Lesson 1: Exploring Polygons

Objectives:

- Students will be able to identify whether a given shape is a polygon using the properties of polygons.
- Students will be able to identify and name polygons that are triangles, quadrilaterals, pentagons, hexagons, and octagons.
- Students will be able to draw a triangle, quadrilateral, pentagon, hexagon, and octagon.

Materials:

- Overhead with two columns of shapes (polygons and shapes that are not polygons)
- Index cards or small pieces of white paper (4 per student).
- Glue.
- 5 sheets of poster-board or other large paper, labeled Triangles, Quadrilaterals, Pentagons, Hexagons and Octagons, respectively.
- Index cards or paper slips with irregular polygons drawn on them (1 per student).

Procedure:

Introductory Activity:

Put the overhead up on a projector. Explain that the two columns of shapes are different from each other in at least one way. Ask students to break up into pairs and discuss what the differences and similarities between the two columns are.

After a couple of minutes, ask students to volunteer what differences and similarities they discovered. (Column B has shapes that have curves and are not closed; all the shapes in column A use only straight lines and are closed). Then ask students what was the same about the figures (They are all flat or two-dimensional). Introduce the terms plane figure and polygon and have students copy definitions for these terms in their math dictionary. Stress that the word polygon actually means “many-angles.” (The idea of word roots will be emphasized throughout the unit). Briefly introduce the concept of an angle as what is formed when two straight lines meet.

Ask students if they know the names for some types of polygons. As students suggest shapes, put their names up on the board and define them. By the end of the conversation, the following terms should be defined and copied into the math dictionary—triangle, quadrilateral, pentagon, hexagon, and octagon. Stress that each of these words can be broken up into two parts that define the word. (For example, quadrilateral means "4 sides."

Further Exploration:

Pass out four index cards/slips of paper to each student. Have the students draw a polygon on each of these cards. Stress that students may only draw one of the specific types of polygons we have discussed earlier.
When the students are done, collect the cards from the students and redistribute them to the students, so that each student has cards that other students drew. In this mix, also add the pictures of more irregular polygons that the teacher has drawn. Each student should get five cards in all. Have students work with the students in their cluster of desks to label each card with the correct polygon name. Then students should place the shapes, by category, on the appropriate poster-board laid out in the classroom (these will be glued down by the teacher later in the day). Images of these posters

*Individual Exploration:*

With the remaining time, introduce each of the three worksheet activities and have students work on the activities at their own pace independently.

*Homework:*

2 Worksheets
Lesson 2: **Perpendicular, Intersecting and Parallel Lines**

**Objectives:**

- Students will be able to identify lines that are perpendicular, parallel and intersecting.
- Students will be able to describe the difference between line and line segment.

**Materials:**

- Geo-boards and rubber bands

**Procedure:**

**Introductory Activity:**

Show students a makeshift, hand-drawn map of UNC on the overhead, showing where. Draw a dot representing a location. Ask students what corner they are at. Explain that this is also the intersection that you live on, or that the two streets intersect. Using the map, introduce the concept of **lines** and **vertices**.

**Exploration:**

Define **parallel**, **perpendicular** and **intersecting lines**, continuing to use the map as a framework. Ask students to find examples of the lines in the classroom and share their thoughts about them.

With all students in a large group, have students define parallel, perpendicular and intersecting, based on the work done the previous day. Rewrite definitions for these terms. Have groups of students volunteer to act out these terms, by standing in two lines that are parallel, that intersect or that are perpendicular.

Then, have students make parallel, intersecting, and perpendicular lines on a geo-board.

**Evaluation:**

Ability to make the shapes on the geo-board

**Homework:**

None
Lesson 3: Quadrilaterals

Objectives:

- Students will be able to identify parallelograms, squares, rectangles, rhombii and trapezoids
- Students will be able to identify multiple names for shapes when relevant (squares are rectangles, etc.)
- Students will be able to identify the properties of these five shapes

Materials:

- 5 geo-boards displaying 3 examples of a given quadrilateral (either rhombus, square, rectangle, trapezoid, or parallelogram)
- Rubber bands
- Tangram sets
- Computers with Internet access
- Copies of a worksheet about tangrams and about multiple meanings.

Procedure:

Quick review:

Ask students that the SIX types of triangles are. Link this to the idea to the fact that there are also many types of quadrilaterals. Remind students that a triangle can have two names (*i.e.*, it could be both acute and equilateral). Quadrilaterals can also have multiple names.

Exploration:

Have students in four groups and assign each group one of the following quadrilaterals: parallelogram, square, rectangle, trapezoid. Hand out the geo-board with the appropriate shape to each group. Ask students to classify, as a group, what is special about their quadrilateral. Tell students to pay attention to side length, parallel sides and anything special about the angles. Have students generate a list of characteristics about their shape to present to the class.

As the groups present what they discovered, write up the characteristics of each quadrilateral on the board, having students copy these into their math dictionaries. Then go over the relationships between the various shapes (*i.e.*, a square is a special kind of parallelogram, and a special type of rhombus). Draw a Venn Diagram showing the “world of quadrilaterals” to show the students how they are all related.

Finally, introduce the rhombus to the whole class, by projecting the geo-board examples using an overhead projector. Have students generate where this shape fits in on the Venn Diagram, then redraw this. Make sure to mention that there are quadrilaterals that are not special types. Have students draw some examples and tell where these would fit in (the “Wild Quadrilaterals”).
Independent Work (or Group):

1. Have students work on:
   - Worksheet which asks students to build various quadrilaterals from tangram sets.

(Students may also use an Internet-based tangram simulation and attempt the puzzles in which
the build a square and parallelogram out of all seven pieces.)

Review:
Bringing the students back together, do a quick spot check of whether or not they can classify
quadrilaterals, by giving them various quadrilaterals to classify.

Homework:
1 Worksheet
Lesson 4: Line symmetry

Goals:

- Students will be able to determine whether a given image or object has line symmetry.
- Students will be able to draw in lines of symmetry on images that do have line symmetry.

Materials:

- precut construction paper quadrilaterals (square, rectangle, rhombus, trapezoid and parallelogram)
- pattern blocks
- Two or Three computers set up for students to explore this website on Symmetry

Procedure:

Quick Review/Setup:

Have students draw a square, rectangle, parallelogram, trapezoid and rhombus in their notebooks. Have five volunteers draw a picture of one of these shapes each on the board. Review what features make each shape unique.

Exploration:

Then, using precut construction paper quadrilaterals, ask the students: “If I cut out these shapes on a piece of construction paper, which could I fold in half with no pieces jutting out? Which fold evenly?” Have students predict which will fold evenly, then test their predictions by actually folding the paper. Ask students if there is more than one way to fold these shapes evenly. Finally, introduce the idea of line symmetry, relating it to the folds of the shapes.

Have students search for symmetry in the room, trying to address any misconceptions students may have about symmetry.

Individual Activities:

Rotate students between these two activities (about 7 minutes at an activity)

Activity 1: Students must find a partner and stand on either side of a table with him/her. Each child will take a turn placing pattern blocks on a table. The first child will place a block. Then the next child will place a block down so that it creates a symmetrical image. Now they should switch roles, so that the first child puts down a block, and the first child find the symmetrical match. The students will repeat this process until they are satisfied with their design.

Activity 3: Have students get in small groups at the computers and explore images from a website which has complied many different ways to look at symmetry in the world around us. Have each student write 5 things that they learned from the web-site.
Evaluation:

Work on the worksheets, progress on block symmetries, and homework.

Homework:

Activity: Alphabet worksheet: students will look for symmetry in the letters of the alphabet

QUIZ TIME: Chapter 6 Quiz, questions 1-10.
Lesson 5: Perimeter

Goals:

- Students will be able to write a definition of perimeter.
- Students will be able to determine the perimeter of any polygon, provided they given the dimensions of each side, or enough information to infer this.

Materials:

- Textbooks
- Yardstick or other large ruler

Procedure:

Introductory Activity:

Introduce with a word problem involving finding the perimeter of an object. (I have a garden that is 8 ft by 10 ft. If I wanted to put a fence around my garden, how many feet of fence would I need?) Ask students how they would find the answer to this problem. Using these initial musings, define perimeter with the students and add it to their geometry dictionaries.

Exploration:

Using the overhead projector or blackboard, draw a few examples of polygons and have students discuss how they could find the perimeter. Then model finding perimeter by having students pick an object in the classroom and working as a class to find its perimeter.

Individual Work:

Have students work on worksheet.

Evaluation:

Worksheet

Homework:

Complete worksheet
Lesson 6: *Area of rectangles*

**Objectives:**

- Students will be able to find the area of a rectangle, given the length of two of its sides.
- Students will be able to generalize a formula to find the area of a rectangle.
- Students will be able to approximate the area of any shape, given a sheet of graph paper.

**Materials:**

- Graph paper

**Procedure:**

Introduce with a word problem about area. (Same problem as for perimeter only asking for how many square feet are in the garden, instead of its perimeter.) Then, explore a definition of *area* with the students.

Trace any item from the classroom on a piece of overhead graph paper. Ask students how they could find the area, or how many squares are in, this shape. When students suggest counting the squares, model counting the squares with the students. Then have students find their own object in their desk and have them trace it and find the area of one of its faces. As students are finished, record the object the student picked and its area on the board.

Finally, ask students if there is an easier way to figure out the area of a rectangle than adding up the squares. Link area to arrays, which they have sued to solve problems before. Then generalize a formula for finding the area of a rectangle with the students.

Finally, have students work on a page from the textbook pertaining to area, and check student work.

**Evaluation:**

Worksheets.

**Homework:**

Complete worksheets.