

1.6

Classify Polygons

Goal • Classify polygons.

Your Notes

VOCABULARY

Polygon A polygon is a closed plane figure with the following properties: (1) It is formed by three or more line segments called sides. (2) Each side intersects exactly two sides, one at each endpoint, so that no two sides with a common endpoint are collinear.

Sides The sides of a polygon are the line segments that form the polygon.

Vertex A vertex of a polygon is an endpoint of a side of the polygon.

Convex A polygon is convex if no line that contains a side of the polygon contains a point in the interior of the polygon.

Concave A concave polygon is a polygon that is not convex.

n -gon An n -gon is a polygon with n sides.

Equilateral A polygon is equilateral if all of its sides are congruent.

Equiangular A polygon is equiangular if all of its angles in the interior are congruent.

Regular A polygon is regular if all sides and all angles are congruent.

Your Notes

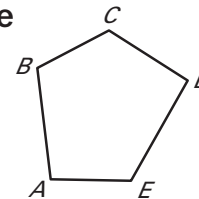
IDENTIFYING POLYGONS

In geometry, a figure that lies in a plane is called a *plane figure*. A polygon is a closed plane figure with the following properties.

1. It is formed by three or more line segments called sides.
2. Each side intersects exactly two sides, one at each endpoint, so that no two sides with a common endpoint are collinear.

Each endpoint of a side is a vertex of the polygon. The plural of vertex is *vertices*.

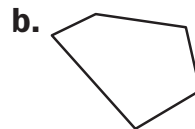
A polygon can be named by listing the vertices in consecutive order. For example, *ABCDE* and *CDEAB* are both correct names for the polygon at the right.



A *plane figure* is two-dimensional. Later, you will study three-dimensional *space figures* such as prisms and cylinders.

Example 1 Identify polygons

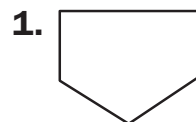
Tell whether the figure is a polygon and whether it is *convex* or *concave*.



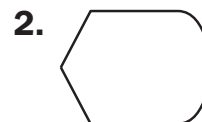
Solution

- Some segments intersect more than two segments, so it is not a polygon.
- The figure is a convex polygon.
- The figure is a concave polygon.

✓ **Checkpoint** Tell whether the figure is a polygon and whether it is *convex* or *concave*.



convex polygon

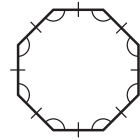


not a polygon

Your Notes

Example 2 Classify polygons

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

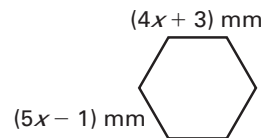


Solution

The polygon has 8 sides. It is equilateral and equiangular, so it is a regular octagon.

Example 3 Find side lengths

The head of a bolt is shaped like a regular hexagon. The expressions shown represent side lengths of the hexagonal bolt. Find the length of a side.



Hexagonal means "shaped like a hexagon."

Solution

First, write and solve an equation to find the value of x . Use the fact that the sides of a regular hexagon are congruent.

$$\underline{4x + 3} = \underline{5x - 1} \quad \text{Write an equation.}$$

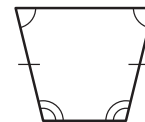
$$\underline{4} = \underline{x} \quad \text{Simplify.}$$

Then evaluate one of the expressions to find a side length when $x = \underline{4}$. $4x + 3 = 4(\underline{4}) + 3 = \underline{19}$

The length of a side is 19 millimeters.

✓ Checkpoint Complete the following exercises.

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



quadrilateral

4. The expressions $(4x + 8)^\circ$ and $(5x - 5)^\circ$ represent the measures of two of the congruent angles in Example 3. Find the measure of an angle.

60°

Homework