Area of Shaded Region Lesson Plan

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Class: Math II

Class Size: 31 Students

Topic:

* Shaded regions of geometric figures
* Finding areas of parts of geometric figures which are determined by areas of shaded and unshaded parts.

Objectives:

* Use knowledge of finding areas of two-dimensional geometric figures to determine areas of shaded parts of geometric figures.
* Use subtractive thinking to think of shaded regions as parts of a whole figure that students are familiar with.
* Use additive thinking to think of shaded regions the sum total of areas of figures that students are already familiar with.

Standards:

* MM2G3: Students will understand the properties of circles.
  + c: Use the properties of circles to solve problems involving the length of an arc and area of a sector.
  + d: Justify measurements and relationships in circles using geometric and algebraic properties.

Instructional Tools/Resources:

* Geometer’s Sketchpad (optional)
* Projection from computer display
* Interwrite
* Mobi
* Handout
* Homework
* Timer (optional)

Initial Classroom Setup:

* No special setup needed. Whole group discussion accounts for most of this task. We chose to go back to rows because that is what the students preferred. Because it was mostly whole group discussion, groups might have been more of a distractions anyway.

Main Ideas/Definitions:

* Area: measurement of the two dimensional space occupied by a figure.
* Shaded Region: a specially-selected portion of a two dimensional figure

Connections to Previous Lessons:

* Students will use understanding of previously learned methods to determine the area of circles, rectangles, and other two dimensional geometric figures.
* Students will connect to the previous lesson about arc length and sector area, through application of sector area to find shaded regions including parts of a circle.

Time Schedule:

* 90 minute class period
  + ( < 10 Minutes ) Display EQ and standards for the day before tardy bell and as students are arriving. Leave up during initial welcome, announcements, logistical/housekeeping needs.
  + (20 minutes) Display Warmup, field homework/review questions as students work on warmup which is related to homework and previous day’s lesson. Have individual students work warmup problems on board.
  + ( up to 15 minutes ) Display GSP File (areaofshadedregions.gsp), discuss basketball court template, have students consider geometric figures in the court diagram which they recognize, list figures on the board. Then have students produce area formulas for the figures that they identify. Record these formulas on the board.
  + (about 45 minutes) Handout the handout (with 6 shaded regions exercises from court template), allow students time to work on the problems with the basketball court and complete them as a group.
  + ( 5-10 minutes ) Ask for any questions, give homework.

Questions:

* What are some of the figures we see in the basketball court?
* What are the area formulas for the figures we see?
* How can we determine the shaded part of this (figure a) that is shaded, when this (figure b) part of that (figure a) is not shaded?
* Are we adding or subtracting area to/from that figure?

How to Monitor:

* As we work problems together, check for student participation and body language/ facial expressions.
* Circulate during time allotted for students to work on their own, take note of the correctness/complexity of thinking of various students, begin thinking of students you want to present based on the notes

Anticipated Student Response:

* Misconceptions:
  + Area of the entire court must be used to complete each part of the task
  + There is a particular, previously-learned formula which must be used to complete the task.
  + More information about the figures is needed to complete the task.

How to Select and Sequence Student Solutions:

* Select solutions which exhibit clear, mathematically correct thinking, as well as some which exhibit unclear and sometimes mathematically incorrect thinking.
* Select a variety of correct solutions from students if a diversity of ways of thinking exist.
* Select incorrect solutions only which have one or two elements which were out of place or misused. The desire is not to create more misconceptions, but to allow correct conceptions to be brought out of initially incorrect solutions.
* Select incorrect solutions from students who are not alienated from the context of the word problem by their non-inclusion in a culture which would easily understand the context of the problem.
* Sequence solutions in a way such that, ideally, some simplistic and correct ideas come first. Then perhaps introduce some more complex ideas that may not exactly be correct, and follow up with more complex/complete ideas that are correct and useful for developing concrete ways of thinking about this problem which have no holes in them.

Transitions:

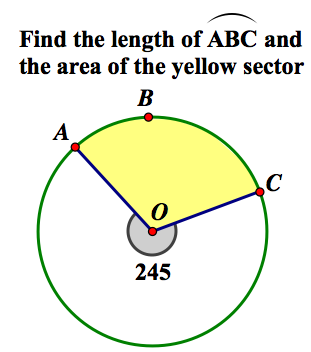
* Once initial welcome is complete, have students return to seats if they are not back in seats. Quiet the class and get their attention before displaying GSP file.

Formative Assessment:

* Discussion of warmup
* Fielding homework questions, general review questions
* Conversations with students while circulating during group work time
* Construction of correct solution and final ideas through class-wide discussion

Tasks:

* warm up (one brief problem of finding the arc length and area of sector)



* areaofshadedregions.gsp
* area of shaded regions bball court.pdf
* area of shaded regions homework.pdf

Accommodations for students with disabilities

* ELL students should not have a problem with this lesson. Nothing about basketball needs to be known to do theses problems... you just have to find the shaded regions.
* For students with sight problems, the handout will be especially beneficial. However, it was pretty small so I would make the images much bigger for that student. I would also consider writing out the answers to the problems on a sheet of paper and giving them to the students since they might not be able to clearly see what was demonstrated and the actual solution on the board.

Plans to Extend/Scaffold:

* Extensions:
  + Have students create their own ideas of real-life situations to find the area of shaded regions. Other sports fields/courts, etc.
* Scaffolding:
  + Give area formulas.
  + Identify figures in court.
  + Ask questions from list that lower cognitive demand.

Alternative Plans:

* If class finishes early, give out homework early and allow in-class work time.
* If class seems to be taking too long, allow rest of in-class handout to be completed along with homework handout as homework.
* If technology is not working, a drawn model on the dry erase board combined with the handout will suffice.

Closing:

* A quick review of method(s) used to determine solution to the task.
* Brief preview of the homework, which will double as a review of what skills were learned and what reasoning was used to determine arc length and area of a sector.
* Hand out homework.
* Class ends, or time to work on homework.

Homework:

* area of shaded regions homework.pdf
  + worksheet we got problems from <http://www.mooreschools.com/cms/lib/OK01000367/Centricity/Domain/1292/Area%20of%20Shaded%20Region%20Worksheet.pdf>

Summative Assessment:

* End of unit test, periodic quizzes.

Analysis of cognitive demand of each task (warm up, other problems done in class, main task)

1. Warm up
   1. This was a procedures without connections task. We wanted to reinforce the formulas for arc length and area of a sector. We wanted to get across the idea that the formula represents taking the fraction of the circle that the arc takes up and multiplying it by the whole area of circumference of the circle.
2. Area of Shaded Regions using basketball court
   1. This was a procedures with connections task. There was a suggested path to use (finding areas of different regions including area of sectors and rectangles). It was only represented visually. Although they knew which area they needed to find, it was still difficult for them to determine how to get there and which areas to calculate. They had the hardest time when they had to think subtractively. By this, I mean that they would have to calculate one area that was larger than the shaded region and then find and subtract the area that the larger region covered but was not supposed to. So, this task required them to mindful of their efforts.