

Sample Performance Assessment

Content Area: Mathematics

Grade Level: Six (6)

Instructional Unit Sample: Go Figure!

Colorado Academic Standard(s): MA10-GR.6-S.1-GLE.3; MA10-GR.6-S.4-GLE.1

Concepts and skills students' master: Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures and apply these techniques in the context of solving real-world and mathematical problems. (MA10-GR.6-S.4-GLE.1-EO.d.i, d.ii, d.iii)

Unit Description

This unit, [Go Figure!](#), focuses on the geometric concepts of perimeter, area, surface area and volume. Students begin by working on the coordinate plane to find the perimeter and area of rectangles. The formula for the area of a rectangle is then built upon to create a formula for the area of parallelograms and triangles. The concept of area is then extended to surface area and nets of three-dimensional solids with rectangular and triangular bases. Students finish the unit by exploring volumes of right rectangular prisms with fractional side lengths by connecting back to area and fraction multiplication.

Performance Assessment Description

You work for a candy company that has just developed a new type of candy. The candy is 1 cm deep and 2 cm across. The owner of the company asked several candy box makers to create packaging for the new candy. The candy box makers were provided the following specifications:

- design a box that could hold 18 pieces of candy (i.e., net)
- minimize the packaging material (i.e., surface area)
- create an appealing design

Several companies have submitted designs. You need to write an evaluation of each design based on the above specifications to help the owner choose the best packaging company.

Example designs of the candy boxes for students to evaluate can be found on pages 18 – 20 at:

<http://map.mathshell.org/materials/download.php?fileid=1364>



RUBRIC: Go Figure!

	Above Mastery	Mastery of Grade Level Standards	Approaching Mastery	Novice	
Scoring Criteria	4	3	2	1	Weight
Content	<p>Determines and uses nets of three-dimensional figures to find surface area. <i>(This may include an indirect (or estimate) of the triangular prism dimensions.)</i></p> <p>Correctly determines if the volume of candy fits in all three boxes. <i>(This may be based on indirect (or estimate) of the triangular prism dimensions.)</i></p> <p>Evaluating, interpreting and critiquing the validity and efficiency of other's responses, approaches and reasoning and provides a counter-example where applicable <i>(ie. Designs their own box.)</i></p>	<p>Determines and uses nets of three-dimensional rectangular figures to find surface area.</p> <p>Determines if the volume of candy fits in all three boxes. <i>(Students may estimate the volume of the candy as a cube.)</i></p> <p>Evaluating, interpreting and critiquing the validity of other's responses, approaches and reasoning.</p>	<p>Determines and uses nets of three-dimensional figures to find surface area. <i>(Contains minor errors in calculation.)</i></p> <p>Determines if the volume of candy fits in all three boxes. <i>(Contains minor errors in calculation.)</i></p> <p>Evaluating the validity of other's approaches and conclusions</p>	<p>Recognizes and states that each net will make a box.</p> <p>No evidence of volume calculations.</p> <p>No evidence of evaluation.</p>	X 1
Communication	<p>Provides effective development of the evidence necessary to support their reasoning and answer and compares/ contrasts their conclusion versus other designs.</p>	<p>Provides effective development of the evidence necessary to support their reasoning and answer. <i>(Builds a convincing argument to support their choice of design.)</i></p> <p>In writing, the student demonstrates effective command of the conventions of mathematical vocabulary. <i>(chooses appropriate academic and technical vocabulary)</i></p>	<p>Provides some development of the evidence necessary to support their reasoning and answer. <i>(The work is shown and reference to assumptions are made.)</i></p> <p>In writing, the student demonstrates limited command of the conventions of mathematical vocabulary. <i>(chooses informal vocabulary)</i></p>	<p>Provides minimal development of the evidence necessary to support their reasoning and answer.</p> <p>In writing, the student demonstrates minimal command of the conventions of mathematical vocabulary.</p>	X 1
				TOTAL	



Performance Assessment Development Template

Who is developing this performance assessment?	
Name: Colorado Content Collaborative in Mathematics	Position/Affiliation: Colorado Content Collaborative in Mathematics

I. CONTENT STANDARDS	
Content Area: Mathematics	
Colorado Academic Standards Specify the Colorado Academic Standard(s) that will be evaluated by the performance tasks. Colorado Academic Standards Online (hold CTRL and click to visit the website)	<u>MA10-GR.6-S.4-GLE.1-EO.d.i, d.ii, d.iii</u> Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures and apply these techniques in the context of solving real-world and mathematical problems.
Grade Level(s)	6th Grade
Indicate the intended Depth of Knowledge (DOK) for this performance assessment.	<input type="checkbox"/> DOK 1 <input type="checkbox"/> DOK 2 <input checked="" type="checkbox"/> DOK 3 <input type="checkbox"/> DOK 4
What are some real-world situations that relate to the content standards above? Some examples are included in the Colorado standards under "Relevance and Application."	<ul style="list-style-type: none"> ➤ Buying carpeting ➤ Painting a room ➤ Decomposing a construction project ➤ Designing landscapes
Summary. Provide a brief summary describing the task in the boxes below.	
Performance Task Name	Brief Description of the Task
Candy Box	<p>You work for a candy company that has just developed a new type of candy. The candy is 1 cm deep and 2 cm across. The owner of the company asked several candy box makers to create packaging for the new candy. The candy box makers were provided the following specifications:</p> <ul style="list-style-type: none"> ➤ design a box that could hold 18 pieces of candy (i.e., net) ➤ minimize the packaging material (i.e., surface area) ➤ create an appealing design <p>Several companies have submitted designs. You need to write an evaluation of each design based on the above specifications to help</p>



	<p>the owner choose the best packaging company.</p> <p>Example designs of the candy boxes for students to evaluate can be found on pages 18 – 20 at: http://map.mathshell.org/materials/download.php?fileid=1364</p>
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II. Claims, Skills, Knowledge & Evidence	
<p>Claims. <i>What claim(s) do you wish to make about the student? In other words, what inferences do you wish to make about what a student knows or can do? Define any key concepts in these claims.</i></p>	<p>Successful completion of this task would indicate...</p> <ul style="list-style-type: none"> ➤ Decomposing three-dimensional figures into nets facilitates calculation of surface area.
<p>Skills. <i>Refer to the standard(s), grade level, and DOK levels you listed in Section I. Given this information, what skills should be assessed? All skills should align with the above claims.</i></p>	<p>Student should be able to...</p> <ul style="list-style-type: none"> ➤ Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism and apply the formulas $V = l w h$ and $V = B h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. (MA10-GR.6-S.4-GLE.1-EO.b.i, b.ii, b.ii) ➤ Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures and apply these techniques in the context of solving real-world and mathematical problems. (MA10-GR.6-S.4-GLE.1-EO.d.i, d.ii, d.iii)
<p>Knowledge. <i>Refer to the standard(s), grade level, and DOK level you listed in Section I. Given this information, what knowledge/concepts should be assessed? All knowledge should align with the above claims.</i></p>	<p>Student should know/understand...</p> <ul style="list-style-type: none"> ➤ Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures and apply these techniques in the context of solving real-world and mathematical problems. (MA10-GR.6-S.4-GLE.1-EO.d.i, d.ii, d.iii)
<p>Evidence. <i>What can the student do/produce to show evidence of the above knowledge and skills?</i></p>	<p>Student will show evidence of skills and knowledge by...</p> <p>Students will write an evaluation for each of the three possible candy packages and provide a recommendation to the owner.</p> <p>When evaluating each candy box students need to determine if:</p> <ul style="list-style-type: none"> ➤ net would create a box ➤ surface area of the box is smaller than the other boxes



	<ul style="list-style-type: none"> ➤ volume of the box would allow for 18 pieces of candy ➤ box has an appealing design ➤ design could be improved ➤ design should be chosen by the owner
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III.A. PERFORMANCE TASKS: Instructions to the Student

Think about the performance assessment process from a student’s perspective. What instructions does the student need? Make sure the instructions are fair and unbiased. Instructions should be detailed, clear, and written at the appropriate grade level.

Give the student an overview of the performance assessment (i.e., purpose of the assessment, tasks the student will need to complete, etc.).

You work for a candy company that has just developed a new type of candy. The candy is 1 cm deep and 2 cm across. The owner of the company asked several candy box makers to create packaging for the new candy. The candy box makers were provided the following specifications:

- design a box that could hold 18 pieces of candy (i.e., net)
- minimize the packaging material (i.e., surface area)
- create an appealing design

Several companies have submitted designs. You need to write an evaluation of each design based on the above specifications to help the owner choose the best packaging company.

Example designs of the candy boxes for students to evaluate can be found on pages 18 – 20 at:

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Stimulus Material. Describe what stimulus material the student will receive. For example, the stimulus might be a story or scenario that the student reads, analyzes, and to which the student provides a response.

You work for a candy company that has just developed a new type of candy. The candy is 1 cm deep and 2 cm across. The owner of the company asked several candy box makers to create packaging for the new candy. The candy box makers were provided the following specifications:

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Explain to the student what documents/materials they have for the performance assessment. Explain what the student should do with those documents/materials.

The student will:

- Design a box that could hold 18 pieces of candy (i.e., net)
- Minimize the packaging material (i.e., surface area)
- Create an appealing design
- Write an evaluation of each design based on the above specifications to help the owner choose the best packaging company.

Describe in detail any safety equipment that is required. Is safety equipment provided onsite, or are students expected to bring their own safety equipment?

n/a

Explain what students need to do when they complete each task (e.g., submit work to the educator, move on to the next task, etc.).

Students will write an evaluation for each of the three possible candy packages and provide a recommendation to the owner.

When evaluating each candy box students need to determine if:

- net would create a box
- surface area of the box is smaller than the other boxes
- volume of the box would allow for 18 pieces of candy
- box has an appealing design
- design could be improved
- design should be chosen by the owner

Provide any other relevant information for the students' instructions.

n/a



**III.B. PERFORMANCE TASKS:
Instructions to the Educator**

Think about the performance assessment process from an educator’s perspective. What instructions do educators need? Instructions to the educator should be clear and concise.

Before the Performance Assessment is Administered

How should the educator prepare the site where the performance assessment will be administered? Be as specific as possible.

Technology components need to be available and accessible

What materials should be provided to students? Be as specific as possible.

Students need access to the web site.

What materials should the student bring to the performance assessment session? Be as specific as possible.

n/a

What materials should not be available to the student during the performance assessment session (e.g., cell phones, calculators, etc.)?

Educator discretion.

Should the educator keep track of time? If so, specify how much time the student will have to complete the performance assessment. Explain how the educator should keep track of and record time.

n/a

Will the educator need to video/audio record the students during the performance assessment session? If so, provide detailed instructions on how to set up the recording equipment.

n/a



During the Performance Assessment Session

How should the educator respond to students' questions?

The educator should respond to clarifying questions.

What should the educator do while the student is completing the tasks (e.g., should the educator make notes about the student's process, mark scores on rubrics, etc.)?

The educator should respond to clarifying questions.

Upon Completion of the Performance Assessment

What does the educator need to collect from the student?

Students will write an evaluation for each of the three possible candy packages and provide a recommendation to the owner.

When evaluating each candy box students need to determine if:

- net would create a box
- surface area of the box is smaller than the other boxes
- volume of the box would allow for 18 pieces of candy
- box has an appealing design
- design could be improved
- design should be chosen by the owner

What information should the educator give the student at the end of the performance assessment session?

n/a

Who is responsible for cleaning/resetting the workstation (if necessary)—the student or the educator? How should the workstation be cleaned?

n/a

Other relevant information for the educator's instructions:

For differentiation:

Students can work with partners on exploring the candy box designs before writing their own evaluations.



Students can use an evaluation form with questions to scaffold their evaluation:

<http://map.mathshell.org/materials/download.php?fileid=1364>

Students can create two of their own candy box designs, compare their designs and explain which of their designs is the best; rather than evaluating the designs of other people.

III.C. PERFORMANCE TASKS: Other Considerations

How will students' responses be recorded? Describe how evidence will be collected about each student's performance (e.g., student submits a work product, educator records information about the student's process, etc.)

Student submits a report.

What needs to be built for this performance assessment? Refer to the materials list above. Think about what materials must be created for this performance assessment. Some examples include: worksheets, instruction sheets for the educator, videos, websites, etc.

n/a

III.D. PERFORMANCE TASKS: Accommodations

What are the requirements for this set of tasks? What accommodations might be needed? List all accommodations that might apply (e.g., accommodations for language, timing, setting, etc.).

For differentiation:

Students can work with partners on exploring the candy box designs before writing their own evaluations.

Students can use an evaluation form with questions to scaffold their evaluation:

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Students can create two of their own candy box designs, compare their designs and explain which of their designs is the best; rather than evaluating the designs of other people.

IV. EDUCATOR INFORMATION

What are the requirements to be an educator for this performance assessment? What are the knowledge and skills and educator must possess in order to successfully administer and score this performance assessment. Please provide your recommendations below.

The evaluator must be a highly qualified mathematics teacher.



Performance Assessment Development Process

The work of the Colorado Content Collaboratives is intended to support effective instructional practice by providing high quality examples of assessment and how assessment information is used to promote student learning.

The new Colorado Academic Standards require students to apply content knowledge using extended conceptual thinking and 21st century skills. Performance assessments have the highest capacity to not only measure student mastery of the standards but also provide the most instructionally relevant information to educators. Further, performance assessments can integrate multiple standards within and across content areas, providing educators a comprehensive perspective of student knowledge and giving students the opportunity to demonstrate the degree to which they understand and transfer their knowledge.

Performance Assessment - An assessment based on observation and judgment. It has two parts: the task and the criteria for judging quality. Students complete a task (give a demonstration or create a product) and it is evaluated by judging the level of quality using a rubric. Examples of demonstrations include playing a musical instrument, carrying out the steps in a scientific experiment, speaking a foreign language, reading aloud with fluency, repairing an engine, or working productively in a group. Examples of products can include writing an essay, producing a work of art, writing a lab report, etc. (Pearson Training Institute, 2011)

The Content Collaboratives worked closely with the [Center for Educational Testing and Evaluation from the University of Kansas](#) to establish protocols for the development of performance assessments and to use those protocols to develop performance assessments that include scoring rubrics. The Performance Assessment Development Process includes a collection of resources to aid schools and districts that choose to engage in locally developing performance assessments. These resources can be accessed in the CDE Assessment Resource Bank at <http://www.coloradopl.org/node/12765>.

The Performance Assessment Development Process is best utilized when intending to create an assessment for culminating assessment purposes such as a unit, end of course, end of semester, or end of year summative assessment. Additionally, a district, BOCES, or school may wish to create a common performance assessment that can be used across multiple classrooms. Engaging in the Performance Assessment Development Process serves as evidence that an educator is participating in valuable assessment work that aligns to the Colorado Academic Standards, district curriculum, and district goals.

The performance assessments developed by the Content Collaboratives serve as high-quality examples of performance assessments that can be used for a variety of purposes. Scores from these performance assessments are used at the discretion of the district or school.

