Re-purposing Technology Lesson Plan
TE 831: Teaching School Subject Matter with Technology

Summary Box

Lesson title: Relating Central Angles with Inscribed Angles

Prepared by: Brandon Cook

Subject area: Math/Geometry

Technology used: SMART Slate WS200

Length of lesson: 45 Minutes

Suggested grade level: 9-12 grade

SMART Slate WS200:

This is a device that works very much like a SMART board except that it is entirely wireless and students can work with it while sitting on their desk. As you will see in the lesson plan, students will be doing work using rudimentary tools for the technological savvy generation that we are now working with. This is necessary for a couple of reasons; the first being that I did not have access to a computer lab at the time and would not be able to do so. The second reason is that I want students to compare the more perfect measurements done on geometry sketchpad when they create their own lines and measure them. I will not be able to have every student operate geometry sketchpad in performing a single task and so I ask that they follow along by forming their own creation. Through the SMART slate, students will be able to interact with geometry sketchpad but, as noted, not all students will be able to do so in this lesson.

Lesson Objectives:

Solve problems and justify arguments about central angles, inscribed angles, and triangles in circles. (Standard G1.6.3)

- Use inscribed angles to solve problems.
- Use properties of inscribed polygons.
- Use angles formed by tangents and chords to solve problems in geometry.
- Use angles formed by lines that intersect in a circle to solve problems.

Student NETS Standards Alignment:

- Student NETS 1c – Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students use models and simulations to explore complex systems and issues.
- Student NET 1d - Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students identify trends and forecast possibilities.
- Student NET 3d - Students apply digital tools to gather, evaluate, and use information. Students will process data and report results.

Materials:

- SMART Slate WS200
- Geometry Sketchpad
- Computer that allows for me to use this software
- Digital Projector and Screen
- 1 half-sheet of paper with a circle for each student (See Appendix A)
- 3-4 different colored pencils for each student
- Protractor for each student

Lesson Procedure: On the next few pages is the actual lesson plan that I would give to the administrator with the few additions that are requested of me for this purposes of this project.

Please describe the lesson procedure using bullet point list. Include a sequence for the lesson from beginning (before the lesson – connecting to prior knowledge), middle (during – what activity or activities will the student be doing), and the end (this is traditionally where the assessment happens, but for this plan just describe ways to extend the lesson with the technology you are using).

Lesson Plan 3/29/11

Date: March 29, 2011
Class: Geometry
Teacher name: Brandon Cook

Lesson Name: Relating Central Angles with Inscribed Angles

Principle student objective: Solve problems and justify arguments about central angles, inscribed angles, and triangles in circles. (Standard G1.6.3)

- Use inscribed angles to solve problems.
- Use properties of inscribed polygons.
- Use angles formed by tangents and chords to solve problems in geometry.
- Use angles formed by lines that intersect in a circle to solve problems.

Extension student objective (for advanced students): Consider what kind of triangle you would have if it were to be inscribed with one side the diameter. Also consider the measure of individual angles in an inscribed quadrilateral and their relationship to the opposite angle and intercepted arcs

Principle teacher objective: To practice listening to, assessing, and building on students' thinking for the purpose of teaching mathematics.

Prerequisite concepts: Knowledge of circles and the formation of rays extending from the center of circles that also form arcs of a circle. They should also know how to use a ruler and a protractor.

Subsequent concepts: Inscribed angles and other relationships in circles. Angle measures of inscribed polygons and other polygons.

Materials: SMART Slate WS200, Geometry Sketchpad, Computer that allows for me to use this software, Digital Projector and Screen, 1 half-sheet of paper with a circle and center for each student, 3-4 different colored pencils for each student, Protractor for each student

Lesson Procedure:
Before the lesson:

Prior to class, I will have the materials students will need ready for use. I will also have my SMART slate ready along with the program Geometry Sketchpad with a circle already created for use.

Warm-up/Quiz (0:00-5:00)

Students are to receive their warm-up as they enter class and prepare themselves by receiving a protractor, a half-sheet of paper with a circle and 3-4 colored pencils from the table in front of class. The warm-up is going to be based on what we learned about the previous day. Students are allowed to collaborate on the subject and use notes.

Collect the warm-up and go over it (5:00-8:00)

I will ask a few students to demonstrate what they remember about arcs and chords of a circle.

Launch (8:00-9:00)

So we have been working with circles the last few days. We have been also required to know the difference between chords and other lines that go through a circle. Most recently, we have been working with central angles and how that relates to the idea of the "measure of an arc". Now we are going to use our knowledge of measuring angles and draw conclusions to a few more concepts.

Students at Work (9:00-57:00)

Teacher's Responsibilities and Potential Questions	Student Responsibilities and Potential Responses
Constructing a Central Angle (9:00-12:00) - The two sides of an angle are called what? - What kind of angle is created?	Using a straightedge provided by the protractor, create two rays extending from the center of the circle forming a central angle. They can even collaborate if unfamiliar with what to do. The student with the SMART slate will use the "create ray" function on geometry sketchpad to do the same. Then this student needs to label the two points intersecting the circle. (See Appendix B)
Determine the measure of the angle you created (12:00-15:00) - How do we use the protractor to measure an angle?	In this case, students need to be able to use their protractor correctly to measure the angle they have created. They need to record their results somewhere on the paper. The student (this time a different student) will go to "measure" and then "angle" provided in the toolbar on sketchpad to measure the central angle. (See Appendix C)
Determine the measure of the intercepted arc (15:00-16:00) - What do we know about the measure of a central angle and its intercepted arc?	Students should already know the connection between the central angle and its intercepted arc to know the measure of this specific arc. The student (another student) will go to "measure" and then "arcangle" provided in the toolbar on sketchpad to measure the intercepted arc. (See Appendix D)
Constructing an inscribed angle with sides intersecting the end points of the intercepted arc (16:00-24:00) - Remind students of what a point "on the circle" means.	Students are now to create a point on the circle opposite the intercepted arc and label that point. Afterwards, they are now going to create another angle from that point where the two sides of the angle are now going to intercept the endpoints of the original intercepted arc.

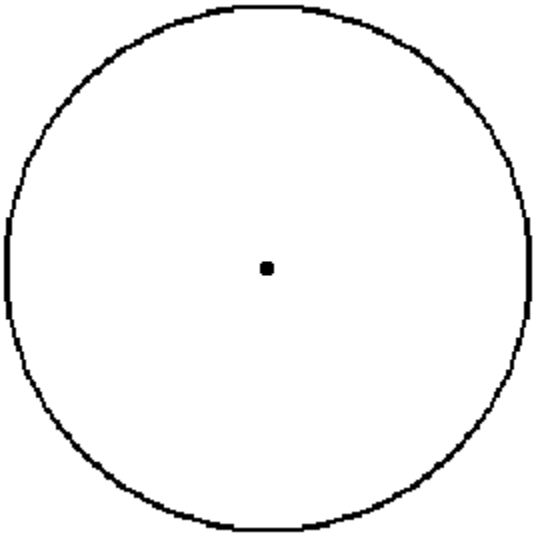
	Another student using the SMART slate will use the "create ray" function on geometry sketchpad to do the same. (See Appendix E)
Determine the measure of the inscribed angle (24:00-26:00) - How do we use the protractor to measure an angle? - Make sure that they made the correct sort of angle before measuring.	Students need to be able to use their protractor correctly to measure the new angle they have created. They need to record their results somewhere on the paper. Another student will go to "measure" and then "angle" provided in the toolbar on sketchpad to measure the inscribed angle. (See Appendix F)
Class Discussion Time (26:00-32:00) - What do we notice about the measure of the inscribed angle compared to the central angle? - What does this also tell you about the measure of an inscribed angle and its intercepted arc? - Do you think we can develop some sort of generalization from what we have noticed? What is it?	Students need to be able to make the reasonable observation on how the measure of the inscribed angle is half the measure of the central angle that intersects the same two points on the circle. Subsequently they should also notice that the measure of this inscribed angle is also half the measure of its intercepted arc. If the measurements aren't exactly aligning with this conclusion, students should be able to compare their results from those produced on sketchpad.
Create another inscribed angle also intersecting the endpoints of the intercepted arc (32:00-36:00) - The purpose of this exercise is to see if our generalization is correct. - Ideally, the next point should be 90 degrees in either direction from the vertex of the original inscribed angle.	Students are now going to plot a new point anywhere else on their circle and label it. Then, like before, they are to create an inscribed angle going through the same two endpoints of the original intercepted arc using a different colored pencil.
Determine the measure of the inscribed angle (36:00-38:00) - How do we use the protractor to measure an angle? - What do we notice about this new angle? - What do both inscribed angles have in common?	Students need to be able to use their protractor correctly to measure the new angle they have created. They need to record their results somewhere on the paper. After students have created another inscribed angle and measured it, a student using the SMART slate will now "grab" the vertex of the previous inscribed angle and move it somewhere else. As this student is doing this, the class needs to observe the measures of the

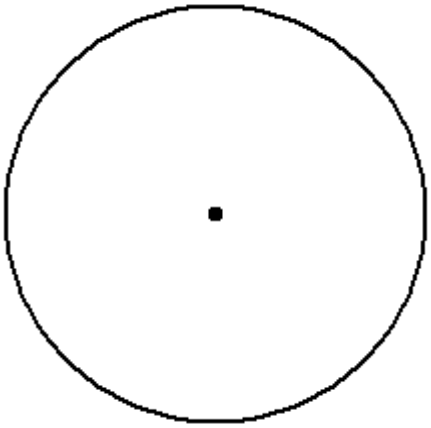
	angles and arcs to see any significant change. (See Appendix G)
Create a third inscribed angle (38:00-42:00) - The point of this exercise is to finalize our generalization into a theorem. - Chose a new point that is approximately opposite from the most recent inscribed angle.	Students are now going to plot a new point anywhere else (hopefully opposite the most recent one) on their circle and label it. Then, like before, they are to create an inscribed angle going through the same two endpoints of the original intercepted arc using a different colored pencil.
Determine the measure of the new inscribed angle (42:00-44:00) - How do we use the protractor to measure an angle? - What do we notice about this new angle?	Students need to be able to use their protractor correctly to measure the new angle they have created. They need to record their results somewhere on the paper. After students have created another inscribed angle and measured it, a student using the SMART slate will now "grab" the vertex of the previous inscribed angle and move it somewhere else. As this student is doing this, the class needs to observe the measures of the angles and arcs to see any significant change. (See Appendix H)
Class discussion time and wrap-up (44:00-52:00) - What do all of these inscribed angles have in common? - What theorem can we formalize from our project here today?	Students need to be able to make a generalization on how the measure of the inscribed angle is half the measure of the central angle that intersects the same two points on the circle. Subsequently they should also notice that the measure of this inscribed angle is also half the measure of its intercepted arc. If the measurements aren't exactly aligning with this conclusion, students should be able to compare their results from those produced on sketchpad.

Wrap-up (52:00-57:00)

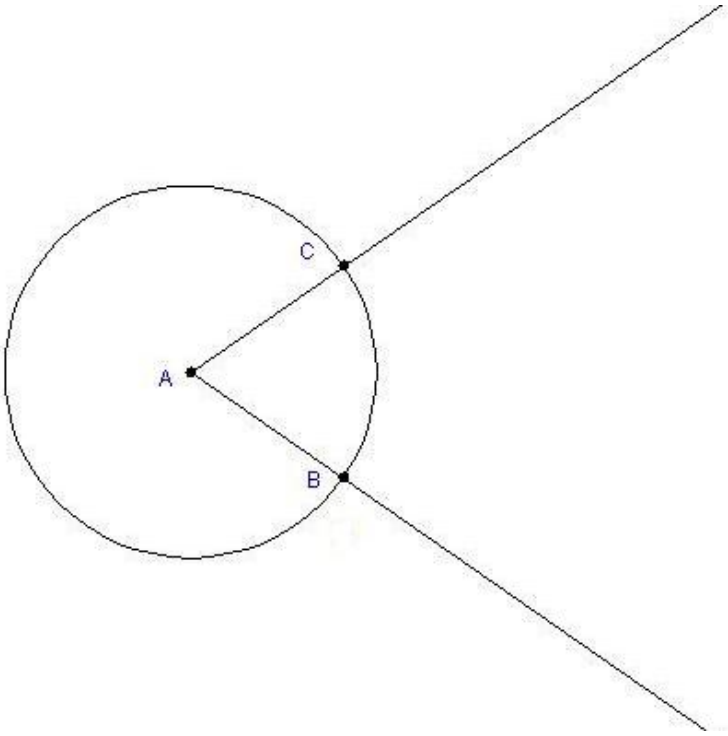
Students are to return any borrowed pencils, colored pencils, protractors and clean up the floor from papers and remain quiet to show me they are ready to leave.

Appendix A





Appendix B



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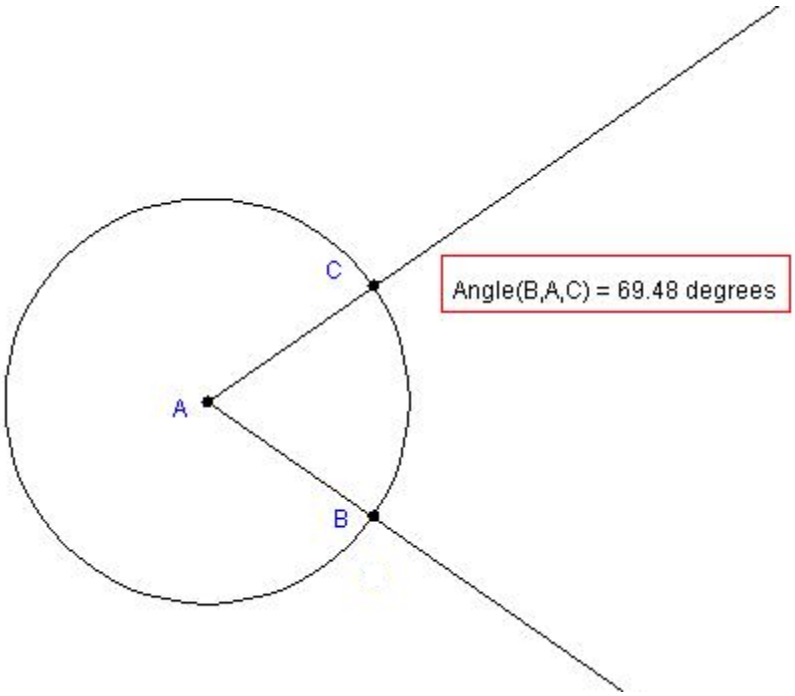
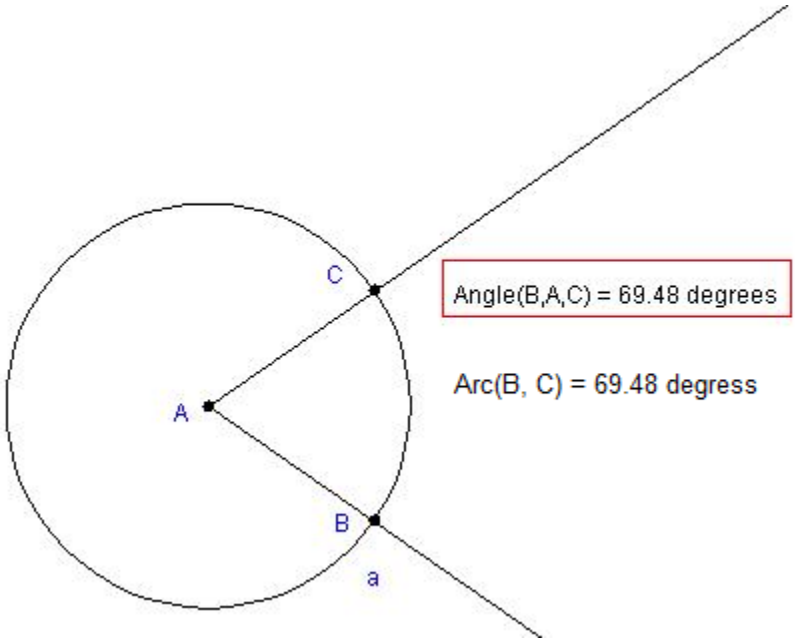
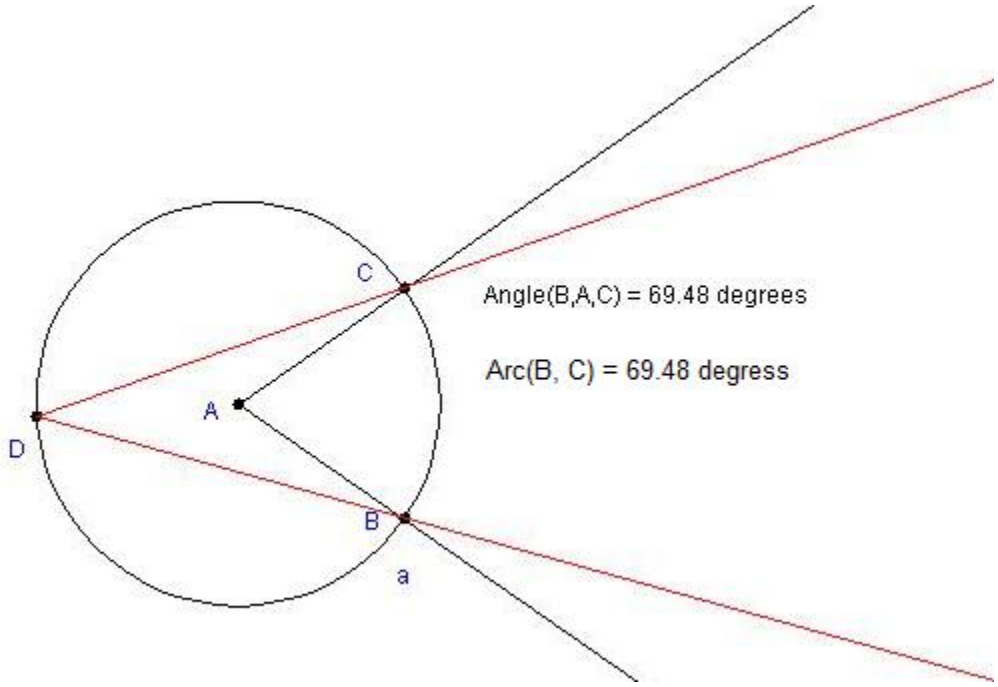


Appendix D



Appendix E



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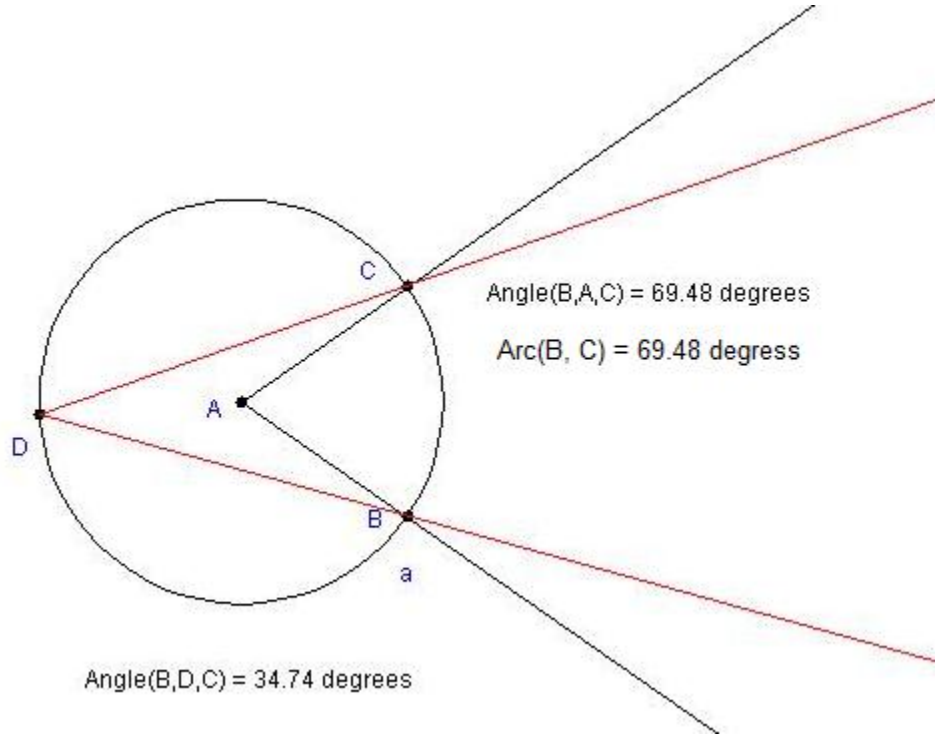
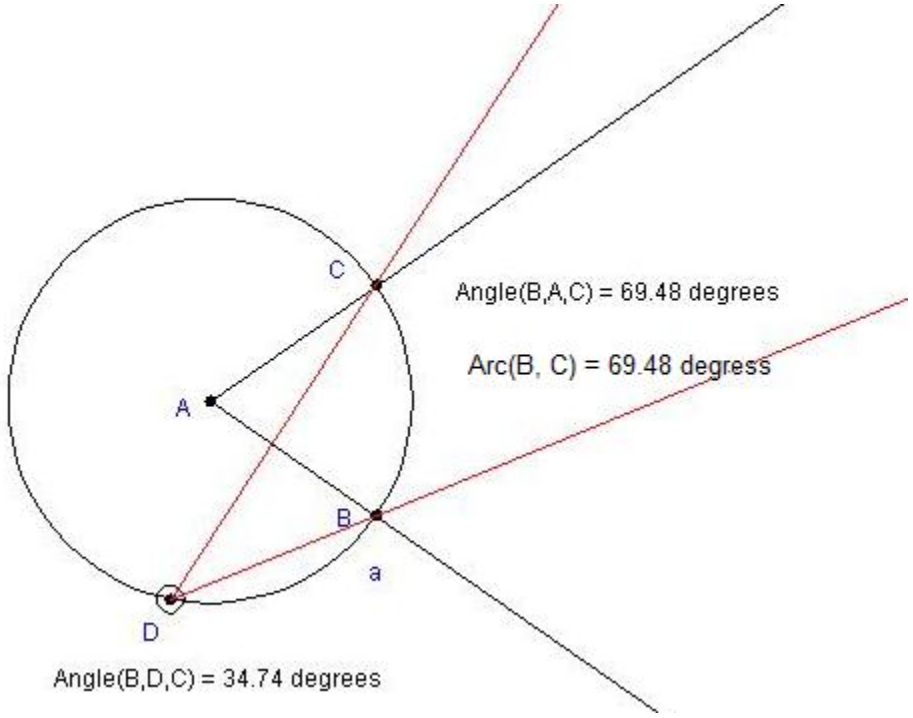
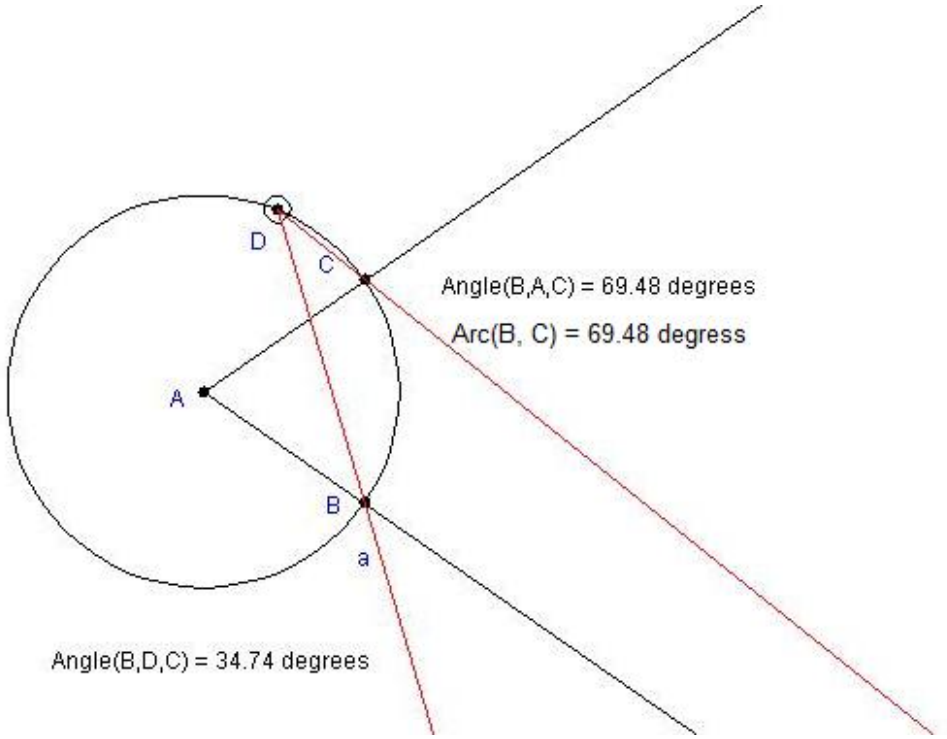


Appendix G



Appendix H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