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), organizing and 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.

Why: Encourage investment in learning through self- and peer-reflection. Improve 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 developed by the Partnership for Assessment and Readiness for College and Careers (PARCC) and the Smarter Balanced Assessment Consortium (SBAC).

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

The *MathLinks* Rubric and a list of many rubric-worthy problems in Student Packets are included in this document. To maximize focused discussions and useful feedback, choose a few problems from a page and about two statements from the rubric. Note that there is some overlap among statements Choose statements that best describe requirements for the problem or question.

Launch the activity: Use Brownie Problems Parts 1 – 3, one at a time, to establish the routine.

Students complete the task individually. Then consider these options:

- Teacher solicits from the class what would make effective responses to this rubric-worthy problem.

- Show the answer key.

  What do you think is correct or effective about the response(s)? How might the response(s) be improved?

- Identify about two statements from the *MathLinks* Rubric.

  What do you think would make an effective response based on these statements?

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(Continued)

For a sequence to help students gain familiarity with the feedback process consider:

- Students complete **Brownie Problem Part 1**. Choose about two rubric statements. Students review sample work (included here) and evaluate whether or not they meet the requirements of the chosen statement(s).

- Students complete **Brownie Problem Part 2**. Choose about two rubric statements. After a discussion about what makes an effective response, students self-evaluate their work, and then make improvements.

- Students complete **Brownie Problem Part 3**. Choose about two rubric statements. After a discussion about what makes an effective response, students exchange papers and give each other feedback based on the rubric statements, and then make improvements to their own papers.

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Choose statements from **M**, **A**, and **R** that are appropriate to the task.

M Math (SMP 6)
1. Math is done correctly (computations, procedures, diagrams)
2. Vocabulary is used properly

A Applications / Modeling Context (SMP 1, 4)
1. Information and representations are used appropriately
2. Solutions satisfy problem requirements, including quantities and units

R Reasoning (SMP 3)
1. Solutions and strategies are justified
2. Explanations are clear and flow logically

For formative assessment, oral and written feedback will help students grow and progress.

This rubric may be used on **Tasks** (in the Teacher Portal) for summative assessment. Here is a scoring option:

- Choose a scale (e.g. 1 – 3 points).

- Choose rubric statements as areas of focus (e.g. 2 or 3 of them).

- For each focus area, give an appropriate score, and add the (2 or 3) scores to get a total summative grade.

GRADE 6 RUBRIC-WORTHY PROBLEMS

Use any pages/problems desired from Packets 1 – 10. Here are some examples from select Student Packets to consider.

Packet	Lesson	Page Title	Choose from These Problems
1	2	Practice 2	Any of 1 – 5
2	1	Factor Game	Any of 2b – 2f
3	3	The Grain Grocer	Any of 1 – 5
4	3	Practice 8	1 and/or 8
	4	Practice 11	Any of 1 – 4
6	2	Practice 4	Any of 6 – 8
7	2	A Committee Decision	Any of 1 – 7
	3	Practice 9: Extend Your Thinking	Any of 1 – 4
8	1	Practice 1	Any of 1 – 6
	1	Inequalities: Extend Your Thinking	Any of 2 and/or 3; 8 and/or 9
9	1	Practice 3: Extend Your Thinking	Any of 1 – 5
	3	The Food Drive	Any of 1 – 4

GRADE 7 RUBRIC-WORTHY PROBLEMS

Use any pages/problems desired from Packets 1 – 10. Here are some examples from select Student Packets to consider.

Packet	Lesson	Page Title	Choose from These Problems
1	1	Practice 2	Any of 1 – 10
	2	Race to the Top Revisited	Any of 1 – 3, 5, 6
2	1	Using Coupons Revisited	Any of 1 – 2
3	1	Practice 2	Any of 1 – 6
4	1	Practice 3	Any of 1 – 2
5	1	Practice 2	Any or all of 19
	2	Writing Rational Numbers in Different Forms	Any of 12 – 13
6	1	Practice 2	Any of 1 – 3
		Crossing the Lake Revisited	Any of 9 – 11
7	1	Practice 2	5 – 8
8	1	Practice 2	Any of 1 – 5 along with 6
	2	A Polygon Investigation	16, 17
9	2	Penny Drop Probabilities	All
		Dart Board Probabilities	All
10	3	Practice 5	Any of 2 – 10

GRADE 8 RUBRIC-WORTHY PROBLEMS

Use any pages/problems desired from Packets 1 – 10. Here are some examples from select Student Packets to consider.

Packet	Lesson	Page Title	Choose from These Problems
1	1	Practice 2: Extend your Thinking	5
	2	Ice Cream Cones	2 – 3
	3	Angle Facts Related to Triangles	11
2	2	Revisiting Two Problems	1
	3	Practice 6	Any of 1 – 4
3	1	Practice 4: Extend your Thinking	16
	2	Practice 5	Any of 9 – 11
		Practice 6	Any of 11 – 12
	3	Practice 8	Any of 17 – 21
4	1	Interpreting Tables, Equations, and Graphs	Any of 1 – 6
		Analyzing Saving Vs Spending	1 – 5
	3	The Bath Graph	All
		The Rollercoaster	All
5	4	Practice 4	1 – 5 or 6 – 10
6	1	Practice 2	Any of 1 – 6
	2	Obesity Rates by State	Any of 1 – 5
	3	Practice 5	Any of 1 – 14
		A Marketing Decision	Any of 1 – 3
7	1	Practice 3	Any of 1 – 4
8	3	Training for a Marathon	Any of 1 – 5
10	2	True-False-Explain	Any of 3 – 4
		Practice 2	Any of 3 – 6

ANALYZING STUDENT WORK WITH THE *MATHLINKS* RUBRIC

Four student work samples for **Brownie Problem Part 1**, problem 1 are included in the Reproducible section for the *MathLinks* Rubric. Use these comments to facilitate understanding of the rubric.

Recommendation: select 2 – 3 rubric statements for discussion.

Bradley • Answer is correct. Solution is justified. (M1, R1) • Run-on equation ($5 \times 4 \neq \frac{15}{4}$) is not true. Rewrite as separate equations. (R1, R2) • More explanation (e.g. label meaning of computations, include a diagram) would improve response. (M1, A2, R2)	Bradley Brown BROWNIE PROBLEM PART 1 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 1. How much brownie does each friend get? Show your work or explain your thinking. $5 \times 4 = 20 = \frac{20}{4} - \frac{4}{4} = \frac{16}{4} - \frac{1}{4} = \frac{15}{4}$ $15 \div 3 = 5$ $\frac{5}{4}$ final
Ramon • The diagram is correct, but the solution is not. (M1) • Diagram shows understanding of the information given. (M1, A1) • Interpretation of the diagram is not correct because each of the pieces for friends are "fourths." (A1, R1, R2) • Labels make it easy to understand student thinking, even through the diagram is not interpreted correctly. (R1, R2)	Ramon BROWNIE PROBLEM PART 1 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 1. How much brownie does each friend get? Show your work or explain your thinking. To his Dad → = 15 pieces when divided into 4's Mateo's 15 ÷ 3 = 5 so that means each friend get 5 pieces of brownies
Evelyn • Solution is correct. Vocabulary is used correctly. (M1, M2, A2) • Word explanation is clear. (R1, R2) • Solution would benefit from labeled computations or diagrams. (M1, R2)	Evelyn BROWNIE PROBLEM PART 1 Mateo has 5 brownies. He keeps one brownie for himself, gives $\frac{1}{4}$ of a one brownie, brownie to his dad, and then divides the remaining brownies among three friends. Mateo 1. How much brownie does each friend get? Show your work or explain your thinking. Mateo gets one whole brownie, his dad gets a quater brownie ang his friends get 1¼ of brownies. I got the answer by taking away one brownie then taking away 3 bownies one for each of his 3 friends then I divided the remaining brownie into 4 forths then I took away one forth for his dad which leaves 3 forths. Finally I gave one forth to his 3 friend which left me with brownies.
Valeria • Solution is not correct. (M1, R1) • Diagram is correct and easy to understand. It appears that Valeria put an "M" in the first circle to represent Mateo and shaded Dad's portion. (A1) • Conclusion not correct because remaining portion for friends was not interpreted correctly. (M1, A1)	Valeria BROWNIE PROBLEM PART 1 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 1. How much brownie does each friend get? Show your work or explain your thinking. M O O O O Dad 3 They each get 1½.

BROWNIE PROBLEM PART 1

Answer key

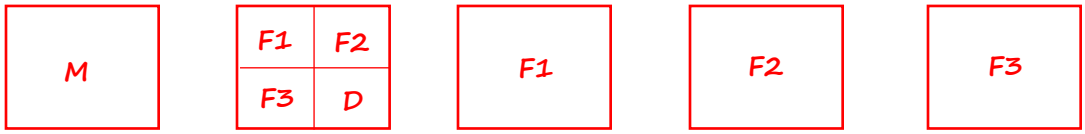

Mateo

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

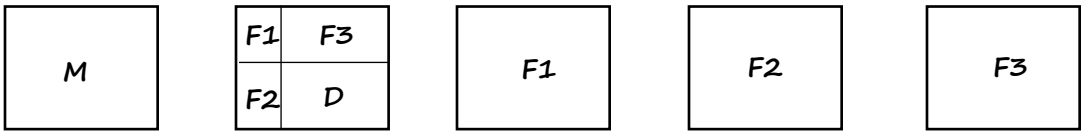
Answer key

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.

Mateo

1. Give constructive feedback and suggestions to Zara to improve the picture.

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



Zara

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).

2. Emmett used numbers to find the correct amount of brownie each friend gets. Give constructive feedback to Emmett to make the mathematics more precise.

Emmett

$5 - 1 = 4 - \frac{1}{4} = 3\frac{3}{4} \div 3 = 1\frac{1}{4}$ 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.

$5 - (1) = 4$ (1 for Mateo)

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

$3\frac{3}{4}$ divided by $3 = (1\frac{1}{4})$

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

BROWNIE PROBLEM PART 3

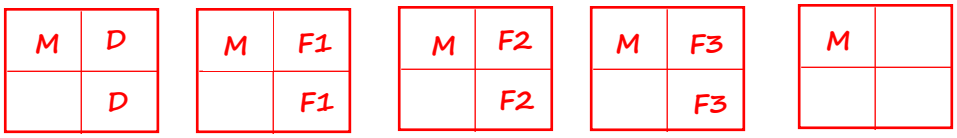
Answer key


Mateo

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.

Solve the problem using a picture. Then use numbers (expressions / equations) or words to support your thinking.



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

Dad and friends in total keep 4-halves, or $\frac{4}{2} = 2$ brownies

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

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

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

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