EXAMINING POLYGONS INSCRIBED IN CIRCLES

Any group of points is called concyclic if they all lie on the same circle. A polygon is said to be inscribed in a circle if the vertices of that polygon are concyclic. In this project students are going to examine the characteristics of polygons that are inscribed in circles and the relationship between the circle and its inscribed polygon.

To complete this assignment students must explore the following questions.

1. Can any triangle be inscribed in a circle?
2. Can any quadrilateral be inscribed in a circle?
3. What types of polygons with larger numbers of sides can be inscribed in a circle?
4. What is the relationship between the radius, circumference, and area of the circle and the sides, perimeter, and area of the inscribed polygon?

[Created by Nicole Leone, Newtown High School]

Procedures:

1. Throughout the unit, use the form attached to keep track of facts and theorems that you learn. This will be helpful for completing this project and it will also help you in preparing for the test.
2. Draw a few triangles. For each one see if you can find a circle that goes through all three vertices.
3. Make a conjecture as to whether all, none, or certain types of triangles can be inscribed in a circle.
4. Try a few more examples to see if you can disprove your theory. If you do find a counter-example make another conjecture.
5. Once you are convinced you know the answer to the question, "Can any triangle be inscribed in a circle?" use deductive reasoning to explain why you are correct. If your answer is that only certain types of triangles can be inscribed in a circle, be sure to describe what characteristics those triangles have that make it so that they can be inscribed in a circle.
6. Answer the next two questions, "Can any quadrilateral be inscribed in a circle?" and "What types of polygons with larger numbers of sides can be inscribed in a circle?" using the methods described in steps 2-5.
7. Look at a few examples of inscribed polygons. If you know the number of sides of the polygon and the length of the radius, see if you can find the perimeter and the area of the polygon.
8. Look at examples of inscribed polygons for which you do not know the radius of the circle. Decide what information you must have about the polygon in order to determine the radius of the circle.
9. Compile your findings into a paper containing the following:
    - Answers to each of the four questions.
    - Description of the process you used to determine those answers.
    - Explanation, using valid deductive reasoning, of why your answers are correct.
    - Discussion of the characteristics that seem to affect whether or not a polygon can be inscribed in a circle and anything else you discovered in this process.

Facts and Theorems:

Fact or Theorem	Notes	Example of Use

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Performance Task Assessment List:

To receive a score of 88% on this project you must meet the following criteria. You may not exceed the first criterion. However, for each question that you do not answer you will loose 4 points. For each of the three remaining criteria you may receive up to 4 additional points if you were exceedingly insightful, thorough, creative, organized, prepared, etc. On the other hand, for each of these criteria that you do not meet you may lose up to 8 points.

Criterion	Teacher Assessment	Self Assessment
1. You answered each of the four questions posed.		
2. You described the process that you used to examine, and ultimately, answer each of the four questions.		
3. You provided sound deductive reasoning, backed up by valid geometric theorems to defend and explain the answer to each of the four questions.		
4. You summarized your findings, including in the summary, a discussion about the characteristics that affected whether or not a polygon could be inscribed in a circle and the relationship(s) that you discovered between the circle and its inscribed polygon.		