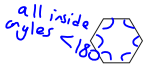
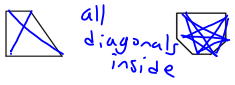
Convex or Concave?

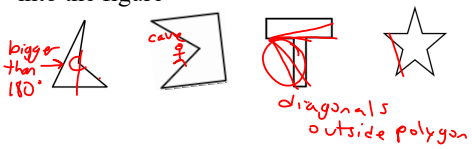
Polygons can also be classified as either *convex* or *concave*.

Convex
- No interior angles larger than 180^0
- No diagonals pass outside the polygon



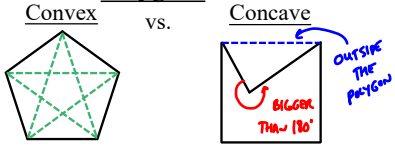


Concave
- 1 or more interior angles is larger than 180^0
- 1 or more diagonal passes outside the polygon
- Has a "cave" in it, or one vertex seems to mov into the figure



Polygons

Convex vs. Concave

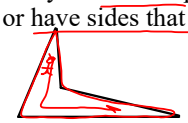


- Concave polygons "go in on themselves."
- You know this if you can draw any of the diagonals of the polygon and they lie outside the figure. (See above)
- Concave polygons also have 1 or more angles that have measures greater than 180 degrees. (See above)

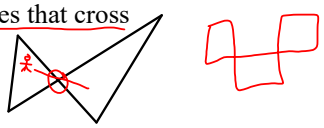
Simple or Complex?

Polygons can also be classified as either *simple* or *complex*.

Simple
- Have 1 boundary and do not pass over themselves or have sides that cross.



Complex
- Do not have 1 distinct boundary and/ or have sides that cross



Practice

7) Find the sum of the angles in a decagon.

$180(10-2)$ 1440° Total n = 10 sides

8) Find the name of the polygon whose angles add up to 1080°.

Octogon

9) Can a polygon have angles whose sum is 600°?

Pentagon 540°

Hexagon 720°

No

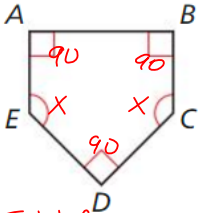
Practice

10.) A home plate for a baseball field is shown to the right.

11.) Is the polygon regular? Explain your reasoning.

all sides equal, all angles equal

No, not all angles the same



12.) Find the measures of $\angle E$ and $\angle C$.

Total Pentagon Sum

$90+90+90+x+x=540$

$270+2x=540$

$2x=270$

$x=135°$

$m\angle E = 135° = m\angle C$

Examples

13.) A hexagon has 4 angles with measures of 40°, 100°, 110°, and 80°. What is the measure of each of the remaining two angles if they are congruent to each other?

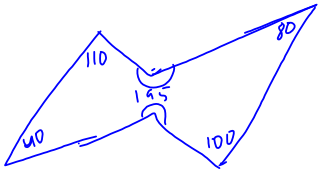
Total Sum = 720°

$40+100+110+80+x+x=720$

$330+2x=720$

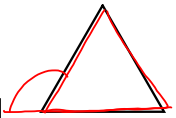
$2x=390$

$x=195$



Sum of Exterior angles

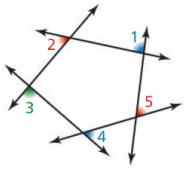
If one exterior angle is drawn at each of the vertices,
the sum of all the exterior angles is 360°.



Sum of Exterior Angles

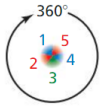
$S =$ [ ]

Exterior Angles (Do not copy this slide)



Step 1 Shade one exterior angle at each vertex.

Step 2 Cut out the exterior angles.

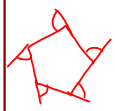


Step 3 Arrange the exterior angles to form 360°.

Regular Polygon

In a **regular polygon**, the measure of ***each exterior angle*** is defined as the sum of all the exterior angles divided by the number of sides.

Each Exterior Angle



Measure of Each Exterior Angle

$$S = \frac{360°}{n}$$

Examples

1.) Find the value of x in the diagram.

0:00:00

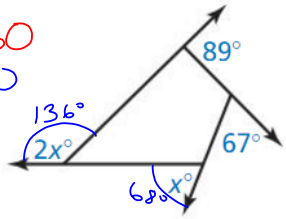
$89 + 67 + x + 2x = 360$

$156 + 3x = 360$

$-156 \quad -156$

$\frac{3x}{3} = \frac{204}{3}$

$x = 68$



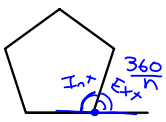
Regular Polygon

In a **regular polygon**, the measure of ***each interior angle*** can be found another way!

Interior and exterior angles at the same vertex are supplementary to each other.

add to 180

Each Interior Angle



Measure of Each Interior Angle

$$180 - \frac{360°}{n}$$

Part 2

So, If the polygon is regular,
Find the measure of each exterior angle,
Then, find its supplement to determine the measure of each interior angle of the regular polygon.

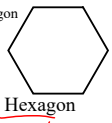
Examples

2.) Use two different ways to find the measure of each interior angle in a regular hexagon. $n = 6$

$\frac{180(n-2)}{n}$	$180 - \frac{360}{n}$
120	120
$\frac{180(6-2)}{6}$	$180 - \frac{360}{6}$

What do regular polygons allow us to do?

Regular Hexagon



3a.) What is the sum of the angles in a regular Hexagon

$n=6$

$180(6-2) = 720°$

3b.) What is the measure of ***each angle*** in a regular hexagon?

$\frac{180(6-2)}{6} = \frac{720}{6} = 120°$ each

3c.) What is the sum of the exterior angles in a regular hexagon?

$360°$

3d.) What is the measure of ***each exterior angle*** in a regular pentagon?

$\frac{360}{6} = 60°$ hexagon

$\frac{360}{5} = 72°$

Examples

4.) The trampoline to the right is a regular dodecagon.

$n=12$

a.) Find the measure of each interior angle.

$\frac{180(12-2)}{12} = 150°$ each

b.) Find the measure of each exterior angle.

$\frac{360}{12} = 30°$

Summary of all Formulas

#1 and 2 apply to all polygons

1.) Sum of Interior Angles ..... $S_I = 180(n-2)$

2.) Sum of Exterior Angles ..... $S_E = 360$

#3 and 4 apply to only regular (or equiangular) polygons

3.) Measure of Each Interior Angle ..... $A_I = \frac{180(n-2)}{n}$ or $180 - \frac{360}{n}$

4.) Measure of Each Exterior Angle ..... $A_E = \frac{360}{n}$

Attachments

quad.wmv

pentagon.wmv

hexagon.wmv

heptagon.wmv