

## Interior Angles in Polygons

by – J. Marvel

### Activity overview

*In the following activity, students discover the rule for finding the number of total degrees in a polygon. Students will use both the TI-Nspire and student worksheet to find the rule and will apply it in predictions.*

### Concepts

*Regular Polygons, Interior Angles, Basic Triangle Knowledge*

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### Teacher preparation

*Students should have a basic understanding of polygons. You may need to walk them through the first round of drawing the non-overlapping triangles within each polygon.*

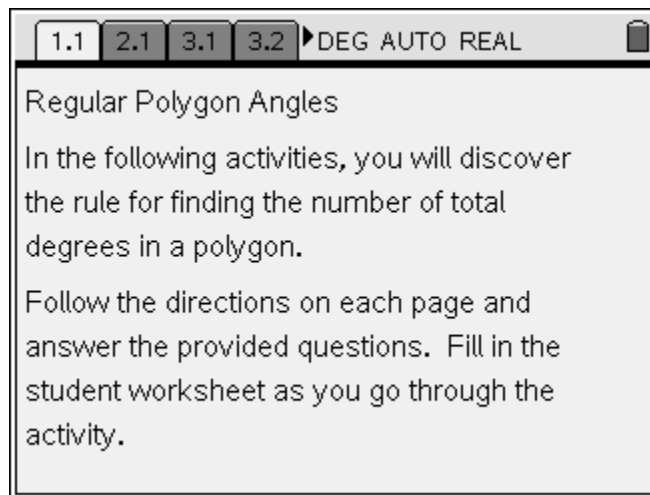
### TI-Nspire Applications

*Polygon Interior Angle Totals.tns*

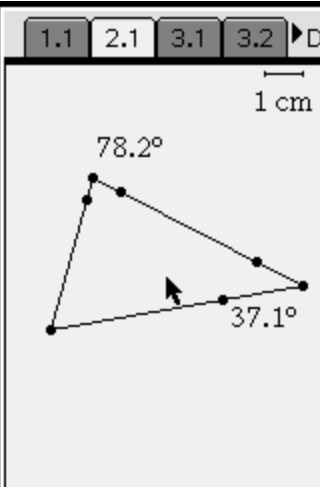
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### Step-by-step directions

Students should open the .tns file and read the introduction. The teacher may need to introduce the basics of interior and exterior angles.



Using the measurement tool, measure each angle of the triangle and add them up to find the total degrees. The document settings may need to be changed from “radians” to “degrees.” Students can use a calculator page or type the formula  $Total\ Angles = a_1 + a_2 + a_3$  and then use the Calculate function [Menu – 1:Tools – 7:Calculate] to find the total. Students should answer the given questions.



1.1 2.1 3.1 3.2 DEG AUTO REAL ctrl

1 cm

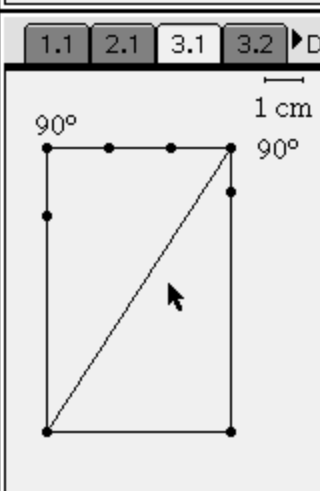
78.2°

37.1°

**Question**

Measure each angle. How many total degrees are in your triangle? Move the triangle to see if the total changes.

As students measure each angle in the rectangle, they will find that they each are 90. The teacher may need to explain the concept of NON-overlapping triangles as shown here. Students should find 2 triangles.



1.1 2.1 3.1 3.2 DEG AUTO REAL ctrl

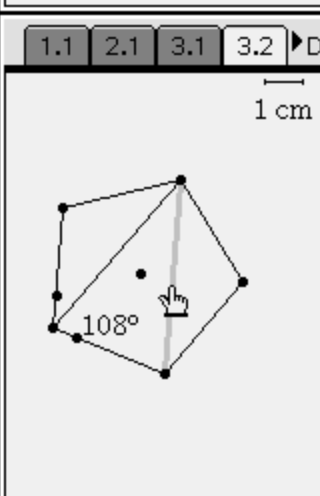
1 cm

90°

90°

Measure each angle of the rectangle. Find the total of the angles. Draw in the NONoverlapping triangles within the rectangle. How many triangles did

Students should measure each angle (they're all the same) and find the total. They should also draw in the segments to create the non-overlapping triangles. They should find 3 triangles.



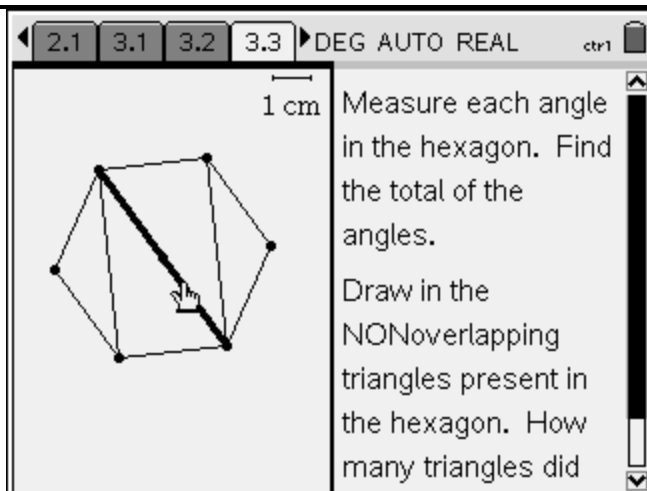
1.1 2.1 3.1 3.2 DEG AUTO REAL ctrl

1 cm

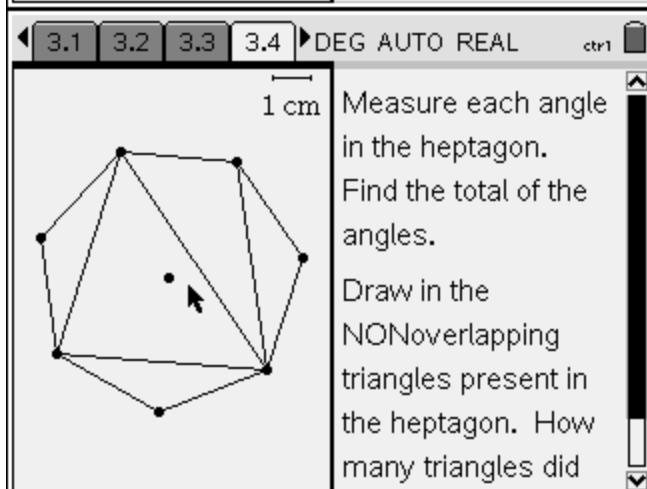
108°

Measure each angle of the pentagon. Find the total of the angles. Draw in the NONoverlapping triangles present in the pentagon. How many triangles did

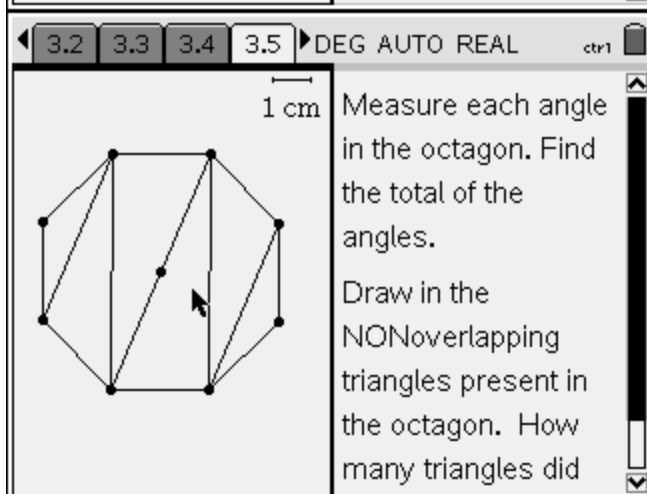
Students should measure each angle (they're all the same) and find the total. They should also draw in the segments to create the non-overlapping triangles. They should find 4 triangles.



Students should measure each angle (they're all the same) and find the total. They should also draw in the segments to create the non-overlapping triangles. They should find 5 triangles.

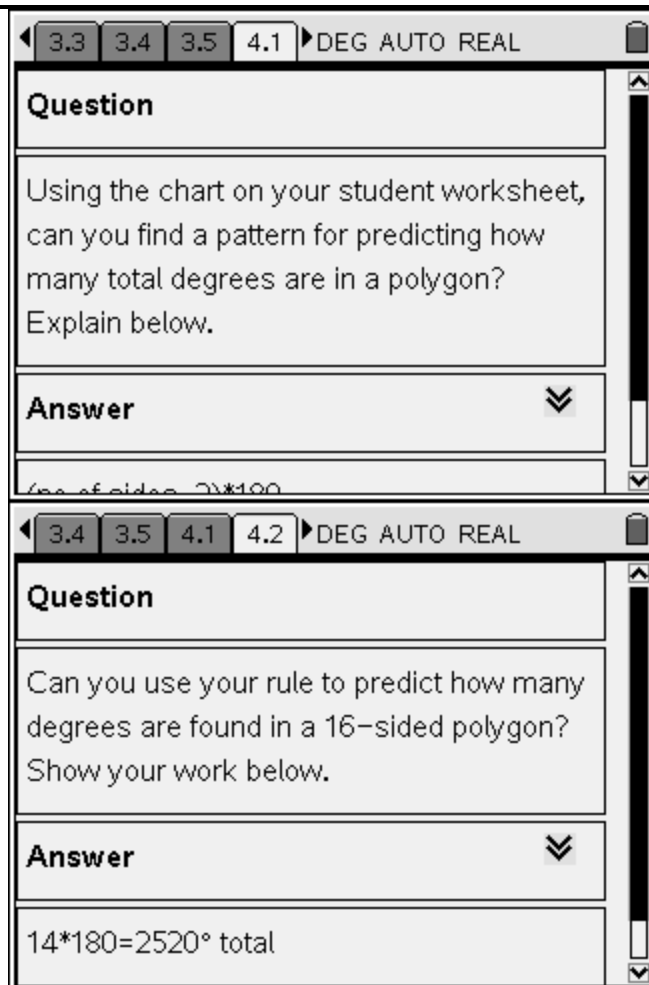


Students should measure each angle (they're all the same) and find the total. They should also draw in the segments to create the non-overlapping triangles. They should find 6 triangles.



As students fill out the accompanying worksheet, they should see a pattern. Teachers should allow students to describe the pattern themselves before clarifying it as  $(n-2) \cdot 180$ .

Students should use their pattern to predict the total degrees in a 14 sided polygon. They can do this using the formula created on the previous page or even by drawing their own 14-sided figure and measuring the degrees.



The image shows two screenshots of a TI-Nspire calculator interface. The top screenshot shows a question: "Using the chart on your student worksheet, can you find a pattern for predicting how many total degrees are in a polygon? Explain below." The bottom screenshot shows an answer: "14\*180=2520° total".

#### Assessment and evaluation

- Students should be able to accurately express the rule and predict the interior degree totals for any *n*-gon.
- See student worksheet

Student TI-Nspire Document  
*Polygon Interior Angle Totals.tns*

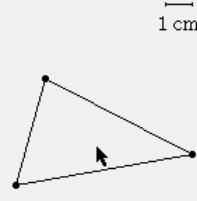
1.1 2.1 3.1 3.2 RAD AUTO REAL ctr1

### Regular Polygon Angles

In the following activities, you will discover the rule for finding the number of total degrees in a polygon.

Follow the directions on each page and answer the provided questions. Fill in the student worksheet as you go through the activity.

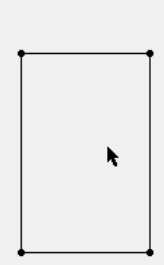
1.1 2.1 3.1 3.2 RAD AUTO REAL ctr1



**Question**

Measure each angle. How many total degrees are in your triangle? Move the triangle to see if the total changes.

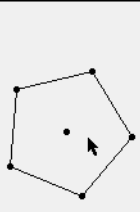
1.1 2.1 3.1 3.2 RAD AUTO REAL ctr1



Measure each angle of the rectangle. Find the total of the angles.

Draw in the NONoverlapping triangles within the rectangle. How many triangles did


1.1 2.1 3.1 3.2 RAD AUTO REAL ctr1



Measure each angle of the pentagon. Find the total of the angles.

Draw in the NONoverlapping triangles present in the pentagon. How many triangles did

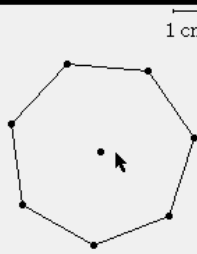
2.1 3.1 3.2 3.3 RAD AUTO REAL ctr1



Measure each angle in the hexagon. Find the total of the angles.

Draw in the NONoverlapping triangles present in the hexagon. How many triangles did

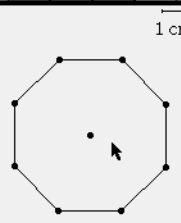
3.1 3.2 3.3 3.4 RAD AUTO REAL ctr1



Measure each angle in the heptagon. Find the total of the angles.

Draw in the NONoverlapping triangles present in the heptagon. How many triangles did

3.2 3.3 3.4 3.5 RAD AUTO REAL ctr1



Measure each angle in the octagon. Find the total of the angles.

Draw in the NONoverlapping triangles present in the octagon. How many triangles did

3.3 3.4 3.5 4.1 RAD AUTO REAL ctr1

**Question**

Using the chart on your student worksheet, can you find a pattern for predicting how many total degrees are in a polygon? Explain below.

**Answer**

3.4 3.5 4.1 4.2 RAD AUTO REAL ctr1

**Question**

Can you use your rule to predict how many degrees are found in a 16-sided polygon? Show your work below.

**Answer**