Mental Floss: Mon, Jan 8th

The angles in a triangle are in a ratio of 3:5:8.

Find the measure of the smallest angle.

\[ 3x + 5x + 8x = 180 ^\circ \]

\[ 16x = 180 \]

\[ x = 11.25 ^\circ \]

\[ \text{smallest angle} = 11.25 ^\circ \]

Chapter 7 - Polygons

What are Polygons?

Polygons have/are:

1. Plane figures (2-dimensional)
2. At least 3 sides (triangles, quadrilaterals, ...)
3. Closed figures - all sides connected with no gaps
4. All "sides" are segments - no curves!

Polygons

<table>
<thead>
<tr>
<th># of Sides</th>
<th>Polygon Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Triangle</td>
</tr>
<tr>
<td>4</td>
<td>Quadrilateral</td>
</tr>
<tr>
<td>5</td>
<td>Pentagon</td>
</tr>
<tr>
<td>6</td>
<td>Hexagon</td>
</tr>
<tr>
<td>7</td>
<td>Heptagon</td>
</tr>
<tr>
<td>8</td>
<td>Octagon</td>
</tr>
<tr>
<td>9</td>
<td>Nonagon</td>
</tr>
<tr>
<td>10</td>
<td>Decagon</td>
</tr>
<tr>
<td>12</td>
<td>Dodecagon</td>
</tr>
<tr>
<td>15</td>
<td>Pentadecagon</td>
</tr>
<tr>
<td>n</td>
<td>n-gon</td>
</tr>
</tbody>
</table>

Polygons NOT Polygons

![Polygons and NOT Polygons](image)

Polygon Formulas

<table>
<thead>
<tr>
<th># Sides</th>
<th># Triangles Inside</th>
<th>Sum of Angles</th>
<th>( S = 180(n - 2) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>180^\circ</td>
<td>( n \text{- number of sides} )</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>360^\circ</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>540^\circ</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>720^\circ</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>900^\circ</td>
<td></td>
</tr>
</tbody>
</table>

Most polygons also contain diagonals.

Diagonal = A segment connecting two non-adjacent vertices.
7.1 - Polygon Formulas

Convex or Concave?
Polygons can also be classified as either convex or concave.

Convex
• No interior angles larger than 180°
• No diagonals pass outside the polygon

Concave
• 1 or more interior angle is larger than 180°
• 1 or more diagonal passes outside the polygon
• Has a “cave” in it, or it bends in on itself

1.) Find the sum of the angles in a decagon.
2.) Find the name of the polygon whose angles add up to 1080°.
3.) Can a polygon have angles whose sum is 600°?

Mental Floss: Wed, Jan 10th
1.) Find the sum of the angles in a decagon.
\[ S = 180(n-2) \]
\[ S = 1440° \]

2.) Find the name of the polygon whose angles add up to 1080°.
\[ 1080 = 180(n-2) \]
\[ n = 8 \]
Octagon

3.) Can a polygon have angles whose sum is 600°?
\[ 600 = 180(n-2) \]
\[ n = \frac{33}{3} \]
Cannot have 5.3 sides!

Examples
3.) A home plate for a baseball field is shown to the right.

a.) Is the polygon regular? Explain your reasoning.

b.) Find the measures of \( \angle E \) and \( \angle C \).

Exterior Angles

Step 1 Shade one exterior angle at each vertex.
Step 2 Cut out the exterior angles.
Step 3 Arrange the exterior angles to form 360°.
7.1 - Polygon Formulas

If one exterior angle is drawn at each of the vertices, the sum of all the exterior angles is 360°.

**Sum of Exterior Angles**

\[ S = 360° \]

---

**Regular Polygons**

**Examples**

5) The trampoline to the right is a regular dodecagon.

a.) Find the measure of each interior angle.

\[ \frac{180°(12 - 2)}{12} = \frac{1800°}{12} = 150° \]

b.) Find the measure of each exterior angle.

\[ \frac{360°}{12} = 30° \]

---

**Summary of all Formulas**

#1 and 2 apply to all polygons

1.) Sum of Interior Angles \[ S = 180(n - 2) \]

2.) Sum of Exterior Angles \[ S = 360° \]

#3 and 4 apply to only regular polygons

3.) Measure of Each Interior Angle \[ A_i = \frac{180(n - 2)}{n} \]

4.) Measure of Each Exterior Angle \[ A_e = \frac{360}{n} \]

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**Homework**

7.1 p.364 #5,6,9,10,13-16,20 #26-28,34,50,52

**Mental Floss: Thurs, Jan 11th**

Part 1: A hexagon has 4 angles with measures of 40°, 150°, 110°, and 80°. What is the measure of each of the remaining two angles if they are congruent to each other?

\[ 40° + 150° + 110° + 80° = 330° \]

\[ S = 180(6 - 2) \]

\[ S = 720° \]

\[ 720° - 330° = 390° \]

\[ \frac{390°}{2} = 195° \text{ missing angle} \]

Part 2: Find the value of } x} in the diagram.

\[ 2x + x + 89 + 67 = 360° \]

\[ 3x + 156 = 360° \]

\[ 3x = 204 \]

\[ x = 68° \]
7.1 - Polygon Formulas

Simple or Complex?
Polygons can also be classified as either simple or complex.

Simple
• Have 1 boundary and do not pass over themselves or have sides that cross.

Complex
• Do not have 1 distinct boundary and/or have sides that cross

Regular or Irregular?
Polygons can also be classified as either regular or irregular.

Regular
• All sides are congruent and all angles are congruent.

Irregular
• All sides are not congruent or all angles are not congruent.