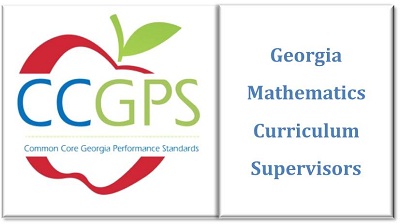
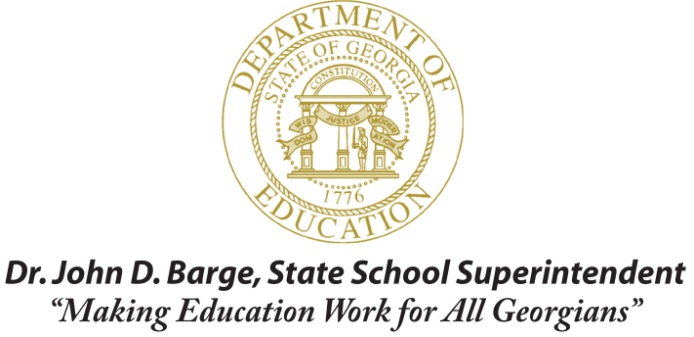
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**CCGPS**

**Frameworks**

**Student Edition**

**Mathematics**



**Unit 5**

**GEOMETRY**

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**OVERVIEW**

The units in this instructional framework emphasize key standards that assist students to develop a deeper understanding of numbers. In this unit they will be engaged in using what they have previously learned about drawing geometric figures using rulers and protractor with an emphasis on triangles, students will also write and solve equations involving angle relationships, area, volume, and surface area of fundamental solid figures.

The challenges in this unit include understanding the geometric figures and solving equations involving geometric figures. The students also should be guided to realize how geometry works in real world situations.  The Big Ideas that are expressed in this unit are integrated with such routine topics as estimation, mental and basic computation.  All of these concepts need to be reviewed throughout the year.

The Evidence of Learning will tell you what your students will learn in this unit.  Take what you need from the tasks and modify as required.  These tasks are suggestions, something that you can use as a resource for your classroom.

**STANDARDS ADDRESSED IN THIS UNIT**

**KEY STANDARDS**

**Draw, construct and describe geometrical figures and describe the relationships between them.**

**MCC7.G.2**. Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

**MCC7.G.3**. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

**Solve real‐life and mathematical problems involving angle measure, area, surface area, and volume.**

**MCC7.G.4**. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

**MCC7.G.5**. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

**MCC7.G.6**. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

**RELATED STANDARDS**

**\*\*From Unit 3\*\***

**MCC7.G.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

**STANDARDS FOR MATHEMATICAL PRACTICE**

**1. Make sense of problems and persevere in solving them.** Students make sense of the problems involving geometric measurements (area, volume, surface area, etc.) through their understanding of the relationships between these measurements. They demonstrate this by choosing appropriate strategies for solving problems involving real-world and mathematical situations.

**2. Reason abstractly and quantitatively.** In grade 7, students represent a wide variety of real world contexts through the use of real numbers and variables when working with geometric figures. Students contextualize to understand the meaning of the number or variable as related to a geometric shape. Students must challenge themselves to think of three dimensional shapes with only two dimensional representations of them on paper in some cases.

**3. Construct viable arguments and critique the reasoning of others.** Students are able to construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades.

**4. Model with mathematics.** Students are able to apply the geometry concepts they know to solve problems arising in everyday life, society and the workplace. This may include applying area and surface of 2-dimensional figures to solve interior design problems or surface area and volume of 3-dimensional figures to solve architectural problems.

**5. Use appropriate tools strategically.** Mathematically proficient students consider available tools that might include concrete models, a ruler, a protractor, or dynamic geometry software such as virtual manipulatives and simulations. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data.

**6. Attend to precision.** In grade 7, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students determine quantities of side lengths represented with variables, specify units of measure, and label geometric figures accurately. Students use appropriate terminology when referring to geometric figures.

**7. Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They can see complicated things as single objects or as being composed of several objects.

**8. Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts.

**ENDURING UNDERSTANDINGS**

* Use freehand, ruler, protractor and technology to draw geometric shapes with give conditions. (7.G.2)
* Construct triangles from 3 measures of angles or sides. (7.G.2)
* Given conditions, determine what and how many type(s) of triangles are possible to construct. (7.G.2)
* Describe the two-dimensional figures that result from slicing three-dimensional figures. (7.G.3)
* Identify and describe supplementary, complementary, vertical, and adjacent angles. (7.G.5)
* Use understandings of supplementary, complementary, vertical and adjacent angles to write and solve equations. (7.G.5)
* Explain (verbally and in writing) the relationships between the angles formed by two intersecting lines. (7.G.5)
* Solve mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. (7.G.6)
* Solve real-world problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. (7.G.6)

**CONCEPTS AND SKILLS TO MAINTAIN**

It is expected that students will have prior knowledge/experience related to the concepts and skills identified below. It may be necessary to pre-assess in order to determine if time needs to be spent on conceptual activities that help students develop a deeper understanding of these ideas.

* number sense
* computation with whole numbers and decimals, including application of order of operations
* addition and subtraction of common fractions with like denominators
* measuring length and finding perimeter and area of rectangles and squares
* characteristics of 2-D and 3-D shapes
* angle measurement
* data usage and representations

**SELECTED TERMS AND SYMBOLS**

The following terms and symbols are often misunderstood. These concepts are not an inclusive list and should not be taught in isolation. However, due to evidence of frequent difficulty and misunderstanding associated with these concepts, instructors should pay particular attention to them and how their students are able to explain and apply them.

**The definitions below are for teacher reference only and are not to be memorized by the students.** Students should explore these concepts using models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

The websites below are interactive and include a math glossary. **Note – At the elementary level, different sources use different definitions. Please preview any website for alignment to the definitions given in the frameworks.**

[http://www.teachers.ash.org.au/jeather/maths/dictionary.html](http://www.teachers.ash.org.au/jeather/maths/dictionary.html%20)

This web site has activities to help students more fully understand and retain new vocabulary (i.e. the definition page for *dice* actually generates rolls of the dice and gives students an opportunity to add them).

<http://intermath.coe.uga.edu/dictnary/homepg.asp>

Definitions and activities for these and other terms can be found on the Intermath website.

Visit [http://intermath.coe.uga.edu](http://intermath.coe.uga.edu/) or [http://mathworld.wolfram.com](http://mathworld.wolfram.com/) to see additional definitions and specific examples of many terms and symbols used in grade 7 mathematics.

* **Adjacent Angle:** Angles in the same plane that have a common vertex and a common side, but no common interior points.
* **Circumference:** The distance around a circle.
* **Complementary Angle:** Two angles whose sum is 90 degrees.
* **Congruent:** Having the same size, shape and measure. ∠*A* ≅∠ *B* denotes that ∠*A* is congruent to ∠*B.*
* **Cross- section:** A plane figure obtained by slicing a solid with a plane.
* **Irregular Polygon:** A polygon with sides not equal and/or angles not equal.
* **Parallel Lines:** Two lines are parallel if they lie in the same plane and they do not intersect. ||  denotes that  is parallel to.
* **Pi:** The relationship of the circle’s circumference to its diameter, when used in calculations, pi is typically approximated as 3.14; the relationship between the circumference (*C*) and diameter (*d*),
* **Regular Polygon:** A polygon with all sides equal (equilateral) and all angles equal (equiangular).
* **Supplementary Angle:** Two angles whose sum is 180 degrees.
* **Vertical Angles:** Two nonadjacent angles formed by intersecting lines or segments. Also called opposite angles.

**SE: Take the Ancient Greek Challenge**

The study of Geometry was born in Ancient Greece, where mathematics was thought to be embedded in everything from music to art to the governing of the universe. Plato, an ancient philosopher and teacher, had the statement, “Let no man ignorant of geometry enter here,” placed at the entrance of his school. This illustrates the importance of the study of shapes and logic during that era. Everyone who learned geometry was challenged to construct geometric objects using two simple tools, known as Euclidean tools:

* A straight edge without any markings
* A compass

The straight edge could be used to construct lines; the compass to construct circles. As geometry grew in popularity, math students and mathematicians would challenge each other to create constructions using only these two tools. Some constructions were fairly easy (Can you construct a square?), some more challenging, (Can you construct a regular pentagon?), and some impossible even for the greatest geometers (Can you trisect an angle? In other words, can you divide an angle into three equal angles?). Archimedes (287-212 B.C.E.) came close to solving the trisection problem, but his solution used a marked straight edge.

We will use a protractor and marked straight edge (you know it as a ruler) to draw some geometric figures.

What “constructions” can you create?

**Your 1st Challenge:**

Draw a regular quadrilateral.

**Your 2nd Challenge:**

Draw a quadrilateral with no congruent sides.

**Your 3rd Challenge:**

Draw a circle. Then draw an equilateral triangle and a square inside so that both figures have their vertices on the circle (inscribed).

**Your 4th Challenge:**

Draw a regular hexagon. Then divide it into three congruent quadrilaterals

**Your 5th Challenge:**

Draw a regular octagon. The divide it into two congruent trapezoids and two congruent rectangles

**Your 6th Challenge:**

Draw a triangle with side lengths of 5, 6, and 8 units.

**Your 7th Challenge:**

Draw a triangle with an obtuse angle.

**Your 8th Challenge:**

Draw an equilateral right triangle.

**Your 9th Challenge:**

Create some challenges of your own and pose them to a classmate.

**Short Cycle Task: Roman Mosaic**

In this task, students decide how they would describe the design of a mosaic pattern over the telephone by utilizing the attributes of specific shapes, symmetry, and angles.

*Source: Balanced Assessment Materials from Mathematics Assessment Project*

<http://www.map.mathshell.org/materials/download.php?fileid=1163>

**STANDARDS ADDRESSED IN THIS TASK**

**Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.**

**MCC7.G.4**. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

**MCC7.G.5**. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

**MCC7.G.6**. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

**STANDARDS FOR MATHEMATICAL PRACTICE**

This task focuses on all of the practices:

1. Make sense of problems and persevere in solving them

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

**ESSENTIAL QUESTION**

* How can attributes of specific shapes, symmetry, and angles be used to accurately describe the design of a mosaic pattern?

**TASK COMMENTS**

Tasks and lessons from the Mathematics Assessment Project are specifically designed to help teachers effectively formatively assess their students. The way the tasks and lessons are designed gives the teacher a clear understanding of what the students are able to do and not do. Within the lesson, teachers will find suggestions and question prompts that will help guide students towards understanding. For more information access the MAP website:

<http://www.map.mathshell.org/materials/background.php?subpage=summative>

The task, *Roman Mosaic*, is a Mathematics Assessment Project Assessment Task that can be found at the website: <http://www.map.mathshell.org/materials/tasks.php?taskid=391&subpage=expert>

The PDF version of the task can be found at the link below:

<http://www.map.mathshell.org/materials/download.php?fileid=1163>

The scoring rubric can be found at the following link:

<http://www.map.mathshell.org/materials/download.php?fileid=1164>

**Short Cycle Task: Octagon Tile**

In this task, students will explore the geometry of a pattern made by arranging squares within an octagon.

*Source: Balanced Assessment Materials from Mathematics Assessment Project*

<http://www.map.mathshell.org/materials/download.php?fileid=1122>

**STANDARDS ADDRESSED IN THIS TASK**

**MCC7.G.4**. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

**MCC7.G.5**. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

**MCC7.G.6**. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

**STANDARDS FOR MATHEMATICAL PRACTICE**

This task uses all of the practices with emphasis on:

3. Construct viable arguments and critique the reasoning of others.

7. Look for and make use of structure.

**ESSENTIAL QUESTION**

* How do I solve real-life mathematical problems involving angle measure and lines of symmetry?

**TASK COMMENTS**

Tasks and lessons from the Mathematics Assessment Project are specifically designed to help teachers effectively formatively assess their students. The way the tasks and lessons are designed gives the teacher a clear understanding of what the students are able to do and not do. Within the lesson, teachers will find suggestions and question prompts that will help guide students towards understanding. For more information access the MAP website:

<http://www.map.mathshell.org/materials/background.php?subpage=summative>

The task, *Octagon Tile*, is a Mathematics Assessment Project Assessment Task that can be found at the website: <http://www.map.mathshell.org/materials/tasks.php?taskid=378&subpage=apprentice>

The PDF version of the task can be found at the link below:

<http://www.map.mathshell.org/materials/download.php?fileid=1122>

The scoring rubric can be found at the following link:

<http://www.map.mathshell.org/materials/download.php?fileid=1123>

**SE: Think Like a Fruit Ninja: Cross-Sections of Solids**

**Part I: Cross Section of a Cube**

1. Try to make each of the following cross sections by slicing a cube.
2. Record which of the shapes you were able to create and how you did it. If you can’t make the shape, explain why not.

|  |  |  |  |
| --- | --- | --- | --- |
| **2-D Cross Section** | **Possible?** | **Impossible?** | **Explanation why possible or why NOT possible?** |
| 1. Square |  |  |  |
| 1. Equilateral triangle |  |  |  |
| 1. Rectangle, not a square |  |  |  |
| 1. Triangle, not equilateral |  |  |  |
| 1. Pentagon |  |  |  |
| 1. Regular hexagon |  |  |  |
| 1. Hexagon, not regular |  |  |  |
| 1. Octagon |  |  |  |
| 1. Trapezoid, not a parallelogram |  |  |  |
| 1. Parallelogram, not a rectangle |  |  |  |
| 1. circle |  |  |  |

**Part II: Cross Sections of a Pyramid**

In the movie, Despicable Me, an inflatable model of The Great Pyramid of Giza in Egypt is created to trick people into thinking that the actual pyramid has not been stolen. When inflated, the false Great Pyramid was 225 m high and the base was square with each side 100 m in length.

Construct a model of the pyramid, with a base that is 1 inch on each side. Be sure to make the height proportional to the base just as in the real pyramid.

1. What proportion can be used in order to determine the height of your model?
2. What is the height of your model in inches?

**Suppose the pyramid is sliced by a plane parallel to the base and halfway down from the top (you can cut your model to demonstrate this slice).**

1. What will be the shape of the resulting cross section?
2. Compare the dimensions of the base of the sliced off top in comparison to the base of the original un-sliced pyramid? How many inches is each side of the top? Justify your answer.

**Next, the pyramid is put back together and then sliced by a plane parallel to the base and 25% of the way down from the top (you can cut your model to demonstrate this slice).**

1. Compare the dimensions of the base of the new smaller sliced off top in comparison to the base of the original un-sliced pyramid? How many inches is each side of this new top?
2. What if the slicing plane is not parallel to the base? What will the shape of the cross section be under those conditions?

**SE Performance Task: What’s My Solid?**

Each of the following descriptions fit one or more solids (prism, pyramid, cone, cube, a cylinder). For each clue, describe what solid it may be and your justification for selecting that solid. If the description fits more than one solid, name and provide justification for each solid. Sketch the solid, and illustrate the properties described.

a) A set of my parallel cross sections are squares that are similar but not congruent.

Example: *This could describe a square pyramid with cross sections parallel to the base.*

b) A set of my parallel cross sections are congruent rectangles.

c) A set of my parallel cross sections are circles that are similar but not congruent.

d) A set of my parallel cross sections are congruent circles.

e) A set of my parallel cross sections are parallelograms.

f) One of my cross sections is a hexagon, and one cross section is an equilateral triangle.

g) I can be made by sliding a rectangle through space.

h) I can be made by twirling a triangle through space.

i) My volume can be calculated using the area of a circle.

j) My volume can be calculated using the area of a rectangle.

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SE: Saving Sir Cumference

Sir Cumference has been turned into a dragon! Help Radius and Lady Di of Ameter break the spell and save Sir Cumference. The answer to this problem lies in this poem. Can you solve the riddle?

|  |  |  |
| --- | --- | --- |
| 1. Read “The Circle’s Measure” to page 13. Help Radius interpret the potion. | |  |
|  | * What do you think is meant by “measure the middle and circle around”? |
|  |  |
|  |  |
|  | * What two numbers should you divide? How do you know? How can you set up these numbers as a ratio? |
|  |  |
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1. How would you explain your emerging understanding of the relationship between circumference and diameter?

Upon completion of the book…

1. What does Radius use as the correct dosage? How did he come to this conclusion?

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| **OBJECT** | **CIRCUMFERENCE**  (MEASURE IN CENTIMETERS) | **DIAMETER**  (MEASURE IN CENTIMETERS) | **RATIO OF CIRCUMFERENCE TO DIAMETER** | **SIMPLIFIED**  **RATIO** |
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Proving the Dosage is Correct

1. Use a measuring tape to find the diameter and circumference of at least 5 different sized circular objects. Use centimeters to measure. If you do not have measuring tape, you may use string and a ruler. Be as exact as possible. Record your results in the table.
2. Use the grid below to make a coordinate graph. Use the horizontal axis for diameter and the vertical axis for circumference. Plot your data for each object your group measured on the graph.

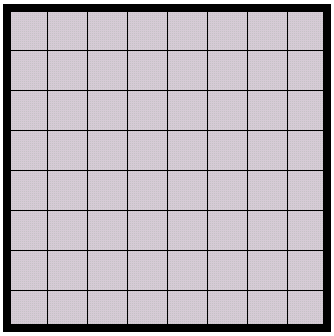
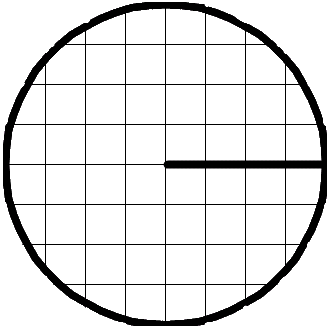
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| **Circumference** |  |  |  |  |  |  |  |  |  |  |  |
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| **Diameter** | | | | | | | | | | |

1. How does your graph reinforce the dosage amount that Radius chose to give his father?
2. The fraction is often used as an equivalent representation of pi. Using your knowledge of conversions between fractions and decimals, convert into a decimal. Why is this fraction an estimate for pi and not an exact value?

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

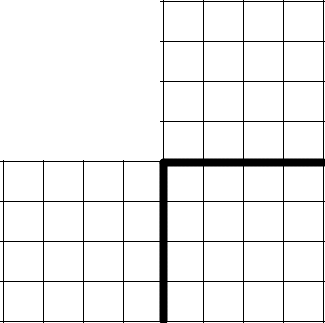
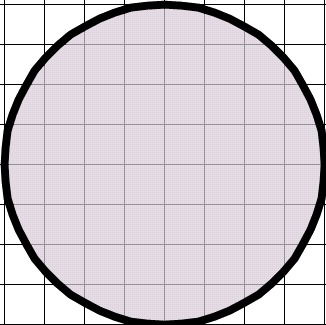
**SE: Circle Cover-Up**

1. Compare the areas of the square and circle below.



Which one has the larger area? Write to explain how you know.

1. How is the radius of the circle related to the length of the square? Write your answer in terms of the example above and then make a generalization if the radius is *r*.
2. Based on the side length for the square you generalized from problem 2, what would be the area of the square?
3. Compare the areas of the two figures below.



1. Do you think one of the areas is larger than the other? Explain your reasoning.
2. What is the approximate area of the three smaller squaresin

terms of *r*? (Use the area formula you created in problem 3 to get started.)

1. Follow the directions on the “Circle Cover-Up Cut and Cover” found on the next page.

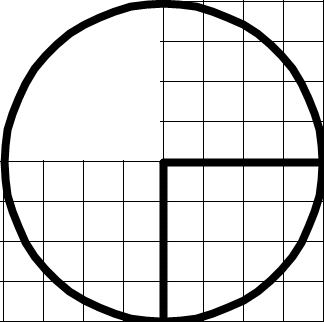
Which figure has the larger area? Write below to explain your findings.

1. How do you think finding the area of a circle is related to finding the area of a square?
2. What role do you think pi plays in finding the area of a circle?

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

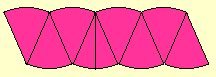
**Circle Cover-Up - Cut and Cover**

1. Color the area of the squares that are outside the circle.
2. Cut out the circle, but save the colored area that was not inside the circle.
3. Paste the area outside the circle into the blank quadrant in a mosaic design. Try not to overlap pieces. You may need to cut your colored pieces into smaller pieces so they will fit.



Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**SE Circle Cover-Up - Circles and Parallelograms**

1. Cut out one circle from the “Circle Cover-Up, Circles to Cut” student sheet.
2. Cut the sectors of the circle apart and arrange them on the grid paper as shown to form a parallelogram.

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1. Use the grid paper to help you approximate the area of the “parallelogram” formed. What is the approximate area of the “parallelogram”? \_\_\_\_\_\_\_\_\_\_ square units
2. Write the formula for the area of a parallelogram.
3. How is the height of the parallelogram related to the original circle?
4. How is the base of the parallelogram related to the original circle?

.

1. Rewrite the formula for the parallelogram in terms of the circle based on your observations from question 5 and 6.
2. What is the formula for the circumference of a circle?
3. Rewrite the formula from step 7 above. Replace C with the formula for circumference that uses the radius. .
4. Why did we need to use the circumference formula that uses the radius instead of the diameter?
5. If the radius of a circle and the height of a parallelogram are the same, use what you discovered about how the circumference and base of a parallelogram are related in order to create a circle and parallelogram with the same area. Write the dimension for circumference and base in terms of pi.

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Circle Cover-Up - Circles to Cut**

**Formative Assessment Lesson: Maximizing Area: Gold Rush**

(Problem Solving Task)

This lesson is intended to help you assess how well students are able to:

* Interpret a situation and represent the variables mathematically.
* Select appropriate mathematical methods to use.
* Explore the effects on the area of a rectangle of systematically varying the dimensions while keeping the perimeter constant.
* Interpret and evaluate the data generated and identify the optimum case.
* Communicate their reasoning clearly.

*Source: Formative Assessment Lesson Materials from Mathematics Assessment Project*

<http://map.mathshell.org/materials/download.php?fileid=1226>

**STANDARDS ADDRESSED IN THIS TASK**

**Draw, construct, and describe geometrical figures and describe the relationships between them.**

**MCC7.G.2** Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

**STANDARDS FOR MATHEMATICAL PRACTICES**

This lesson uses all of the practices with emphasis on:

1. Make sense of problems and persevere in solving them

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

**ESSENTIAL QUESTIONS:**

* How can the area of a given plot of land be maximized when the perimeter is a fixed number?

**TASK COMMENTS:**

Tasks and lessons from the Mathematics Assessment Project are specifically designed to help teachers effectively formatively assess their students. The way the tasks and lessons are designed gives the teacher a clear understanding of what the students are able to do and not do. Within the lesson, teachers will find suggestions and question prompts that will help guide students towards understanding. For more information access the MAP website:

<http://www.map.mathshell.org/materials/background.php?subpage=formative>

The task, *Maximizing Area: Gold Rush*, is a Formative Assessment Lesson (FAL) that can be found at the website: <http://map.mathshell.org/materials/lessons.php?taskid=415&subpage=problem>

The FAL document provides a clear lesson design, from the opening of the lesson to the closing of the lesson.

The PDF version of the task can be found at the link below:

<http://map.mathshell.org/materials/download.php?fileid=1226>

## Formative Assessment Lesson: Using Dimensions: Designing a Sports Bag

(Problem Solving Task)

This lesson is intended to help you assess how well students are able to: recognize and use common 2D representations of 3D objects; identify and use the appropriate formula for finding the circumference of a circle.

*Source: Formative Assessment Lesson Materials from Mathematics Assessment Project*

<http://map.mathshell.org/materials/lessons.php?taskid=416&subpage=problem>

**STANDARDS ADDRESSED IN THIS TASK**

**Solve real‐life and mathematical problems involving angle measure, area, surface area, and volume.**

**MCC7.G.4**. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

**Standards for Mathematical Practice**

This lesson uses all of the practices with emphasis on:

1. Make sense of problems of problems and persevere in solving them

3. Construct viable arguments and critique the reasoning of others

4. Model with mathematics

6. Attend to precision

**ESSENTIAL QUESTIONS**

* How do I apply the concepts of surface area and circumference to solve real-world problems?

**TASK COMMENTS**

Tasks and lessons from the Mathematics Assessment Project are specifically designed to help teachers effectively formatively assess their students. The way the tasks and lessons are designed gives the teacher a clear understanding of what the students are able to do and not do. Within the lesson, teachers will find suggestions and question prompts that will help guide students towards understanding. For more information access the MAP website:

<http://www.map.mathshell.org/materials/background.php?subpage=formative>

The task, *Designing a Sports Bag*, is a Formative Assessment Lesson (FAL) that can be found at the website: <http://map.mathshell.org/materials/lessons.php?taskid=416&subpage=problem>

The FAL document provides a clear lesson design, from the opening of the lesson to the closing of the lesson.

The PDF version of the task can be found at the link below:

<http://map.mathshell.org/materials/download.php?fileid=1228>

**Formative Assessment Lesson: Applying Angle Theorems**

(Concept Development Task)

This lesson is intended to help you assess how well students are able to solve problems relating to the measures of the interior and exterior angles of polygons.

*Source: Formative Assessment Lesson Materials from Mathematics Assessment Project*

<http://map.mathshell.org/materials/download.php?fileid=680>

**STANDARDS ADDRESSED IN THIS TASK**

**MCC7.G.4** Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

**MCC7.G.5** Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

**MCC7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

**Standards for Mathematical Practice**

This lesson uses all of the practices with emphasis on:

3. Construct viable arguments and critique the reasoning of others.

7. Look for and make use of structure.

**ESSENTIAL QUESTIONS**

* How can the interior and exterior measures of polygons?
* How are angle relationships applied to similar polygons?

**TASK COMMENTS**

Tasks and lessons from the Mathematics Assessment Project are specifically designed to help teachers effectively formatively assess their students. The way the tasks and lessons are designed gives the teacher a clear understanding of what the students are able to do and not do. Within the lesson, teachers will find suggestions and question prompts that will help guide students towards understanding. For more information access the MAP website:

<http://www.map.mathshell.org/materials/background.php?subpage=formative>

The task, *Applying Angle Theorems*, is a Formative Assessment Lesson (FAL) that can be found at the website: <http://map.mathshell.org/materials/lessons.php?taskid=214&subpage=concept>

The FAL document provides a clear lesson design, from the opening of the lesson to the closing of the lesson.

The PDF version of the task can be found at the link below:

<http://map.mathshell.org/materials/download.php?fileid=680>

**Formative Assessment Lesson: Drawing to Scale: Designing a Garden**

(Problem Solving Task)

This lesson is intended to help assess how well students are able to interpret and use scale drawings to plan a garden layout. This lesson also addresses students’ ability to apply proportional reasoning and metric units.

*Source: Formative Assessment Lesson Materials from Mathematics Assessment Project*

<http://map.mathshell.org/materials/download.php?fileid=1376>

**STANDARDS ADDRESSED IN THIS TASK**

**MCC7.G.2** Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

**MCC7.G.3** Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

**MCC7.G.4** Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

**MCC7.G.5** Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

**MCC7.G.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

**Standards for Mathematical Practice**

This lesson uses all of the practices with emphasis on:

2. Reason abstractly and quantitatively.

4. Model with mathematics.

5. Use appropriate tools strategically

**ESSENTIAL QUESTIONS**

* How can proportional relationships be analyzed to determine the reasonableness of the scale factor?
* How are geometrical figures constructed and used to analyze the relationships between figures?
* How are real-life mathematical problems solved using algebraic equations?

**TASK COMMENTS**

Tasks and lessons from the Mathematics Assessment Project are specifically designed to help teachers effectively formatively assess their students. The way the tasks and lessons are designed gives the teacher a clear understanding of what the students are able to do and not do. Within the lesson, teachers will find suggestions and question prompts that will help guide students towards understanding. For more information access the MAP website:

<http://www.map.mathshell.org/materials/background.php?subpage=formative>

The task, *Drawing to Scale: Designing a Garden*, is a Formative Assessment Lesson (FAL) that can be found at the website: <http://map.mathshell.org/materials/lessons.php?taskid=494&subpage=problem>

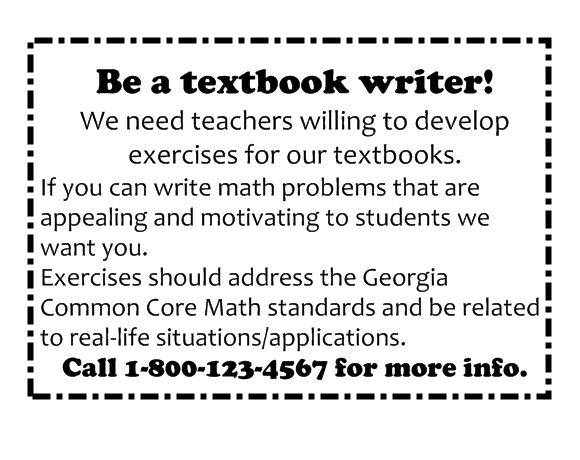
The FAL document provides a clear lesson design, from the opening of the lesson to the closing of the lesson.

The PDF version of the task can be found at the link below:

<http://map.mathshell.org/materials/download.php?fileid=1376>

### SE: Performance Task: I Have a Secret Angle

A 7th Grade math teacher saw the following job listing in a magazine:



The teacher decided to ask her 7th grade students for help, since they are *very creative*.

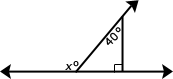
They will need to develop problems for the 7th grade standard:

Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

She gave them craft sticks, rulers, protractors, and other related supplies and instructed them to design exercises similar to exercises that they solved last year.

They designed worksheets about fashion design, cell phones, entertainment, etc. that contained problems with illustrations similar to the following examples:

* Write and solve an equation to find the measure of angle *x.*



* Write and solve an equation to find the measure of angle *x.*

Gr7 graph 3

**We will use the information we have discovered about angle relationships to write and solve equations for the above examples**