Topic: Polygons

Grade Level: 4th

Textbook: *Everyday Mathematics* (Wright Group)

Overview: This lesson was based on Lesson 1-5 in the *Everyday Mathematics* Teacher's Lesson Guide, Volume 1, Unit 1: Naming and Constructing Geometric Figures. It is the 5th lesson in the unit of 8 lessons. This lesson builds on previous lessons in Grades 1-3 that analyze common characteristics of all polygons and exploring polygons with straws, geoboards, and dot paper. This lesson will prepare students for activities later in the year and in Grades 5 and 6 where they will be identifying lines of symmetry of polygons, congruent polygons, and similar figures. Although a substantial amount of the content from the *Everyday Mathematics* lesson was included in this lesson plan, the sequencing was modified somewhat and elaborated on. This lesson plan is written in the 5-E inquiry lesson plan format.

Objectives: Students will identify properties of polygons and regular polygons.
Students will distinguish between convex and concave polygons.
Students will construct convex and concave polygons.
Students will identify types of polygons according to the number of sides.

Michigan GLCE:
G.GS.04.02 Identify basic geometric shapes, including isosceles, equilateral, and right triangles, and use their properties to solve problems.

Materials
Lesson 1.5 from Teacher's Lesson Guide, Volume 1, Unit 1
Overhead, clean transparencies, Vis-?-Vis® overhead wet wipe markers
Math Journal for Students (1), p. 12 (What is a Polygon?) <see attached>
Math Masters (p. 19) (Polygons on a Geoboard) <see attached>
Geoboards, rubber bands, rulers, pencils (1 per student)
Student Reference Book, pp. 96-97 (Polygons) <see attached>
Straws (full-length, half-length, and 3/4 –length) - 3 of each/student (bring extra)
Twist ties - 8/student (bring extra)
Study Link 1.5 - Math Masters (p. 18) (Polygon Riddles) <see attached>

Extension Materials
The Greedy Triangle
Math Masters (p. 20) (The Greedy Triangle) <see attached>
Straws (see above)

Procedures (50 minutes)

Lesson Plan Component	Materials*	Time
Engage/Pre-Assess – What is a Polygon?	Overhead/MJ pg 12	5 min
Explore – Exploring Polygons with Geoboards	Geoboards/MM pg 19	10 min
Explain – Convex, Concave and Regular	Straws/SRB pp 96-97	15 min
Elaborate – Hexagons, Heptagons, Octagons…etc.	Straws	10 min
Evaluate	SRB p 97	10 min

** See materials list for more details.*

1. Engage/Pre-Assess – Whole Class/Individual Activity – What is a Polygon? **(5 minutes) –** Using the overhead, the teacher asks for a volunteer to come up to the overhead and draw some shapes. {Student may or may not draw polygons…if the student draws only polygons, the teacher will draw some examples of non-polygons and vice versa}. The teacher will then ask the class "*What is polygon?*" and "*Are there any polygons drawn on the overhead?*" The students will then complete Math Journal page 12 (What is a Polygon?) using the examples provided and their background knowledge to explain what a polygon is and what a polygon is not. The class will then discuss their answers to what makes a shape a polygon and list the characteristics of a polygon on the overhead (2-dimensional, closed, 3-sides or more, straight sides). The teacher collects Math Journal page 12 from the students as a means of pre-assessment.

2. Explore – Small Group – Exploring Polygons with Geoboards (10 minutes) - Using geoboards, rubber bands and Math Masters page 19 (Polygons on a Geoboard); students work with a partner to construct polygons (i.e., a triangle with each side touching 4 pins, a square with each side touching 3 pins, a trapezoid, and a hexagon that touches 8 pins) as directed on page 19 using the concrete model - geoboards. Students record their answers on dot paper on page 19 using a ruler. {Students may or may not remember what a "trapezoid" or a "hexagon" is, but at this point, they are just exploring, with their partner, the geoboards and using what they already know}. As the students work with their geoboards, the teacher circulates the room helping and guiding the students as needed. Students put away the geoboards and rubber bands and the teacher collects Math Masters page 19. As the students put away their geoboards and rubber bands, they are instructed to get 3 of each size straw (full-length, half-length, and ¾-length) and 8 twist ties.

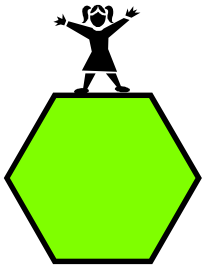
3. Explain – Whole Group/Individual – Convex, Concave and Regular (15 minutes) – The students return to their desks with the new supplies and the teacher asks the students to construct a 5-sided polygon with their straws. The teacher asks the students what type of polygon they just constructed. {pentagon} The teacher explains to the students that a 5-sided polygon is called a "pentagon" and it has 5 edges (sides) and 5 vertices (points). The teacher then instructs the students to push one or more of the vertices toward the inside and explains to the students that this shape is also a pentagon, but it is called a "concave" polygon. Conversely, the polygon that we started with that had all of its vertices pushed out is called "convex." The teacher also explains that if the polygons have all equal sides (straws) they are called "regular." The teacher asks the students to open their Student Reference Book to pages 96 and 97 and read silently.

4. Elaborate – Small group/whole group – Hexagons, Heptagons, Octagons & Nonagons (10 minutes) – The teacher now asks the students to work with their partner to create polygons that with 6 straws, 7 straws, 8 straws and 9 straws. The students are challenged to make both convex and concave polygons. After the groups have completed their polygons, the teacher will ask for students to share in the whole group some of their constructed polygons. At this time, the teacher and students review of the names of polygons that have 6 sides, 7 sides, 8 sides, and 9 sides, respectively (hexagon, heptagon, octagon and a nonagon). Students may refer back to page 96 of the Student Reference Book for a listing of the prefixes associated with each polygon name and the number of sides it has.

5. Evaluate - Individual (10 minutes) – The students are once again asked to open their Student Reference Book to page 97. They are then asked to turn to a blank page in their math notebook and answer the three questions at the bottom of the page: 1) What is the name of a polygon having 4 sides? 6 sides? 8 sides? 2) Draw a convex and concave octagon. 3) Explain why the cover of this book is not a regular polygon.). The teacher collects their work to assess for understanding of the topics covered today.

Homework
The students are assigned Study Link 1.5 - Math Masters page 18 (Polygon Riddles) for homework.

Extension Activity
The teacher reads aloud *The Greedy Triangle* by Marilyn Burns with students building polygons with straws from the story and recording their work on Math Masters, page 20 (The Greedy Triangle).



Overview of Textbook Lesson Plan
I chose an *Everyday Mathematics* lesson on polygons for fourth graders to create my lesson plan. Although I used a substantial amount of the content from the *Everyday Mathematics* lesson, I modified the sequencing and elaborated on it somewhat. This lesson plan is written in the 5-E inquiry lesson plan format.

Topic/Objective/Grade Level/Textbook/MI GLCE (10 pts)
This lesson is an *Everyday Mathematics* lesson on polygons for 4th graders. See attached for objectives and GLCE.

Step-By-Step Outline (30 pts)
This lesson plan was written to cover one class period of approximately 45-55 minutes. The time estimates for each piece and an outline of the procedures are outlined in the attached lesson plan.

Additional Enhancement (10 pts)
The additional enhancement activity I chose for this lesson plan is the suggested reading aloud of Marilyn Burns' *The Greedy Triangle* with the students completing the suggested activity. This book is an outstanding book and would provide a good extension activity for the students.

Manipulatives (10 pts)
The students will be using geoboards, rubber bands, straws, and twist ties to construct polygons in this lesson. See attached materials list.

Homework (10 pts)
The students will be completing the suggested Math Links homework activity (Polygon Riddles) with this lesson.

Assessment (10 pts)
The students will be assessed informally through teacher observation during the Explore activity and formally through the collection of Math Journal page 12 (What is a Polygon?), Math Masters page 19 (Polygons on a Geoboard), and the students' math notebook assignment answering the questions on page 97 of the Student Reference Book.

Quality of Lesson Plan (20 pts)

For further details, please see the attached lesson plan.