie (or $1\frac{1}{4}$ or $\frac{5}{4}$ brownie).

4. Emmett used numbers to find how much brownie each friend gets. Is Emmett correct? Give feedback to improve the response.

$$5 - 1 = 4 - \frac{1}{4} = 3\frac{3}{4} \div 3 = 1\frac{1}{4} \text{ for each friend}$$

Emmett's thinking is correct, but the "run-on" equalities don't make sense. It starts with $5 - 1$ (which is 4) and ends with $1\frac{1}{4}$. But $5 - 1$ does not equal $1\frac{1}{4}$. Emmett could write each equation separately, and point out important parts.



Emmett

$$5 - \textcircled{1} = 4 \text{ (1 for Mateo)}$$

$$4 - \textcircled{\frac{1}{4}} = 3\frac{3}{4} \text{ (}\frac{1}{4}\text{ for Dad)}$$

$$3\frac{3}{4} \text{ divided by } 3 = \textcircled{1\frac{1}{4}}$$

The solution is $1\frac{1}{4}$ brownies for each friend

BROWNIE PROBLEM PART 3



Mateo has 5 brownies. He keeps $\frac{1}{4}$ of all of the brownies for himself, gives $\frac{1}{2}$ of a brownie to his dad and $\frac{1}{2}$ of a brownie to each of his three friends. How much brownie is left over?

Let M stand for Mateo, D for dad, and F1, F2, and F3 for the 3 friends.

2. Solve the problem. Show your work or explain your thinking.

M	D	M	F1	M	F2	M	F3	M	
	D		F1		F2		F3		

Mateo keeps $\frac{5}{4}$ or $1\frac{1}{4}$ brownies

Dad and friends in total keep $\frac{4}{2}$ or 2 brownies

$1\frac{3}{4}$ brownies are left over

3. Use numbers and words as an explanation to the problem and your picture above.

$$\frac{1}{4} \text{ of } 5 = \frac{1}{4} \times 5 = \frac{5}{4} \text{ or } 1\frac{1}{4} \text{ (Mateo's brownies kept)}$$

$$4 \times \frac{1}{2} = \frac{4}{2} \text{ or } 2 \text{ (brownies for dad and 3 friends)}$$

$$5 - 1\frac{1}{4} - 2 = 1\frac{3}{4} \text{ (brownies left over)}$$