# Geometric Properties of Octagons

An octagon is a polygon with eight sides and eight angles. Octagons can be regular (all sides and angles are equal) or irregular (sides and angles vary). Below are the key properties of a regular octagon:

1. Number of Sides and Vertices:

- An octagon has eight sides and eight vertices (corners). Each vertex is the point where two sides meet.

2. Interior Angles:

- The sum of the interior angles of an octagon is 1080°.

- Each interior angle in a regular octagon is 135°.

3. Exterior Angles:

- The sum of the exterior angles of any polygon is 360°. In a regular octagon, each exterior angle is 45°.

4. Diagonals in an Octagon:

- A regular octagon has 20 diagonals.

5. Area of a Regular Octagon:

- The area can be calculated using the formula: Area = $2(1 + \sqrt{2}) \times a^2$, where 'a' is the length of a side.

6. Perimeter of a Regular Octagon:

- The perimeter is 8 times the length of one side (P = 8 × a).

7. Symmetry and Reflection:

- A regular octagon has 8 lines of symmetry and rotational symmetry of order 8.

8. Circumscribed and Inscribed Circles:

- A regular octagon has both circumscribed and inscribed circles, with the circumradius and inradius related to the side length.

9. Real-life Application:

- Octagons are used in stop signs, tiling, and other geometric designs.