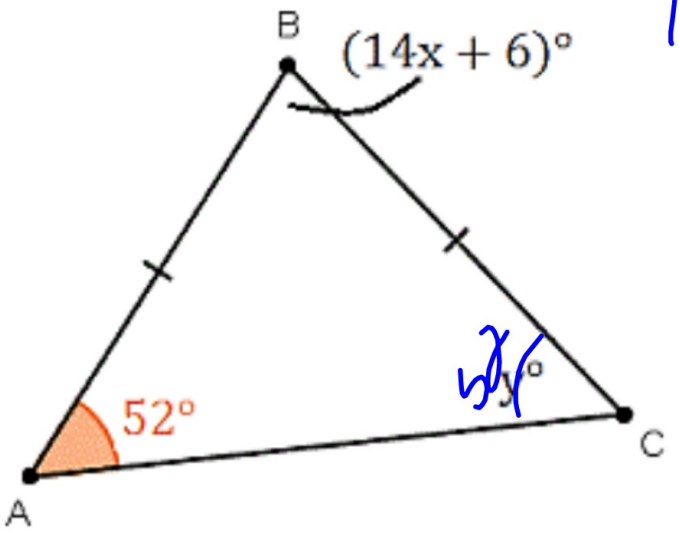
1. $x =$ 5

$y =$ 52

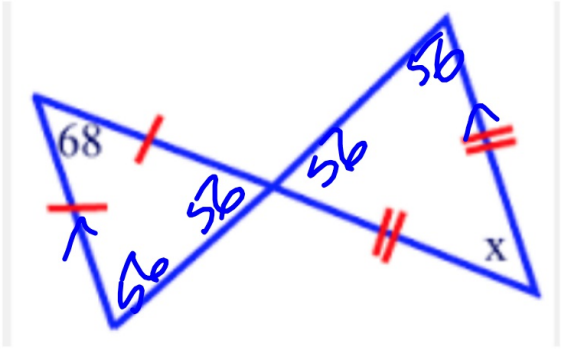
$14x + 6 + 104 = 180$

$14x = 70$

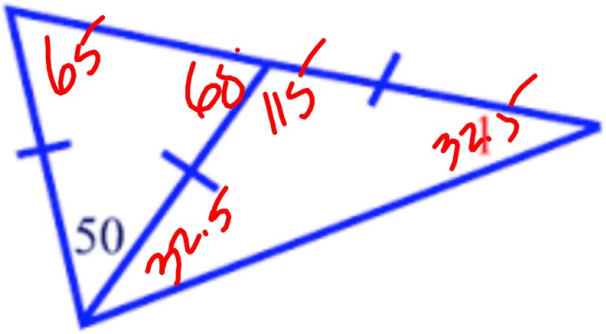
$x = 5$



2. $x =$ 68



3. $\angle 1 =$ 32.5



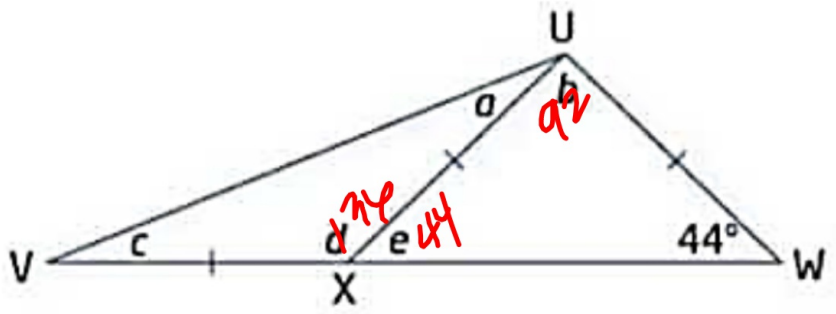
$a =$ 22

$b =$ 92

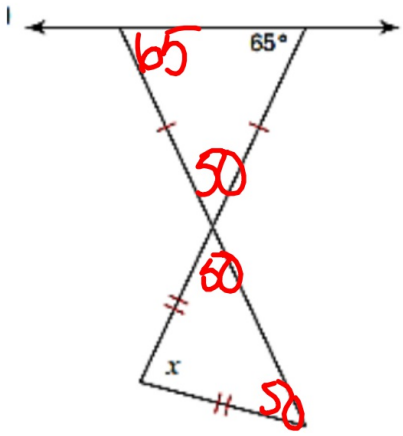
4. $c =$ 22

$d =$ 136

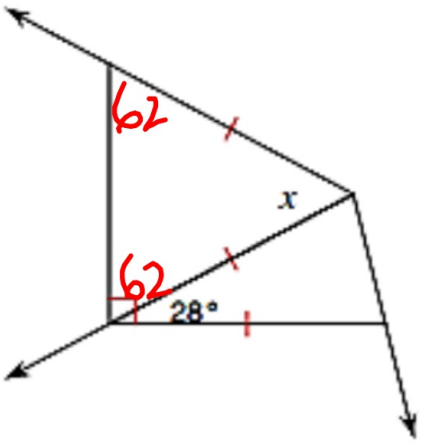
$e =$ 44



5. $x =$ 80



6. $x =$ 56

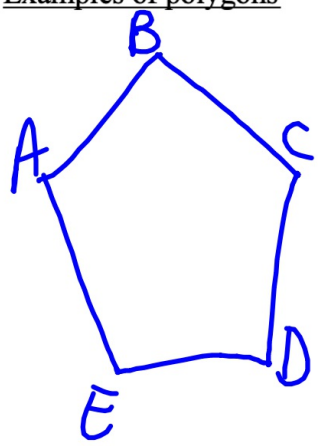


H. Geometry **3.5 - The Polygon Angle-Sum Theorem** **Date:** 11/1

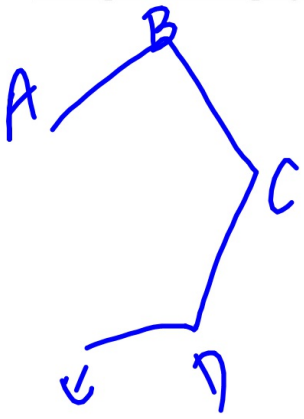
Objective 1: Classifying Polygons

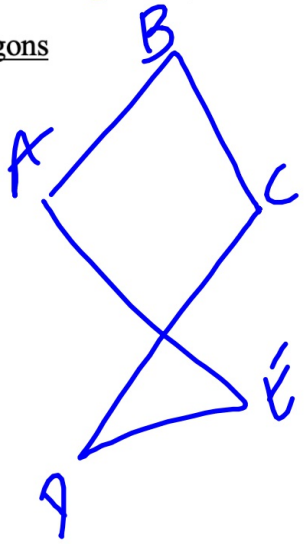
A polygon is a closed plane figure with at least 3 sides that are segments. The sides intersect only at their endpts, and no adjacent sides are collinear.

Examples of polygons



Examples of non-polygons

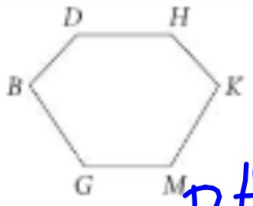




To name a polygon, start at any vertex and list the vertices in order in a clockwise or counterclockwise direction.

Ex 1: Naming Polygons

A. Name the polygon. Then identify its sides, vertices and angles.



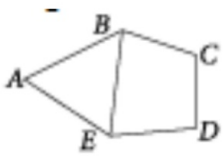
Name: DHKMGB
MKHDBG

Vertices: DHKMGB

Sides: DH, HK, KM, MG
GB, BD

Angles: ∠D ∠K
∠H ∠M
∠G ∠B

B. Three polygons are pictured below. Name each polygon, its sides and its angles.



ABE: $\overline{AB}$, $\overline{BE}$, $\overline{EA}$
∠A, ∠ABE,
∠BEA

BCDE
$\overline{BC}$, $\overline{CD}$
$\overline{ED}$, $\overline{EB}$
∠EBC,
∠C,
∠D,
∠DEB

ABCDE
$\overline{AB}$, $\overline{BC}$, $\overline{CD}$
$\overline{DE}$, $\overline{EA}$
∠A, ∠ABC
∠C, ∠D, ∠AED

You can classify a polygon by the # of sides. it has. Let's make a table below that shows the names of some of the common polygons.

# of Sides	Name
3	triangle
4	quadrilateral
5	pentagon
6	hexagon
8	octagon
9	nonagon
10	decagon
12	dodecagon
n	n-gon

Polygons can also be classified as convex or concave.

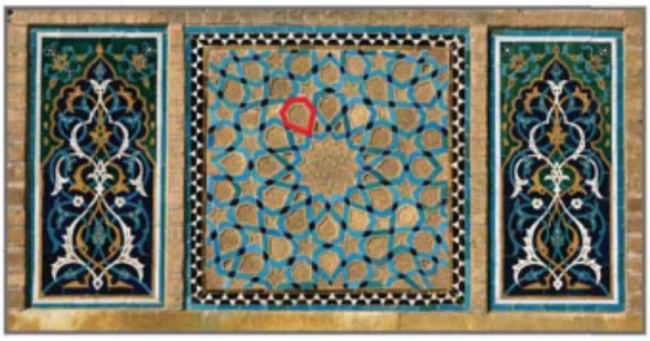
A convex polygon has no diagonal with points outside the polygon.

A concave polygon has at least one diagonal with points outside the polygon.

IN THIS BOOK, A POLYGON IS convex UNLESS OTHERWISE STATED!!!

Example 2: Real-World Connection

The tile work in the photo below is a combination of different polygons that form a pleasing pattern. Classify the polygon outlined in red by using the table above. Then classify the polygon as convex or concave.



Name using number of sides: hexagon

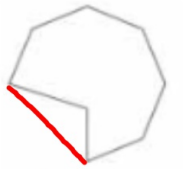
Convex or concave: convex

QC2: Classify each polygon by its sides. Identify each as convex or concave.

A.

hexagon
convex

B.



octagon
concave

C.

The 12-pointed star at the center of the tile work pictured above.

24-gon
concave

Objective 2: Polygon Angle Sums

Activity: The Sum of Polygon Angle Measures

You can use triangles and the triangle sum theorem to find the sum of the measures of the angles of a polygon. Record your data in the table below.

Polygon	# of Sides	Number of triangles formed	Sum of the interior angle measures
	4		
	5		
	6		
	7		
	8		

Theorem 3-14: Polygon Angle-Sum Theorem

The sum of the measures of the angles of an n-gon is $(n-2)\cdot 180$

Example 3: Finding a polygon angle sum

A. Find the sum of the measures of a 15-gon. $(15-2)\cdot 180 = 2340$

B. Find the sum of the measures of a 13-gon. 1980

C. The sum of the measures of a given polygon is 720°. How many sides does the polygon have?

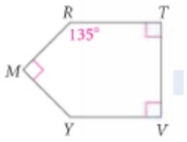
$(n-2)\cdot 180 = 720$

$n-2 = 4$

$n = 6$ hexagon.

Example 4: Using the polygon angle-sum theorem.

A. Find $m\angle Y$ in pentagon MRTVY below.



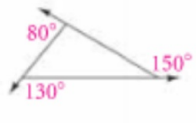
$90 \cdot 3 + 135 + \angle Y = 540$

$Y = 135°$

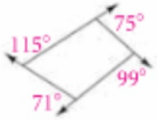
B. Hexagon ABCDEF has all congruent angles. Find the measure of each angle.

120

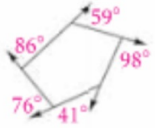
You can draw an ext. ∠s at any vertex of a polygon. The figures below show that the sum of the measures of the exterior angles, one at each vertex, is 360.



$80 + 150 + 130 = 360$



$115 + 75 + 99 + 71 = 360$



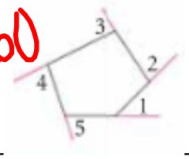
$86 + 59 + 98 + 41 + 76 = 360$

Theorem 3-15: Polygon Exterior Angle-Sum Theorem

The sum of the measures of the exterior angles of a polygon, one at each vertex is 360.

For the pentagon at the right:

$\angle 1+\angle 2+\angle 3+\angle 4+\angle 5=360$

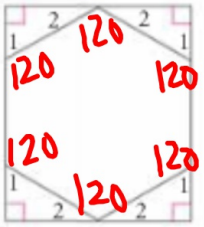


An equilateral polygon has all sides equal.

An equiangular polygon has all angles ".

A regular polygon is both equilateral and equiangular.

Example 5: The game board below has the shape of a regular hexagon. It is packaged in a rectangular box outlined next to it. The box uses four right triangles made of foam in its four corners. Find $m\angle 1$ in each foam triangle.



hexagon

$(6-2)\cdot 180=720$

$\frac{720}{6}=120$

$\angle 1=180-120$

$=60$

QC 5:

A. Find $m\angle 1$ above by using the Polygon Exterior Angle Sum Theorem.

60

B. Find $m\angle 2$. Is $\angle 2$ an exterior angle? Explain.

30; NO

Hwk #18 - due tomorrow

Sect. 3-5

Pages: 161-162

Problems: 1-4, 8, 9, 13, 14, 21, 22, 24, 34, 43

IXL #9 - D.7 & F.1 due tomorrow at 4pm!