**A polygon** is a closed figure made of line segments. Polygons have at least three angles and at least three line segments.

A polygon is named by the number of sides it has.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of Sides** | **Name of Polygon** |  | **Number of Sides** | **Name of Polygon** |
| 3 | Triangle |  | 8 | Octagon |
| 4 | Quadrilateral |  | 9 | Nonagon |
| 5 | Pentagon |  | 10 | Decagon |
| 6 | Hexagon |  | 12 | Dodecagon |
| 7 | Heptagon |  |  | -gon |

A polygon is **convex** if no line that contains a side of the polygon contains a point in the interior of the polygon. Every interior angle in a convex polygon is less than 180°.

A polygon that is not convex is called **non convex** or **concave.**

**Sample Problem 1**: **Tell whether the figure is a polygon and whether it is convex or concave.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **a.** |  | **b.** |  | **c.** |  |
|  | The figure is a convex polygon. |  | Part of the figure is not a segment, so it is not a polygon. |  | The figure is a concave polygon. |

**Sample Problem 2**: **Draw a figure that fits the description.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **a.** | **Convex octagon** | **b.** | **Concave heptagon** | **c.** | **Convex decagon** |
|  |  |  |  |  |  |

In an **equilateral polygon**, all sides are congruent.

In an **equiangular polygon**, all angles in the interior of the polygon are congruent.

**A regular polygon** is a convex polygon that is both equilateral and equiangular.

**Irregular polygon** is one that does not have all sides equal and all angles equal.

**Sample Problem 3**: **Classify the polygon by the number of sides. Tell whether the polygon is equilateral, equiangular, or regular.**

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | | **The polygon has 5 sides.**  **It is equilateral and equiangular.**  **Regular pentagon** |
| **b.** |  | | **The polygon has 4 sides, so it is a quadrilateral.**  **It is not equilateral or equiangular, so it is not regular.**  **Irregular quadrilateral (** **Isosceles trapezoid)** |
| **c.** |  |  | **The polygon has 12 sides, so it is a dodecagon.**  **The sides are not congruent, so it is not equilateral.**  **The interior angles are not congruent so it is not equiangular.**  **Irregular dodecagon** |

**Sample Problem 4**: **Draw a figure that fits the description.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **a.** | **A triangle that is not regular.** | **b.** | **A pentagon that is not regular.** | **c.** | **A concave quadrilateral.** |
|  |  |  |  |  |  |

**Sample Problem 5**: **Each figure is a regular polygon. Expressions are given for two side lengths. Find the value of .**

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | **b.** |  |
|  |  |  |  |