Grade 5
Open-Ended Questions and Rubrics
# PRIME2

## Open-Ended Questions for Grades 4 and 5

### Grade 4

<table>
<thead>
<tr>
<th>Math topic</th>
<th>Task</th>
<th>All or optional</th>
<th>Rubric</th>
<th>EM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra</td>
<td>Hexagon Desks*</td>
<td>All teachers</td>
<td>MARS</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td>Math Rules</td>
<td>Optional</td>
<td>MARS</td>
<td></td>
</tr>
<tr>
<td>Multiplication</td>
<td>Stone Soup</td>
<td>Optional</td>
<td>PRIME2</td>
<td>Unit 5</td>
</tr>
<tr>
<td></td>
<td>Line of Laundry</td>
<td>All teachers</td>
<td>MARS</td>
<td>Unit 5</td>
</tr>
<tr>
<td>Area &amp; perimeter</td>
<td>Same Shape, Different Area</td>
<td>All teachers</td>
<td>PRIME2</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td>Tina's Rabbit Pen</td>
<td>Optional</td>
<td>PRIME2</td>
<td>8.5</td>
</tr>
<tr>
<td>Fractions</td>
<td>A Weighty Problem</td>
<td>All teachers</td>
<td>PRIME2</td>
<td>7.5, 7.7</td>
</tr>
<tr>
<td>Decimals</td>
<td>School Supplies</td>
<td>Optional</td>
<td>PRIME2</td>
<td>4.6</td>
</tr>
</tbody>
</table>

### Grade 5

<table>
<thead>
<tr>
<th>Math topic</th>
<th>Task</th>
<th>All or optional</th>
<th>Rubric</th>
<th>EM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra</td>
<td>Hexagons in a Row</td>
<td>All</td>
<td>MARS</td>
<td>Unit 10</td>
</tr>
<tr>
<td></td>
<td>Walls with Windows</td>
<td>Optional</td>
<td>MARS</td>
<td>Unit 10</td>
</tr>
<tr>
<td>Fractions</td>
<td>Finding Fractions*</td>
<td>All</td>
<td>CLA #2/EM</td>
<td>Unit 5</td>
</tr>
<tr>
<td></td>
<td>Knowing Fractions</td>
<td>All</td>
<td>MARS</td>
<td>8.7</td>
</tr>
<tr>
<td>Volume</td>
<td>A Box of Cubes</td>
<td>All</td>
<td>MARS</td>
<td>Unit 11</td>
</tr>
<tr>
<td></td>
<td>Boxes of Cubes</td>
<td>Optional</td>
<td>PRIME2</td>
<td>Unit 11</td>
</tr>
</tbody>
</table>

* Give the task to your students by January 24, 2013. Bring the student work from the task to the PRIME2 After-School Workshop on January 24. We will score it at the workshop.
Open-Ended Questions for Grades 4 and 5

The purpose of administering the open-ended tasks is to have your students gain familiarity and comfort with these types of tasks, and provide them with an opportunity to show the highest level of their mathematical thinking on problems.

BEFORE THE TASK
PRE-ACTIVITY
You may elect to design a pre-activity to get students used to the type of problem, and promote equal access to the task.

EXPECTATIONS FOR QUALITY WORK
Share with students what makes an excellent paper. You may refer to the highest score in the rubric and explain all the parts that will make the work successful. Include the importance of calculating accurately, clearly explaining their thinking if the problem calls for it, and organizing their work so someone else can understand it.

VOCABULARY AND CONTEXT
Go over any difficult or unfamiliar vocabulary, or words with multiple meanings. Discuss any context that may be unfamiliar.

DURING THE TASK
TIME
Allow students as much time as needed for them to complete the task. If you give it during one math period and some students have not finished, allow them more time during another part of the day.

SHOW ALL WORK
Have students show all their work. Some tasks may not have enough space provided for students to answer a question completely. You may provide paper for them to solve the entire problem on it. Let students know that in order for you to understand their mathematical thinking about the problem, you need to see all of their work.

TEACHER ROLE
Try not to offer much prompting during the task. Observe students as they work the task. Note how they approach the problem, where they get stuck, their level of perseverance, and any questions they want to ask you.

AFTER THE TASK
SCORE THE WORK
Use the rubric provided for each task to score the work. If possible, have a scoring session with grade level colleagues.

Bring the student work from Hexagon Desks (Grade 4) or Finding Fractions (Grade 5) to the PRIME2 After-School Workshop on January 24 where they will be scored collaboratively.

(OPTIONAL)
PROVIDE FEEDBACK
Give the task back to students with their score and any comments.

SHOW STUDENTS EXAMPLES OF EXCELLENT WORK
Cover the name of the students whose work you are showing, or show work from another class. Discuss with students what makes the paper an excellent one.
Hexagons in a Row

This problem gives you the chance to:
- find a pattern in a sequence of diagrams
- use the pattern to make a prediction

Joe uses toothpicks to make hexagons in a row.

1 hexagon
6 toothpicks

2 hexagons
11 toothpicks

3 hexagons
16 toothpicks

4 hexagons

Joe begins to make a table to show his results.

<table>
<thead>
<tr>
<th>Number of hexagons in a row</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of toothpicks</td>
<td>6</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Fill in the empty spaces in Joe’s table of results.
2. How many toothpicks does Joe need to make 5 hexagons? ____________

Explain how you figured it out.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

3. How many toothpicks does Joe need to make 12 hexagons? ____________

Explain how you figured it out.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

4. Joe has 76 toothpicks.
How many hexagons in a row can he make? ____________

Explain how you figured it out.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________
## Hexagons in a Row

The core elements of performance required by this task are:
- find a pattern in a sequence of diagrams
- use the pattern to make a prediction
Based on these, credit for specific aspects of performance should be assigned as follows

<table>
<thead>
<tr>
<th>Rubric</th>
<th>points</th>
<th>section points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gives correct answers: <strong>16 and 21</strong></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2. Gives correct answer: <strong>26</strong></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Gives correct explanation such as: I added on 5, accept diagrams</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. Gives correct answer: <strong>61</strong></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Gives correct explanation such as: The first hexagon needs 6 toothpicks; each extra needs 5, 6 + 11 x 5 =</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Accept diagrams or adding on.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Gives correct answer: <strong>15</strong></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Gives correct explanation such as: The first hexagon needs 6 toothpicks; each extra needs 5, 76 - 1 = 75, 75 ÷ 5 = 15</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Accept diagrams</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>
Walls with Windows

This problem gives you the chance to:
- identify and extend a pattern

Darla is making windows in walls using rectangles. These pictures show how she builds windows.

1 window
6 rectangles

2 windows
10 rectangles

3 windows
14 rectangles

1. Draw a wall with 4 windows.

2. How many rectangles will a wall with 5 windows have? ________

3. Complete this table to show the rectangles needed for each wall with windows.

<table>
<thead>
<tr>
<th>Number of windows</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of rectangles</td>
<td>6</td>
<td>10</td>
<td>14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Darla used 30 rectangles to make a wall with windows.

How many windows will that wall have? ___________ windows

Explain how you figured this out.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

5. Darla wants to build a wall with 10 windows! She thinks that she needs 44 rectangles to build that wall. Explain how you know that she is wrong.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

How many rectangles will she need? ___________ rectangles
## Walls with Windows Rubric

The core elements of performance required by this task are:
- identify, describe and extend a pattern

Based on these, credit for specific aspects of performance should be assigned as follows

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>points</th>
<th></th>
<th>section points</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Draws a wall with 4 windows and 18 rectangles</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gives correct answer: 22</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fills in the table with the correct answers:</td>
<td>1x2</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Windows</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Rectangles</td>
<td>6</td>
<td>10</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>Gives correct answer: 7</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Gives correct explanation such as: 5 windows used 22 rectangles and I added 2 more groups of 4 for 6 windows and 7 windows or I continued the chart</td>
<td></td>
<td></td>
<td>接受正确图示</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Gives correct explanation such as: If I continue to count the pattern by four it would be 42 or 46 not 44 or 2 + 4 times 10 equals 42.</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Gives correct answer: 42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Points**  8
Math CLA Grade 5 Performance Assessment #2
Finding Fractions

The figure below represents One.
Find and write the correct fraction in each of the figure's parts.
Check to be sure that the sum of the fractions is 1.

Explain how you found the fraction for the part labeled F.

List a combination of parts that is worth about \(\frac{2}{3}\). Explain your answer.

Taken from page 179 of the Everyday Math Assessment Masters
Math CLA Grade 5 Performance Assessment #2
Finding Fractions - Rubric

MA.5.NS.2.3 Solve simple problems, including ones arising in concrete situations, involving the addition and subtraction of fractions and mixed numbers (like and unlike denominators of 20 or less), and express answers in the simplest form.

This rubric is designed to help you assess levels of mathematical performance on this task. It emphasizes mathematical understanding with only a mention of clarity of explanation. Consider the expectations of standardized tests in your area when applying a rubric. Modify this sample rubric as appropriate.

**Score:** 0, 1, 2, 3, 4  **Points Possible:** 4

4 Clearly labels all regions with the correct fraction. Clearly explains how to use a relationship between regions to determine the fraction name for Region F. In the last part of the problem, chooses regions that total about $\frac{5}{3}$ and clearly justifies how the regions are chosen.

3 Labels most regions with the correct fraction. Explains how to use a relationship between regions to determine the fraction name for Region F. In the last part of the problem, chooses regions that total more than $\frac{1}{2}$. Attempts to justify how the regions are chosen, but the explanation might be unclear.

2 Labels all regions demonstrating some understanding of how to find the fraction of a region. Makes reference to some relationship between regions to determine a fraction name for Region F. Might attempt to solve the last part of the problem.

1 Attempts to label regions. Attempts to explain how to find the fraction name for Region F, but the explanation might be incorrect or makes no sense in the context of the problem. Might attempt to solve the last part of the problem.

0 Does not attempt to solve the problem.

This performance assessment was taken from the Everyday Mathematics Assessment Handbook. To accurately score each Open Response task, please refer to Everyday Mathematics Assessment Handbook which includes student work samples that illustrate each performance level.

Taken from pages 87-88 of the Everyday Math Assessment Handbook - Lesson 5-13 Open Response Progress Check 5
Open Response, Finding Fractions

Description
For this task, students identify fractions of a region by using relationships between the fractional parts.

Focus
✦ Use numerical expressions to represent equivalent names for fractions.
   [Number and Numeration Goal 5]
✦ Use mental math and paper-and-pencil algorithms to solve addition and subtraction problems involving fractions; describe the strategies used and explain how they work.
   [Operations and Computation Goal 4]

Implementation Tips
✦ Relate the fraction of a region exploration to students' experiences with pattern blocks for exploring fractions. Relate the fraction of a fraction idea to making fraction strips.
✦ Remind students that for the last problem, they are looking for a total of about \( \frac{2}{3} \).

Modifications for Meeting Diverse Needs
✦ Provide students with an additional copy of the figure and a pair of scissors so they can manipulate the individual pieces. For the last part, convert all fractions to percents, using a calculator if necessary.
✦ Have students provide at least three different solutions to the last part of the problem. Record their solutions with letters and as number sentences.

Improving Open Response Skills
Before students begin the task, have them read the problem together.
Review Level 4 of the rubric using the board or overhead projector. Have them restate Level 4 of the rubric; record the students' version on chart paper; and display this during the task. Have students compare their work with the posted Level 4 description before turning in their papers.

Note: The wording and formatting of the text on the student samples that follow may vary slightly from the actual task your children will complete. These minor discrepancies will not affect the implementation of the task.
Knowing Fractions

This task gives you a chance to:
- Work with fractions
- Use number lines

Joey and Kris are studying about fractions and number lines.

1. Circle whether the statement is true or false.

\[ \frac{4}{5} \times \frac{7}{8} > 1. \quad \text{True} \quad \text{False} \]

Joey and Kris draw the following number line and symbols. The triangle and square stand for numbers on the number line.

2. Joey thinks if you add the triangle and square you will get a number to the left of the square. Kris thinks Joey is wrong. Who do you agree with? Explain.

3. Kris thinks that if you subtract the triangle from the square you will get exactly 1. Joey thinks Kris is wrong. Who do you agree with? Explain.
Joey and Kris are trying to figure when the statements are true. Indicate which statement is Always True, Sometimes True or Never True.

4. When I add two fractions between 0 and 1, I will get fractions bigger than 1.

Always True   Sometimes True   Never True

Explain.

5. When I multiply two fractions that are both between 0 and 1, I will always get a fraction between zero and 1.

Always True   Sometimes True   Never True

Explain.

6. If I pick any positive number and then multiply it times a positive fraction less than one, the answer is bigger than the first number I picked.

Always True   Sometimes True   Never True

Explain.
# Knowing Fractions

The core elements of performance required by this task are:
- Use number lines
- Understand fractions and operations

Based on these, credit for specific aspects of performance should be assigned as follows:

| 1. Circles the correct answer: **False** | 1 | 1 |
| 2. Gives correct answer and explanation such as: **Kris** is right because the distance the triangle is from zero can be marked to the right of the square to show the sum. | 1 | 1 |
| 3. Gives correct answer and explanation such as: **Joey** is right because the distance the triangle is from zero can be marked to the left of the square to show the difference is less than 1. | 1 | 1 |
| 4. Gives correct answer: **Sometimes True** | 1 |
| Gives a correct explanation such as:  
1/2 + 3/4 > 1 and 1/2+ 1/4 < 1 | 1 | 2 |
| 5. Gives correct answer: **Always True** | 1 |
| Gives a correct explanation such as:  
If you start with any fraction (between 0 and 1) and you multiply it by another fraction (between 0 and 1) the product will be smaller than either fraction, but still positive.  
(Accept an example) | 1 | 2 |
| 6. Gives correct answer: **Never True** | 1 |
| Gives a correct explanation such as:  
If you start with any number and you multiply it by a fraction (between 0 and 1) the product will be smaller than the first number, because multiplying by the fraction reduces the original number by the fraction’s ratio.  
(Accept an example) | 1 | 2 |

**Total Points** 9
A Box of Cubes

This gives you a chance to:
• determine dimensions of rectangular prisms
• work with volume

Dia found a lot of cubes that are each 1 inch wide, 1 inch long, and 1 inch high.

She stacked the cubes to make a rectangular prism 2 inches wide, 3 inches long and 4 inches high.

1. How many cubes did she use? ______________________ cubes

Explain how you figured it out.

Dia found a box that was measured 5 inches long, 3 inches wide and 2 inches high.

2. How many of the 1 by 1 by 1 inch cubes can exactly fit in the box ____________________.

Show how you figured it out.
3. Dia has 42 cubes and wants to make a rectangular prism. She asked for your help. 
What are the dimensions of the prism she can build? ____________________________
Draw a box the cubes could fit in and label the dimensions.

4. Dia has found two new rectangular boxes. One box is 2 inches by 3 inches by 6 inches
and a second box has a volume of 72 cubic inches. Dia has 104 cubes. Does she have
the right amount to fill the two boxes completely? Explain.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
# A Box of Cubes

The core elements of performance required by this task are:
- understand volume
- solve problems involving the volume of rectangular prisms

Based on these, credit for specific aspects of performance should be assigned as follows:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Gives correct answer: 24 cubes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2.</strong> Gives correct answers: 30 cubes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3.</strong> Gives correct answer such as: 2 by 3 by 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4.</strong> Gives correct explanation such as:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Rubric

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>points</th>
<th>section points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Gives correct answer: 24 cubes.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>2.</strong> Gives correct answers: 30 cubes.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>3.</strong> Gives correct answer such as: 2 by 3 by 7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>4.</strong> Gives correct explanation such as:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total Points** 7
Boxes of Cubes

This is a sugar cube.

It is about 1/2-inch on each edge.
There are 48 cubes in each box.
You need 1000 cubes for a school project.

How many boxes will you need?

How much space will you need to store 1000 cubes?
<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 points</td>
<td>Determines 21 boxes of cubes are needed.</td>
</tr>
<tr>
<td>1 point</td>
<td>Uses an appropriate method to find the number of boxes needed, but makes a calculation error or incorrectly interprets the remainder, and does not arrive at 21 boxes.</td>
</tr>
<tr>
<td>2 points</td>
<td>Determines either 125 or 126 cubic inches are needed.</td>
</tr>
<tr>
<td>1 point</td>
<td>Uses an appropriate method to find the cubic inches needed, but makes a calculation error and does not arrive at 125 or 126 cubic inches.</td>
</tr>
<tr>
<td>Total Possible</td>
<td>= 5</td>
</tr>
</tbody>
</table>