7.1 Exploring Interior Angles of Polygons

GOAL
Investigate the sum of the interior angles of polygons.

EXPLORIE the Math

Denise created a triangle on the computer.

She began a pattern of polygons by adding non-overlapping right triangles.

Denise thought, “I know the sum of the interior angles of a triangle is 180°. I wonder if I can determine the sum of the angles of any polygon using non-overlapping triangles.”

How can you determine the sum of the interior angles of a 20-gon?

A. Draw a quadrilateral.

B. Estimate the sum of the interior angles and confirm it by measuring. 360°

C. Draw as many non-overlapping diagonals as you can inside the figure. only one

D. Calculate the sum of the angles of all the triangles. each has 180°

Compare to your answer from part A. quadrilateral = 2(180°) = 360°

E. Repeat parts A to D for each polygon in the table on the next page.
7.1 Exploring Interior Angles of Polygons

<table>
<thead>
<tr>
<th>Polygon</th>
<th>Number of Sides</th>
<th>Number of Triangles</th>
<th>Sum of Interior Angles</th>
<th>Sketch of Polygon</th>
</tr>
</thead>
<tbody>
<tr>
<td>triangle</td>
<td>3</td>
<td>1</td>
<td>180° (180° × 1)</td>
<td>![Triangle Sketch]</td>
</tr>
<tr>
<td>quadrilateral</td>
<td>4</td>
<td>2</td>
<td>360°</td>
<td>![Quadrilateral Sketch]</td>
</tr>
<tr>
<td>pentagon</td>
<td>5</td>
<td>3</td>
<td>540°</td>
<td>![Pentagon Sketch]</td>
</tr>
<tr>
<td>hexagon</td>
<td>6</td>
<td>4</td>
<td>720°</td>
<td>![Hexagon Sketch]</td>
</tr>
<tr>
<td>heptagon</td>
<td>7</td>
<td>5</td>
<td>900°</td>
<td>![Heptagon Sketch]</td>
</tr>
<tr>
<td>octagon</td>
<td>8</td>
<td>6</td>
<td>1080°</td>
<td>![Octagon Sketch]</td>
</tr>
<tr>
<td>n-gon</td>
<td>n</td>
<td>(n - 2)</td>
<td>180°(n - 2)</td>
<td></td>
</tr>
</tbody>
</table>

F. Complete the table on the right.

Graph the ordered pairs in it.

<table>
<thead>
<tr>
<th>x: Sides</th>
<th>y: Sum of Interior Angles</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>180°</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

G. What relationship do you see in your graph? **Linear**

Explain whether you would join the points. **No**

H. Write the equation of the line.

**What is the slope?**

\[ m = 180 \]

**What is the y-intercept for the linear relationship?**

\[ b = -360 \]

I. Determine the sum of the interior angles of any 20-gon using your equation from part H.

In Summary

**Key Ideas**

- You can draw non-intersecting diagonals to divide the interior of an n-gon into \( n - 2 \) non-overlapping triangles.
- The sum of the interior angles of an n-gon is \( (n - 2) \times 180° \).

**Need to Know**

- The sum of the interior angles of a triangle is 180°.
- The sum of the interior angles of a quadrilateral is 360°.

Good-times: pg. 390 #1 - 5

For a regular polygon: all sides and angles are equal.

\[
y = 180(20) - 360° = 3240°
\]