9.2 Polygons

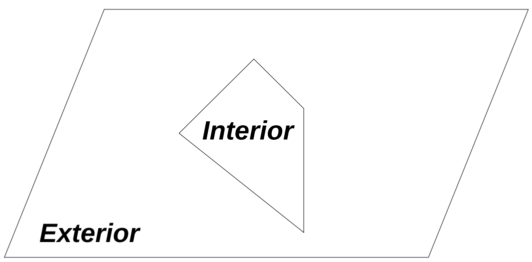
We begin by defining a curve: In one plane, with a pencil, draw a path without lifting the pencil or retracing any part of the path except for single points.

Look at Table 9-4 on page 589. All of the figures in this table are curves.

A curve can be further classified as a:

Simple curve: which does not cross itself (except that it can stop at the same point as the starting point);
Closed curve: which can always be drawn by starting and stopping at the same point;
Polygonal curve (or Polygon): which is a simple, closed curve whose sides are segments;
Convex curve: which is a simple, closed curve with no indentations (the segment formed by connecting any two points in the interior of the curve lies completely in the interior of the curve);
Concave curve: which is a simple, closed curve that is not convex; that is, it has an indentation.

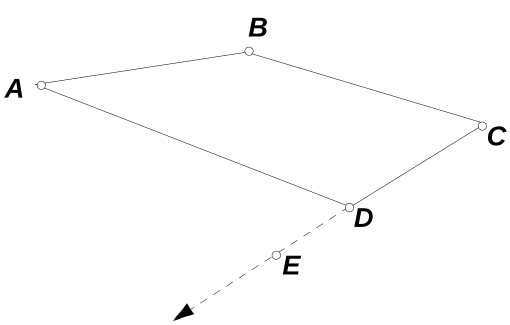
A Polygon separates the plane into 3 disjoint sets, the interior, the exterior, and the polygon itself.



A Polygon in a Plane

Polygons are classified by the number of sides or vertices that they have. See Table 9-5 on page 591for a list of some names of polygons. Notice, an n-gon is a polygon with n sides and n vertices.

A polygon is named by listing its consecutive vertices. Here we have polygon ABCD:



Note: A and B are consecutive vertices. A and C are nonconsecutive vertices.

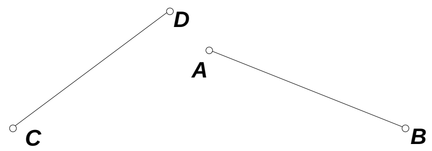
Any 2 sides of a polygon having a common vertex determine an interior angle of a polygon, or simply an angle of the polygon. Name some interior angles of this polygon.______________________________

An exterior angle of a polygon is formed by one side of the polygon and the extension of an adjacent side. So, an exterior angle of polygon ABCD is: ______________________.

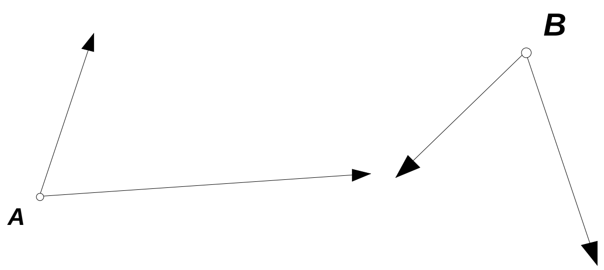
A diagonal is any line segment connecting nonconsecutive vertices. What are the diagonals of polygon ABCD? ____________________________

CONGRUENT SEGMENTS AND ANGLES

Line segments that are congruent have exactly the same length. We write $\overline{AB} \cong \overline{CD}$. This means that AB = CD. We can also mark a figure to denote congruent segments:



Angles are congruent iff they have the same measure. So, if $m\angle A = m\angle B$, then we say that $\angle A \cong \angle B$. We mark congruent angles with arcs:



REGULAR POLYGONS
If the angles of a polygon are all congruent and the sides are all congruent, then the polygon is a regular polygon. So a regular polygon is both equiangular and equilateral.

See figure 9-17 on page 593. It shows a regular pentagon and a regular hexagon.

TRIANGLES AND QUADRILATERALS
In Table 9-6 on the same page, are definitions of all kinds of triangles and quadrilaterals. These definitions need to be studied very carefully. You may be asked some very tricky questions, such as:
Is a rhombus a square?
Is a square a rhombus?
Is a square a rectangle?
Is a rectangle a square?
Is a rhombus a parallelogram?
Is a parallelogram a rhombus?
Let's look at the table and then try to answer these questions.

Problem #6 on page 598 asks you to find the number of diagonals 3 different polygons have. To solve this problem, we should use a strategy learned in T101, solve a simpler problem first...