TI-Nspire Activity: *Interior Angles in Polygons*
By: Jean McKenny

Activity Overview
This is an activity designed to elicit possible student misconceptions regarding the relative sizes of interior angles in regular polygons. Research (Rojhany, 1997) reported by (Stavy and Tirosh, 2000) indicates that if one attribute of a geometric shape (same length of sides) is present, students will often think that other attributes are also equal (size of interior angles). Some students also believe that if one attribute is larger (more sides) that other attributes will also be larger (larger angles). The activity begins by using a prompt to elicit student misconceptions or correct conceptions. It then continues by exploring regular polygons and gives each student an opportunity to either change (misconceptions) or reinforce (conceptions) as appropriate.

Concepts
Measures of interior angles in regular polygons.

Teacher Preparation
The teacher should download the file regularguys.tns and transfer it to student handhelds. The teacher should provide a copy of the student worksheet for each student.

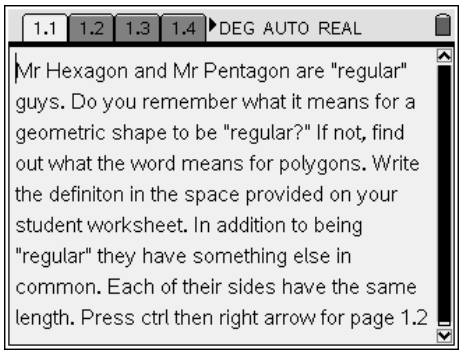
The Classroom.
Each student should work through the activity independently and record answers on the student worksheet. The teacher should move about the room checking the student answers to the beginning of the worksheet to determine student understanding or misunderstanding of the concept. The teacher should just read the student responses and NOT comment or provide instruction. The activity will provide instruction so the teacher is asked not to do so. Certainly, if the teacher has a TI-nspire Navigator system,s/he can monitor students working.

The activity uses the notes and the graphs and geometry applications of the handheld.

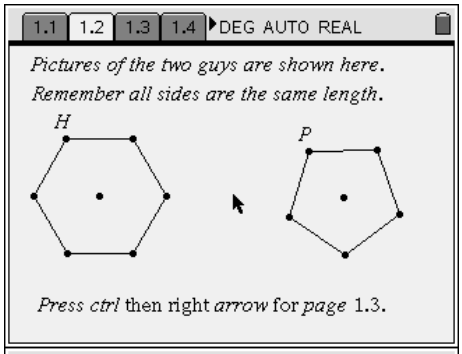
-Each student should open the document by pressing the home key and then selecting #2 for my documents and then selecting regularguys. Each student should have a copy of the student worksheet for this activity. Students will be asked for the definition of a "regular" polygon so the teacher should provide that to individual students if needed.

The Document

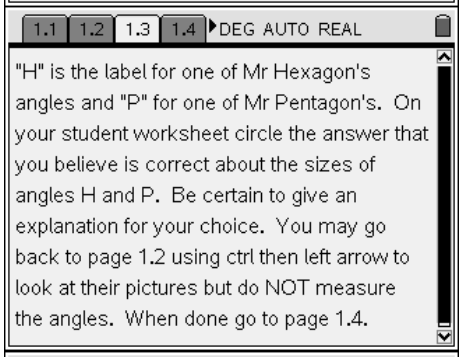
This page 1.1 introduces the students to Mr. Hexagon and Mr. Pentagon and asks the student to write the definition for a "regular" polygon on the student work sheet. It also tells the students that all the sides of the given hexagon and the given pentagon are of equal length.



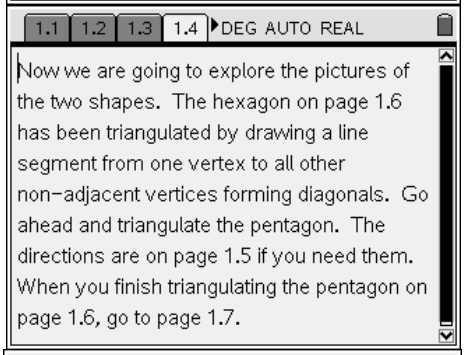
This page 1.2 shows a diagram of the hexagon and the pentagon and reminds students that all sides are the same length. Care should be taken to be certain that students do not confuse this special situation (equal lengths in the hexagon and pentagon) with each shape being a "regular" shape, therefore having equal sides.



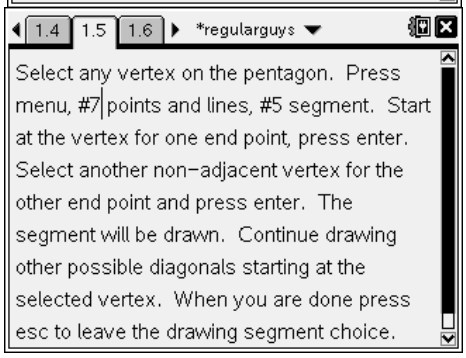
This page 1.3 asks the student to answer the prompt on the student worksheet to elicit student conceptual understanding or misunderstanding. ***It is important that the student do not "measure" the angles and that the teacher does NOT give students any help with this initial question.*** *For the teacher only the correct answer is "a" but do NOT tell students the correct answer at this time! As they do the activity, they will correct their own thinking.*



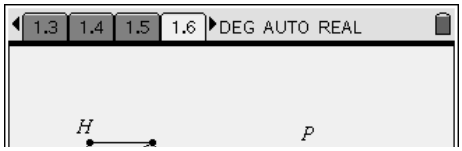
This page 1.4 describes how the activity will proceed. The hexagon has been triangulated as an example and the students are asked to triangulate the pentagon.



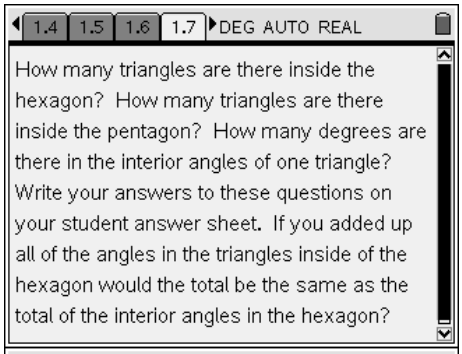
This page 1.5 gives directions for triangulating the pentagon if any students need help doing this part of the activity.



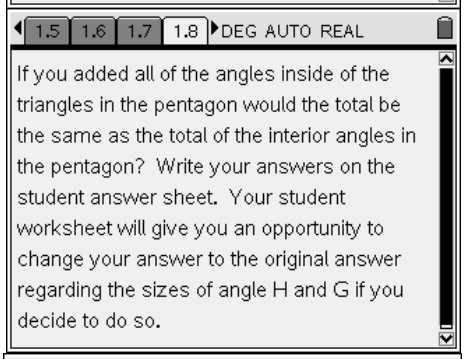
This is the page 1.6 where students will actually triangulate the pentagon. When they are done there will be four triangles in the hexagon (done for them) and three triangles in the pentagon that they have created.



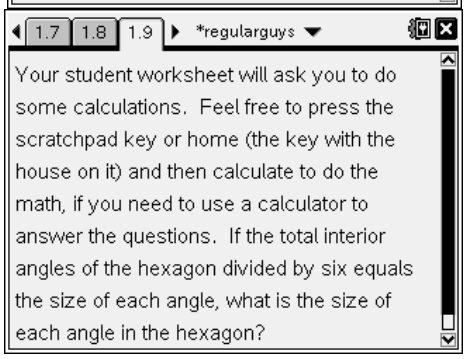
This page 1.7 asks the students a series of questions and tells them to answer the questions on the student worksheet. The teacher should be quietly monitoring student worksheets to be certain that students are answering these questions correctly. There are 4 triangles in the hexagon and 3 in the pentagon and the sum of the total angles in one triangle is 180 °. The last question may be harder for some students. The teacher may need to help some students to see that the answer is Yes.



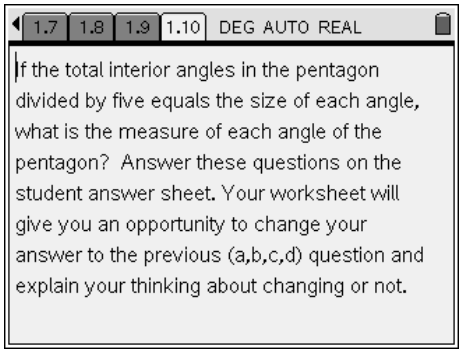
On this page 1.8 again the answer to the first question is Yes. This page also tells the students that they will have an opportunity to re-answer the original question on the worksheet if they have changed their minds about the answer.



This page 1.9 asks students to calculate the size of one angle in the hexagon. It tells them how to access the calculator (scratchpad) on the handheld if they need it to do the math. The math for the hexagon is 4 X 180 = 720 and 720 / 6 = 120. The math for the pentagon is 3 X 180 = 540 and 540 / 5 = 108.



This page 1.10 asks students to calculate the size of one angle in the pentagon. It also points students to the last section of the worksheet that asks if they want to change the a,b,c,or d answer that they gave previously. The worksheet asks students to explain why or why not they have decided to change their minds.



Assessment and Evaluation

The teacher should collect the student worksheets when the students have finished the activity. The teacher should be alert to checking to see if students having initial misconceptions (wrong answer to the a,b,c, or d question) have corrected their thinking (given the correct answer at the end). It is especially ***important*** *to read the students* ***reasons for their thinking****. Some students will get a correct answer with*

incorrect thinking. The activity is viewed as being valuable for even the students who may have initially chosen the correct answer. Some students may be able to remember the formula for the interior angles of a polygon (n-2)180 ° but may not have experienced triangulating a polygon to see "why" the formula works.

Optional End Activity

If the teacher wanted to do so, s/he could use the measurement ability of the handheld to actually confirm the answer that was arrived at by the calculations in the activity (120 ° for the hexagon and 108 ° for the pentagon).

To do this the students would go to page 1.6 of the activity. First the students should place the handheld in a degree mode. This is done by pressing the home key, selecting #5 for settings & status, selecting #2 for document settings, and then #2 for graphs & geometry. Then use the tab and arrow keys to select degrees. Then tab down and arrow over to "OK" and press enter.

To measure angles they would press menu, #8 for measurement,#4 for angle. They then go to a vertex and press the enter or click key. Go to an adjacent vertex of the geometric shape and press enter again. The angle they wish to measure must be this middle vertex (or the second enter). Finally go to the last vertex that defines the angle they are measuring and press enter again. This is a series of three enters and the vertex of the angle being measured must be the middle vertex. The measurement will show in a light grey color. After the third enter, they can move the measurement to a spot of their choice and press enter again to drop the measurement and have it show in a darker black color.