6.7 Regular Polygons

1. Recall, what is a polygon?

2. Define **Regular Polygon**: A convex polygon whose **EQUILATERAL**
   and whose **EQUIANGULAR**.

3. The two most regular polygons we've discussed so far are

   1.) **EQUILATERAL TRIANGLE**

   2.) **SQUARE**

   Other regular polygons that are being discussed are...(Give the number of sides, and the total angle measure)

   3.) **PENTAGON** $n = 5$ total angle measure = 540 interior angles = 72

   4.) **HEXAGON** $n = 6$ total angle measure = 720 interior angles = 60

   5.) **HEPTAGON** $n = 7$ total angle measure = 900 interior angles = 51.4

   6.) **OCTAGON** $n = 8$ total angle measure = 1080 interior angles = 45

   7.) **NONAGON** $n = 9$ total angle measure = 1260 interior angles = 40

   8.) **DECAGON** $n = 10$ total angle measure = 1440 interior angles = 36

9. Define **Equilateral and Equiangular Polygons**: If the **sides** of a polygon have the **SAME LENGTH** the polygon is **EQUILATERAL**. If THE **ANGLES** of a polygon have the same measure, then polygon is called **EQUIANGULAR**.
10. Define **Center of Regular Polygon Theorem**: In any regular polygon, there is a point (it's **CENTER**) which is equidistant from all of its vertices.

11. **Proof time!**

**Given:** \( UDTCE \) is a regular polygon.

**Proof:** \( \angle 1 \cong \angle 2 \)

<table>
<thead>
<tr>
<th>Conclusion</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. UOTCE is a regular polygon</td>
<td>GIVEN</td>
</tr>
<tr>
<td>2. UE = UO</td>
<td>Def’n of Regular Poly.</td>
</tr>
<tr>
<td>3. ( m\angle 1 = m\angle 2 )</td>
<td>Isosceles Triangle Base Angle Theorem</td>
</tr>
</tbody>
</table>

12. Define **Regular Polygon Symmetry Theorems**: Every regular \( n \)-gon possesses

1.) **LINES OF SYMMETRY** which are **PERPENDICULAR BISECTORS** of each of its sides and the bisectors of each of its angles;

2.) \( n \)-fold rotation symmetry.

13. Draw in the symmetry lines, if any, then draw the center of symmetry, if it exists. If it does, label it point \( C \).

14. Find the **magnitude of rotation/each interior angle** of a polygon!

Since regular polygons have lines of symmetry, we can use those lines of symmetry, and the center point to find out the magnitude of rotation and the interior angle.

Using the figure at the right, draw the lines of symmetry and plot center point, \( C \).

Connect all vertices to center point \( C \).

The degree measure of a circle is **360**

Therefore \( 360/n = 360/4 = 90 \) for the magnitude of rotation/each interior angle.

Complete the following worksheet with a partner or individually before starting the homework.
1. Using the figure at the right, complete the following:
   a.) Draw in the lines of symmetry.
   b.) Label center point D.
   c.) Connect center point D to vertices.
   d.) \( n = \) ___________.
   e.) The magnitude of rotation is ___________.
   f.) What is the measure of each angle in triangle ABC? ________

2. Using the figure at the right, complete the following:
   a.) Draw in the lines of symmetry.
   b.) Label center point A.
   c.) Connect center point A to vertices.
   d.) \( n = \) ___________.
   e.) The magnitude of rotation is ___________.
   f.) What is the measure of each angle of hexagon RSTLNE? __________

3. If your magnitude of rotation is 36 degrees, how many sides does the regular polygon have? ________

4. If your magnitude of rotation is 9 degrees, how many sides does the regular polygon have? ________

5. If your magnitude of rotation is 14.4 degrees, how many sides does the regular polygon have? ________

6. If your magnitude of rotation is 12 degrees, how many sides does the regular polygon have? ________