

CMST Challenge Project Polygons Within Our World

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Abstract

Polygons Within Our World

Students learned to construct polygons using Geometers Sketchpad. Using these constructions, students were able to infer the sum of the exterior angles of any polygon, the formula to find the sum of the interior angles of a polygon and the measure to each angle of any regular polygon.

Students continued to explore polygons, this time considering their area with a constant perimeter restriction and how the area of a regular polygon relates to the area of a triangle inside the regular polygon which uses the center as a vertex.

Justification of software used

Geometer's Sketchpad was easily understood by our students. It was uncomplicated for them to remember construction steps and to figure out how to calculate new measurements on their own. It allowed students to gather data about polygons and to make conjectures based on their data. This software was also ideal for this project in that it helped students understand constructions versus drawings. The Excel software was important for students to see the relationship between a graphic model and a list of data. Students could draw conclusions from both and understand the relationship between them.

Log Files

11/4 meeting after school to discuss project

11/14 meeting after school to discuss project
11/18 begin meeting with students after school
11/21 meet with students after school
11/28 meet with students after school
12/2 meet with students after school
12/5 meet with students after school
12/9 meet with students after school
12/12 meet with students after school
12/16 meet with students after school
12/19 meet with students after school

Problem Definition

Students will perform this challenge to verify the following: The sum of the interior angles of a convex polygon is governed by the equation $x = 180^\circ (n - 2)$. Students will construct different polygons and verify interactively the sum of the interior angles. The interior angle of a regular polygon is governed by the equation $y = 180^\circ (n - 2) / n$. Students will construct different regular polygons and verify interactively each of the angles. The sum of the exterior angles of a convex polygon is equal to 360° . Students will construct different polygons and verify interactively the sum of the exterior angles. The area of a regular polygon is governed by the equation $A = nTa$, where Ta is equal to the area of one of the included triangles where the center polygon is one vertex of the triangle. Students will construct different polygons and verify interactively the area of a regular polygon. The project will be presented in a PowerPoint format illustrating how polygons are integrated into our world.

Problems Encountered

Our biggest challenge was getting our students to attend regularly and our own time constraints. If students were unable to attend we found some time was spent getting students 'up to speed' with the others. This did offer students an opportunity to teach one another, which was valuable.

Evaluation of Results

Students learned the theorems as defined. The project allowed for a constructivist approach to learning. The PowerPoint presentation helped students realize the process in which they learned the information.

Summary of Experience

The students were highly motivated by the use of the software and laptops. It was exciting to see students enjoying learning mathematics and extending their learning outside of the normal school day. As teachers, we considered how to have them construct using Geometer's Sketchpad and became more knowledgeable of better techniques of instructing with the software.

Curriculum Standards Addressed

Mathematics A

Performance Indicator 4A (Modeling/Multiple Representation)

Represent problem situations symbolically by using algebraic expressions, sequences, tree diagrams, geometric figures, and graphs. Specifically, the following bullets:

- Simple closed curves: polygons and circles
- Sum of interior and exterior angles of a polygon

Performance Indicator 5A (Measurement)

Apply formulas to find measures such as length, area, volume, weight, time, and angle in real-world contexts. Specifically, the following bullets:

- Perimeter of polygons and circumference of circles
- Area of polygons and circles

Performance Indicator 7B (Patterns/Functions)

Apply linear and quadratic functions in the solution of problems. Specifically, the following bullet:

- Graphic and algebraic solutions of linear and quadratic functions in the solution of problems.

Performance Indicator 7C (Patterns/Functions)

Translate among the verbal descriptions, tables, equations, and graphic forms of functions. Specifically, the following bullet:

- Translate linear and quadratic functions, systems of equations, inequalities and quadratic linear pairs between representations that are verbal descriptions, tables, equations, or graphs