TI-*nspire*™

## Interior Angles of Polygons
by Mary Bourassa

### Activity overview
*This activity allows students to discover the value of the sum of the interior angles of an n-sided polygon.*

### Concepts
- *Sum of the interior angles of a triangle*
- *Angle measurement*

### Teacher preparation
*Download the student .tns file.*

### Classroom management tips
*This activity is designed for students who have already learned how to measure angles using TI-Nspire as well as inserting formulas (as a text box) and performing calculations. Students can work individually or in groups.*

### TI-Nspire Applications
- *Graphs & geometry*
- *Lists & spreadsheet*
- *Notes*
- *Calculator*
- *Data & statistics*

### Step-by-step directions

On page 1.2 students verify the interior angles of a triangle sum property by dragging any of the vertices and observing that the sum remains constant with a value of 180°.
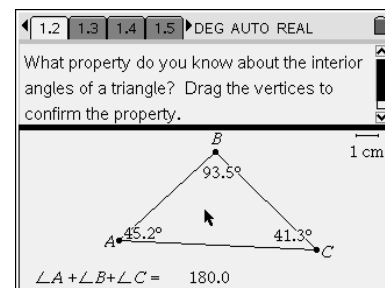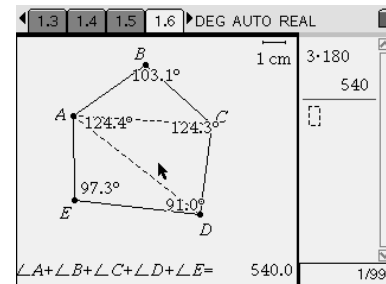
On page 1.4 students will
- Use the Polygon tool (**MENU > SHAPES > POLYGON**) to create a quadrilateral, naming the vertices as they are created.
- Measure all four interior angles and place the measurements next to the corresponding vertex.
- Open a text box (**MENU > ACTIONS > TEXT)** and write a + b + c + d in it.
- Calculate the sum of the angles (**MENU > ACTIONS > CALCULATE**) by clicking on the formula they just
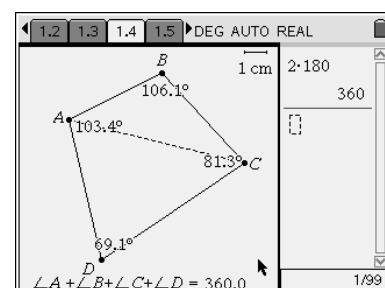
created then on each of the angle measures (not on the vertices).
- Create as many non-overlapping triangles within the polygon as possible.
- Use the calculator page (CTRL + TAB to move over) to calculate the sum of the angles in the number of triangles created.
- Compare the results.

On page 1.6 students will repeat the process from page 1.4 with a pentagon.

On page 1.8 students will create a hexagon then create as many non-overlapping triangles as possible and use those to calculate the sum of the interior angles of the hexagon.
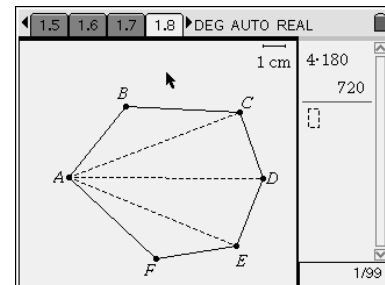
On page 1.9 students will enter the data they have collected for:
- numbers of sides of the polygon
- number of non-overlapping triangles created
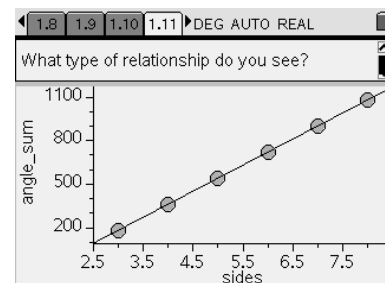- sum of the interior angles of the polygon

They will extend this to a heptagon and octagon.

On page 1.11 students will set up a scatter plot with the number of sides as the independent variable and the sum of the interior angles of the polygon as the dependent variable.

They will note that the relationship is linear.

On page 1.12 they will be asked to return to the scatter plot and add the line of best fit. They need to note its equation on page 1.12

Page 1.13 asks for the slope and y-intercept of the line of best fit.

Page 1.14 asks students to generalize their findings by writing the formula for the sum of the interior angles of a polygon in two ways.

Page 1.15 asks students to apply their formula to a 20-sided polygon.

## Assessment and evaluation

- *This activity is intended as an investigation. Teachers may wish to assess whether students have completed the activity and should debrief at the end.*

**Student TI-Nspire Document:** Interior angles of a polygon.tns

**1.1** 1.2 1.3 1.4 ▶DEG AUTO REAL

Exploring Interior
Angles of Polygons

*Press* **Ctrl and the right arrow** *to move to the next page.*

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◀ 1.2 1.3 1.4 1.5 ▶DEG AUTO REAL

What property do you know about the interior angles of a triangle? Drag the vertices to confirm the property.

1 cm

B
93.5°

A 45.2°          41.3° C

$\angle A + \angle B + \angle C =$      180.0

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◀ 1.3 1.4 1.5 1.6 ▶DEG AUTO REAL

On the next page:

✓ Draw a quadrilateral.

✓ Measure the interior angles and calculate their sum.

✓ Draw as many non-overlapping diagonals as you can inside the figure.

✓ Calculate the sum of the angles of all the triangles.

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◀ 1.4 1.5 1.6 1.7 ▶DEG AUTO REAL

1 cm

0/99

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◀ 1.5 1.6 1.7 1.8 ▶DEG AUTO REAL

On the next page:

✓ Draw a pentagon.

✓ Measure the interior angles and calculate their sum.

✓ Draw as many non-overlapping diagonals as you can inside the figure.

✓ Calculate the sum of the angles of all the triangles.

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◀ 1.6 1.7 1.8 1.9 ▶DEG AUTO REAL

1 cm

0/99

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◀ 1.7 1.8 1.9 1.10 ▶DEG AUTO REAL

On the next page:

✓ Draw a hexagon.

✓ Draw as many non-overlapping diagonals as you can inside the figure.

✓ Calculate the sum of the angles of all the triangles.

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◀ 1.8 1.9 1.10 1.11 ▶DEG AUTO REAL

1 cm

0/99

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◀ 1.9 1.10 1.11 1.12 ▶DEG AUTO REAL

Complete the following table, where:

sides = number of sides in the polygon

| A sides | B triangles | C angle_sum | D |
|---|---|---|---|
| 1 | 3 | 1 | 180 |
| 2 | 4 | | |
| 3 | 5 | | |

A1 | 3

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◀ 1.10 1.11 1.12 1.13 ▶DEG AUTO REAL

On the next page create a scatter plot with the number of sides (sides) as the independent variable and the sum of the interior angles of the polygon (angle_sum) as the dependent variable.

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◀ 1.11 1.12 1.13 1.14 ▶DEG AUTO REAL

What type of relationship do you see?

Click to add variable

Click to add variable

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◀ 1.12 1.13 1.14 1.15 DEG AUTO REAL

Return to the last page and find the equation of the line of best fit.

**Question**

What is the equation of the line?

**Answer** ⌄

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◀ 1.12 1.13 1.14 1.15 DEG AUTO REAL

**Question**

If a polygon has *n* sides, what is the formula for the sum of its interior angles? Write it in two different ways.

**Answer** ⌄

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◀ 1.12 1.13 1.14 1.15 DEG AUTO REAL

**Question**

What is the slope?

**Answer** ⌃

**Question**

What is the y-intercept?

**Answer** ⌃

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◀ 1.12 1.13 1.14 1.15 DEG AUTO REAL

**Question**

What is the sum of the interior angles of a 20-gon?

**Answer** ⌄

0/99