

Lesson Plan Template

Title:

Subject Area:

Grade Level: 9-12

Concept/Topic to teach:

Learning Objectives:

- **Content objectives (students will able to.....)**

What should students be able to do as a result of completing this lesson?

Students should be able to explain why you cannot make two equal areas within an irregular quadrilateral.

Essential Question:

What single big idea do you want students to walk away with?

When is it possible to have two equal areas within a quadrilateral?

Standards addressed:

- **Common Core State Mathematics Standards:**

This is a list of the CCSS math standards that are addressed in this lesson.

CCSS.MATH.CONTENT.8.G.A.2

Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

- **Common Core State Mathematical Practice Standards:**

This is a list of the CCSS mathematical practice standards that are emphasized in this lesson. (Do not include all 8 practices, just the ones that are specifically emphasized (if any).)

- Construct Viable Arguments
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and express regularity in repeated reasoning

- **Technology Standards: Copy and paste from NCDPI**

This is a list of the NCDPI information and technology essential standards that are addressed in this lesson

HS.TT.1.3 Use appropriate technology tools and other resources to design products to share information with others (e.g. multimedia presentations, Web 2.0 tools, graphics, podcasts, and audio files).

- **21st Century skill (Communication, Collaboration, Creativity, Critical Thinking)**
- Communication
- Creativity
- Technology and information media
- Learning and Innovation Skills

Required Materials:

List all materials needed for your lesson

- Computer with GSP software
- Paper
- Pencil

Prerequisite Knowledge:

Write anything here that you think the reader needs to know before implementing this lesson. For example, if you are assuming that the students have already experienced

- Knowledge of how to use GSP
- Definition of congruence
- Definition of irregular, convex quadrilaterals

Time	Teacher Actions	Student Engagement
	<p>Before</p> <ul style="list-style-type: none"> ● <i>Prior Knowledge:</i> I will show students constructions of irregular polygons, and ask them to write down (silently) the characteristics they notice about these polygons. Hopefully, students will remember these characteristics, so this part will go quickly and simply. ● After we have reviewed the properties of the polygons, I will present them with the problem “Two brothers are part of an expedition and they have discovered a new island. From the sky, they notice that the island is shaped is like an irregular convex quadrilateral. They are not sure of an actual dimension of the island, but they want to determine a way that they can fairly divide the island between the two of them. The older brother suggests that they divide the land along one diagonal. Then, each can have one triangular part. He states that this method create two triangles and each will receive one of the two triangles, is it fair” ● The students will think about the problem for a few minutes, then they will pair up and begin working through the problem. 	
	<p>During</p> <p>How will my students explore mathematical concepts during the lesson? Get students to open GSP and explore making congruent figures within an irregular figure. They will construct an irregular convex quadrilateral. The students will try to make two equal areas within the irregular quadrilateral</p> <p>Notice students mathematical thinking What will you look for as students are working? I will look to see if students are heading in the right direction of seeing if they are discovering that irregular convex quadrilaterals cannot be divided into two equal areas. I will listen to students discussion to see what conjectures and</p>	<p>“Does the diagonal HAVE to go through two of the points? Like two corners?”</p> <p>Yes, it has to go through the points</p>

	<p>ideas they have about dividing an irregular quadrilateral. I will also listen to discussions about if the quadrilaterals were regular, could they make equal areas within the quadrilateral. The students should discuss different ideas on how to divide quadrilaterals in such a way that each brother can have land next to water.</p> <p>What strategies do you anticipate students will use to think about/solve the task?</p> <p>They will use the line tool and measurement tool in GSP. They will be thinking in terms of area. The students may construct the irregular polygon, then look for diagonals to place in the polygon that will possibly give them the two equal areas they are looking for.</p> <p>Provide Appropriate Support</p> <p>What questions will you ask of individual students if they are struggling? List specific questions you plan to ask.</p> <p>“Does it matter what the irregular quadrilateral looks like when you are trying to get a diagonal that makes two equal areas?”</p> <p>“What if you change the size of the quadrilateral?”</p> <p>“Try changing the shape of the irregular quadrilateral, are there any other ways you can place a diagonal?”</p> <p>Provide Worthwhile Extensions</p> <p>What questions will you ask of individual students if they finish quickly? List specific questions you plan to ask.</p> <p>“Is this applicable to all irregular quadrilaterals?”</p> <p>“If you had to summarize this problem in one sentence, what would you say?”</p> <p>“Could you find any irregular polygon that will give you two equal areas?”</p>	
	<p>After</p> <p>Promote a community of learners</p> <p>How will students share their work/thinking?</p> <p>Students will work in groups of two or three. They will share their ideas and thoughts among each other. After a while of working on the problem, we will come together as a class and have different groups and individuals share their solutions and conjectures about each question of the problem.</p> <p>What questions will you ask to help students summarize what they have done and learned?</p>	

	<p>Was it possible to make two equal areas in an irregular convex quadrilateral? Why or why not? How did you discover this?</p> <p>Was it possible to make two equal areas in a regular quadrilateral? Why or why not? Did anyone find a regular quadrilateral that could not be divided into equal areas? If so, why did this happen?</p> <p>Did anyone find a way to divide the “land” equally?</p> <p>Listen actively without evaluation What ideas do you anticipate will be addressed? The students should begin to realize that no matter how they divide the islands, they will not come up with an equal way to divide it.</p> <p>Summarize main ideas and identify future Problems. Students may begin to try to re-shape the island, as the teacher, you will need to remind them that the island needs to remain an irregular quadrilateral.</p> <p>How will you wrap up the discussion? “With your exploration well underway, what can you conclude about this problem?” The students will now share their explorations with the class.</p> <p>What mathematics content and processes need to be emphasized? No matter what exact size the island is, as long as it is an irregular quadrilateral, you will not be able to create two equal areas from the quadrilateral.</p> <p>We will use the questions and solutions given on the “Solutions” page.</p>	
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*** Your lesson plan should ALL be included here (the reader shouldn't have to go anywhere else to find the plans.) The teacher should be able to read it chronologically. The only things to be included at the end of the plan are supplemental artifacts (e.g. handouts, tech files, ppt). If you chose not to use the table then the time, teacher actions and student actions should be clearly noted throughout your plan.

- Make sure that your lesson is detailed enough that someone else could teach from it. This is especially important during class discussion phases. For example, be sure to detail what the teacher should be sure

to bring out in a whole class discussion, including questions to push students to build conceptual understanding, questions to assess student understanding, and transitions between portions of your lesson.

- If students are working in pairs / small groups this should be noted (including how the groups are to be determined)
- All tasks / examples should be worked out and included in the body of the lesson plan
- All HW should be worked out

The only homework the students would have would be their explanation of their solution if they have not completed it in class.