

Teacher Guide

BMC Issue: Issue 64: Of Shapes and Curves

Subjects: Geometry, Topology

Grade Level: 4th grade and up

Topics: Area, Numeric Patterns, Parity

Lesson Aim/Objectives:

- Analyze curves and regions bounded by curves
- Solve problems about partitioning of space by curves
- Find areas of regions enclosed by curves
- Analyze possible and impossible areas for regions bound by quarter-circles

Common core standards:

Geometry CCSS.Math.Content.8.G.A

Understand congruence and similarity using physical models, transparencies, or geometry software.

Geometry CCSS.Math.Content.7.G.A

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

Geometry CCSS.Math.Content.7.G.B

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

Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
5. Use appropriate tools strategically.
7. Look for and make use of structure.

<https://www.thecorestandards.org/Math/>

Materials:

Print

- BMC issue and two handouts

Bring

- Pens or pencils
- Plain paper, graph paper
- Scissors

Terms:

Geometry: Grid, point, interval, area, circle, quarter-circle.

Topology: Boundary, region, parity.

Instructions:

1. Read activities in the newsletter.
2. Register for the BMC meeting to get the Zoom link.
3. Instruct students to consider the hosts as guests in the classroom.
4. Pass out a copy of the newsletter and handouts to each student.
5. Tell students we encourage participation; they should share results and drawings, and ask questions. They can show their papers to the camera.

Notes:

- Test technology; if problems arise, please let hosts know.
- Revisit problems in the classroom.
- Provide feedback.

Pedagogical Suggestions:

- Check the tech! Test Zoom ahead of time.
- Invite people to work in pairs or small groups.
- Help students improve their hand-drawn circles by using the grid, because paying attention to that skill will help them see the mathematical structure.
- At the same time, assure students that hand-sketched circles will be imprecise, and that's okay. Tell students that all models are wrong, but some are useful. Models help us think mathematically. Ask students to imagine precise circles. In our minds, mathematics can be perfectly precise.
- If you recently worked on a topic that uses areas of shapes composed of other shapes, help students make that connection.

Big Ideas—Drivers of Investigation:

DI1, Make sense of the world: Analyze how to compose complex maps out of simpler regions.

DI2, Predict what could happen: Investigate patterns in what is and is not possible with maps drawn by specific rules.

DI3, Impact the future: Create map-making puzzles and art of your own.

Big Ideas—Content Connections:

CC1, Reasoning with data: Notice patterns in border-crossings and composite areas.

CC2, Exploring changing quantities: The areas of regions bound by quarter-circles change in certain ways as the borders grow.

CC3, Taking wholes apart, putting parts together: Compose and decompose areas of regions.

CC4, Discovering shape and space: Analyze art, maps, and abstract shapes made out of curves.

<https://www.cde.ca.gov/ci/ma/cf/>

Big Ideas—NCTM Mathematics Teaching Practices:

MTP1. Establish mathematics goals to focus learning.

MTP3. Use and connect mathematical representations.

MTP4. Facilitate meaningful mathematical discourse.

MTP5. Pose purposeful questions.

MTP6. Build procedural fluency from conceptual understanding.

MTP7. Support productive struggle in learning mathematics.

<https://www.nctm.org/Conferences-and-Professional-Development/Principles-to-Actions-Toolkit/Resources/7-EffectiveMathematicsTeachingPractices/>

More math circle materials from the Alliance of Indigenous Math Circles:

<https://aimathcircles.org/bluebird/>

