Chapter 5: Plane Geometry

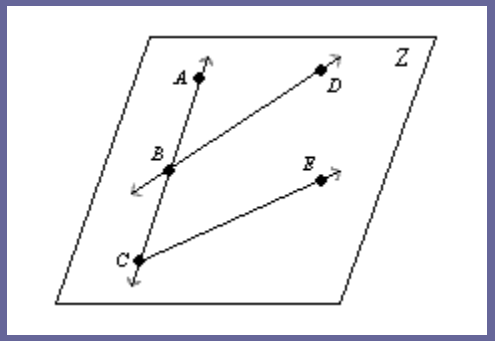
Regular Math

Section 5.1: Points, Lines, Planes, and Angles

- A **point** names a location.
- A **line** is perfectly straight and extends forever in both directions.
- A **plane** is a perfectly flat surface that extends forever in all directions.
- A **segment**, or line segment, is the part of a line between two points.
- A **ray** is part of a line that starts at one point and extends forever in one direction.

Naming Points, Lines, Planes, Segments, and Rays

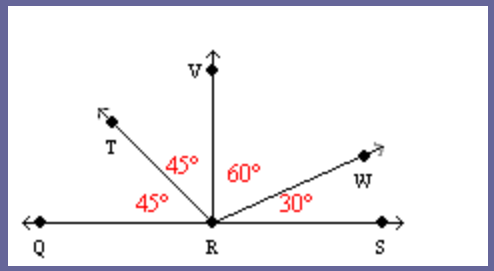
- Name 4 points.
- Name a line.
- Name a plane.
- Name 4 segments.
- Name 4 rays.



Classifying Angles Vocabulary

- **Complementary Angles** have measures that add up to 90 degrees.
- **Supplementary Angles** have measures that add to 180 degrees.
- **Right Angles** measure 90 degrees.
- **Acute Angles** measure less than 90 degrees.
- **Obtuse Angles** measure more than 90 degrees but less that 180 degrees.
- **Straight Angles** measure exactly 180 degrees.

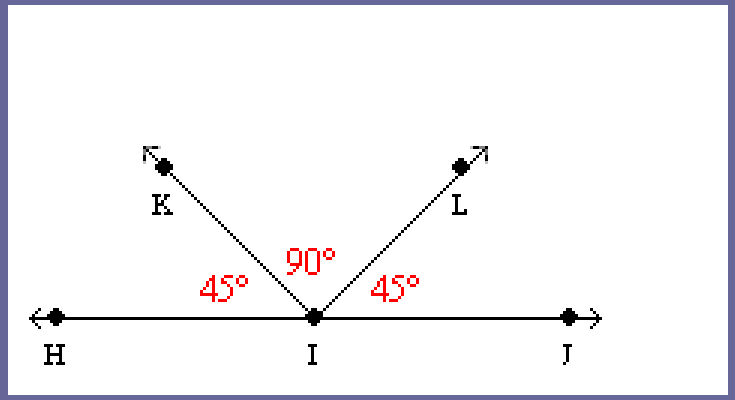
Classifying Angles



- Name a right angle.
- Name two acute angles.
- Name two obtuse angles.
- Name a pair of complementary angles.
- Name a pair of supplementary angles.

Try these on your own…

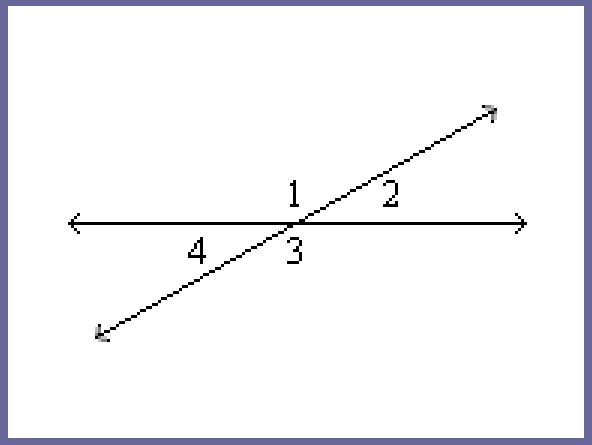
1. Name a point.
2. Name a line.
3. Name a segment.
4. Name a ray.
5. Name a right angle.
6. Name an acute angle.
7. Name a obtuse angle.
8. Name a pair of complementary angles.
9. Name a pair of supplementary angles.



Vertical Angles Vocabulary

- Intersecting lines form two pairs of **vertical angles.**

Vertical Angles



- <1 and <3 are vertical angles, and <2 and <4 are vertical angles.

1. If m<2 = 30 degrees, find m<4?

2. If m<1 = 150 degrees, find m<3?

Section 5.2: Parallel and Perpendicular Lines

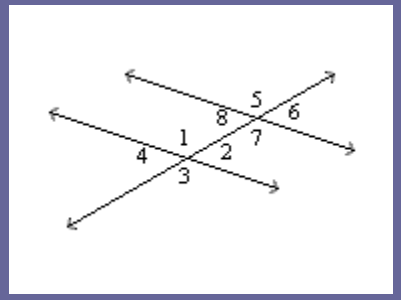
- **Parallel Lines** are two lines in a plane that never meet, like train tracks.

- **Perpendicular Lines** are two lines that intersect at a 90 degree angle.

- A **Transversal** is a line that intersects any two or more lines.

Identifying Congruent Angles Formed by a Transversal

- Measure the angles formed by the transversal and the parallel lines. What angles seem to be congruent?



<4 and <2

<1 and <3

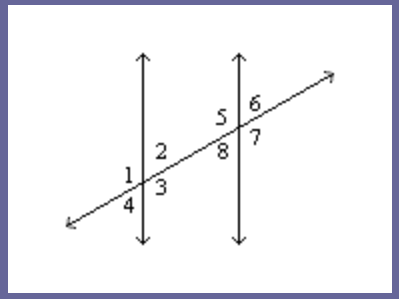
<8 and <6

<7 and <5

$$\angle 4 \cong \angle 2 \cong \angle 8 \cong \angle 6$$

$$\angle 1 \cong \angle 3 \cong \angle 7 \cong \angle 5$$

Try this one on your own…



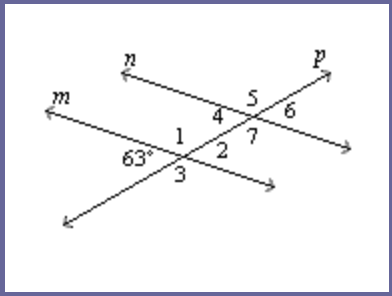
- Measure the angles formed by the transversal and the parallel lines. Which angles seem to be congruent?

$\angle 1 \cong \angle 3 \cong \angle 5 \cong \angle 7$

$\angle 4 \cong \angle 2 \cong \angle 8 \cong \angle 6$

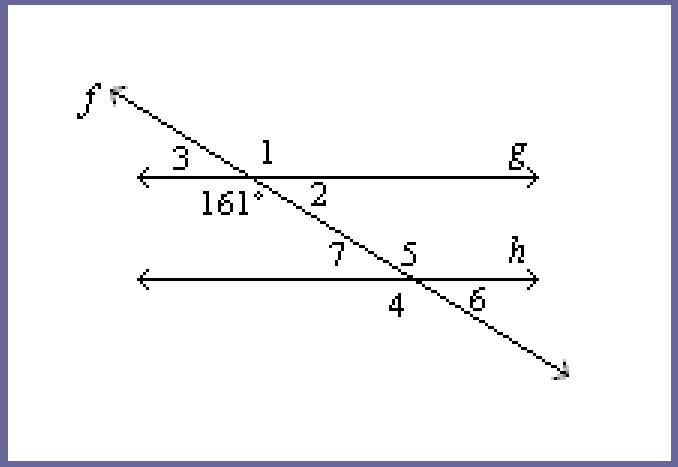
Finding Angle Measures of Parallel Lines Cut by Transversals

- In the figure, line ***m*** and line ***n*** are parallel. Find the measure of each angle?



<1 = 117
<2 = 63
<3 = 117
<4 =63
<5 = 117
<6 = 63
<7 = 117

Try this one on your own…



- In the figure, line ***g*** is parallel to line ***h***. Find the measure of each angle?

<1 = 161

<2 = 19

<3 = 19

<4 = 161

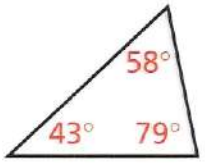
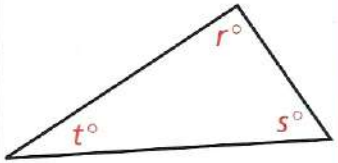
<5 = 161

<6 = 19

<7 = 19

Section 5.3: Triangles

TRIANGLE SUM THEOREM

Words	Numbers	Algebra
The angle measures of a triangle in a plane add to 180°.	 $43° + 58° + 79° = 180°$	 $r° + s° + t° = 180°$

Triangle Vocabulary

- An **equilateral triangle** has 3 congruent sides and 3 congruent angles.
- An **isosceles triangle** has at least 2 congruent sides and 2 congruent angles.
- A **scalene triangle** has no congruent sides and no congruent angles.

Finding Angles in a Triangle That Meets Given Conditions

- The second angle in a triangle is twice as large as the first. The third angle is half as large as the second. Find the angle measures and draw a possible picture.

- 1st angle = x
- 2nd angle = 2x
- 3rd angle = ½ (2x)

$$x + 2x + \tfrac{1}{2}(2x) = 180$$

$$x + 2x + x = 180$$

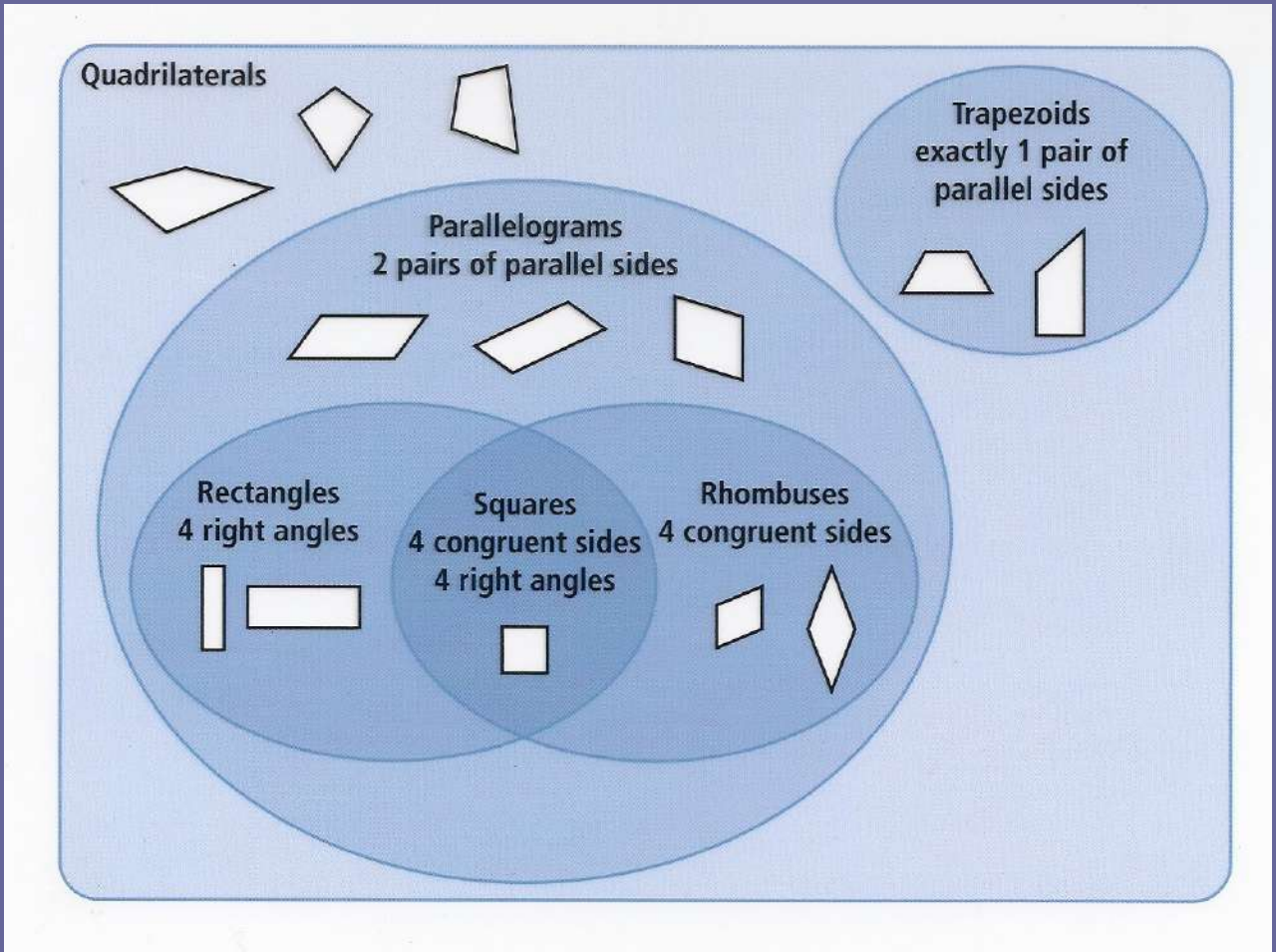
$$4x = 180$$

$$\frac{4x}{4} = \frac{180}{4}$$

$$x = 45 \text{ degrees}$$

Section 5.4: Polygons

Polygon	Number of Sides
Triangle	3
Quadrilateral	4
Pentagon	5
Hexagon	6
Heptagon	7
Octagon	8
n-gon	*n*

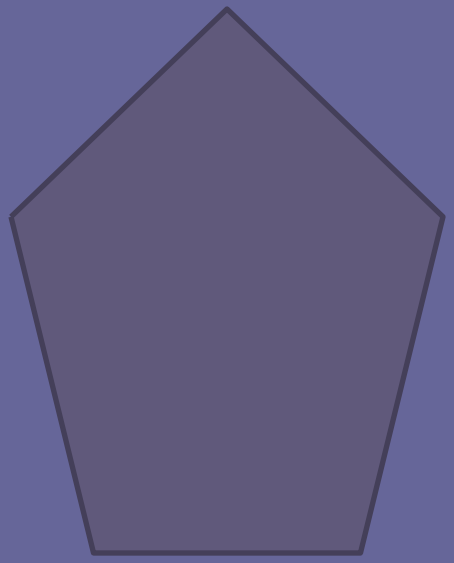

Quadrilaterals
Trapezoids
exactly 1 pair of
parallel sides
Parallelograms
2 pairs of parallel sides
Rectangles
4 right angles
Squares
4 congruent sides
4 right angles
Rhombuses
4 congruent sides

Polygon Vocabulary

- A **polygon** is a closed plane figure formed by three or more sides.

- All the sides and angles of a **regular polygon** have equal measures.

Finding Sums of the Angle Measures in Polygons

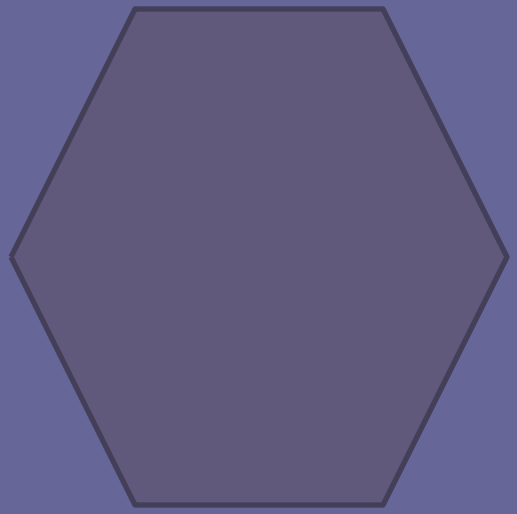


Find the sum of the angle measures in a pentagon.

- Step One: Divide the figure into triangles.
- Step Two: Multiply the # of triangles and 180 degrees.

Try this one on your own…

- Find the sum of the angle measures in a hexagon.



- 4 Triangles

- 4 x 180 = 720

- In a polygon, there are 2 more sides than triangles.
- An *n*-gon can be divided into n-2 triangles.
- The sum of the angle measures of any *n*-gon is 180 (N – 2).

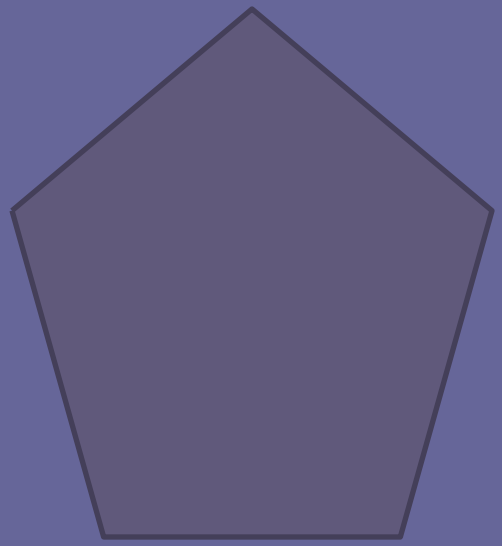
Formula

N (X) = 180 (N – 2)

N = NUMBER OF SIDES

Finding the Measure of Each Angle in a Regular Polygon

- Find the angle measure in each regular polygon.



Step One: Figure out how many sides the figure has…

5

Step Two: Fill the number of sides into the equation.

$5x = 180\ (5 - 2)$

Step Three: Solve

$5x = 180\ (5 - 2)$

$5x = 180\ (3)$

$5x = 540$

$$\frac{5x}{5} = \frac{540}{5}$$

$x = 108$ degrees

Try this one on your own…

- Number of Sides: 4

$4x = 180\ (4 - 2)$

$4x = 180\ (2)$

$4x = 360$

$$\frac{4x}{4} = \frac{360}{4}$$

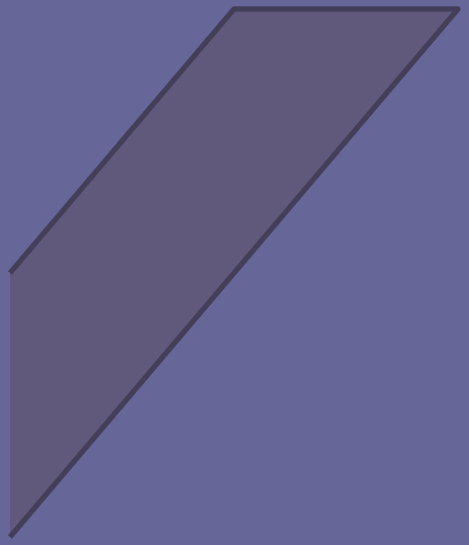
$X = 90$ degrees

Find the angle measure in each regular polygon?

Classifying Polygons

- Give all the names that apply to each figure.
  - Quadrilateral
  - Parallelogram
  - Rhombus

Try this one on your own…



- Give all the names that apply to each figure.
  - Quadrilateral
  - Trapezoid

Section 5.6: Congruence

- A **correspondence** is a way of matching up two sets of objects.

Writing Congruence Statements

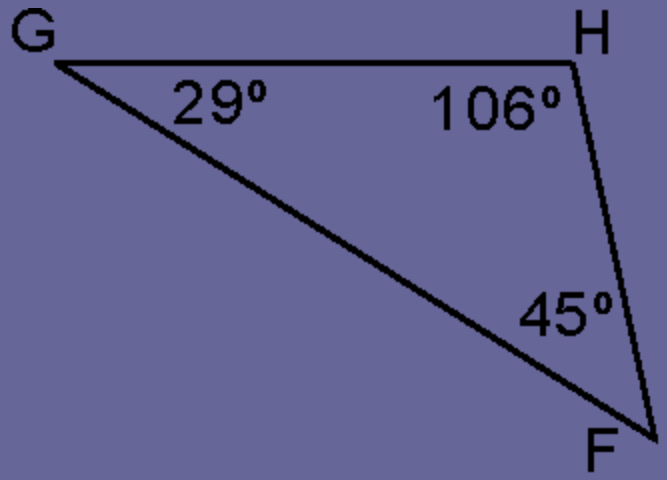
Write a congruence statement for each pair of polygons.

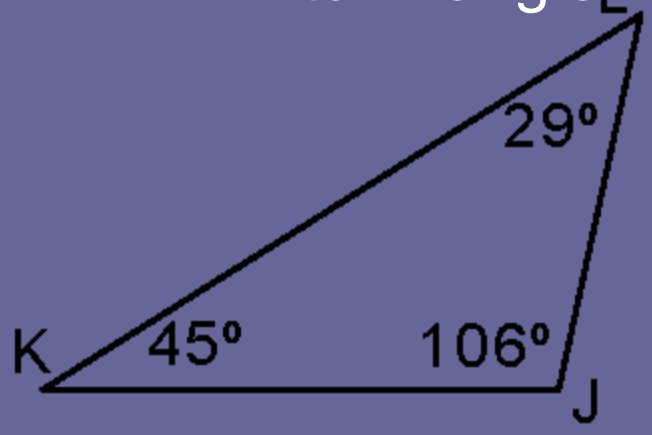
<G is equal to <L

<H is equal to <J

<F is equal to <K

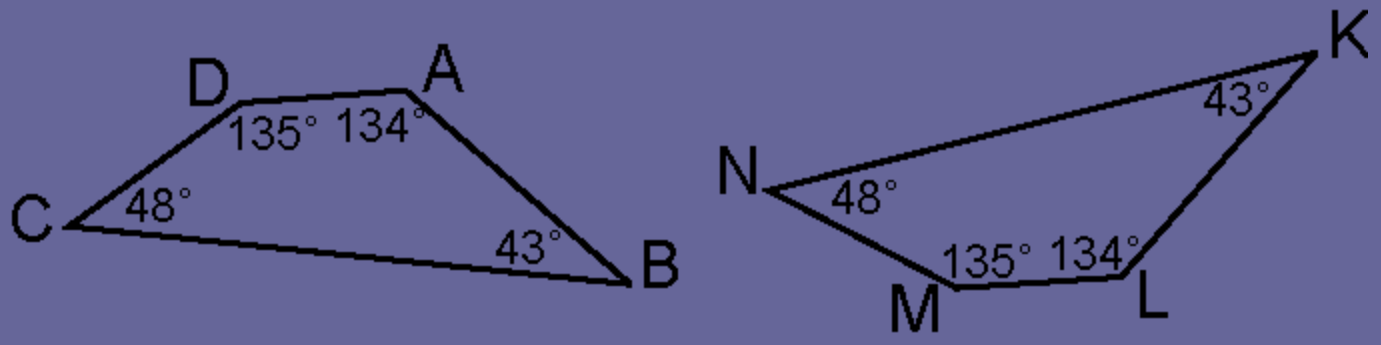
Triangle GHF is congruent to Triangle LJK



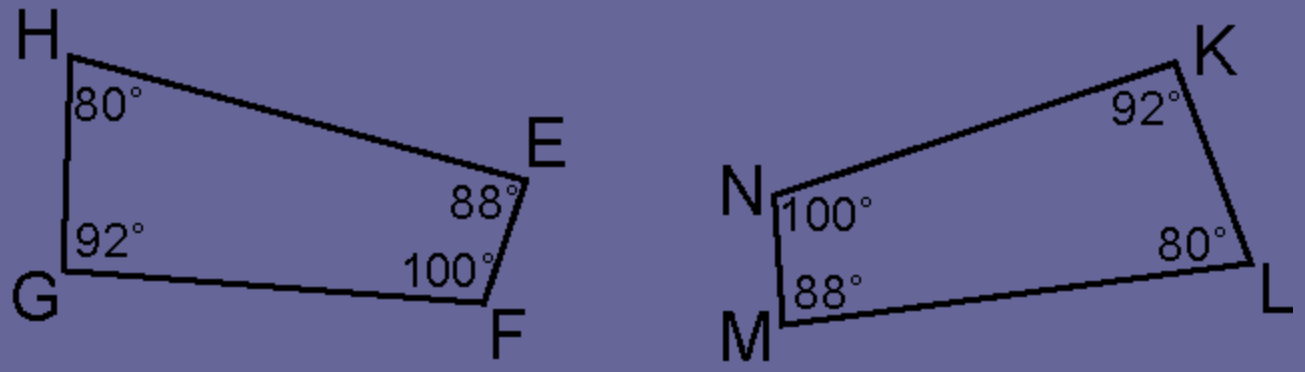


- Write a congruence statement for each pair of polygons.

Quadrilateral DABC is congruent to Quadrilateral MLKN.



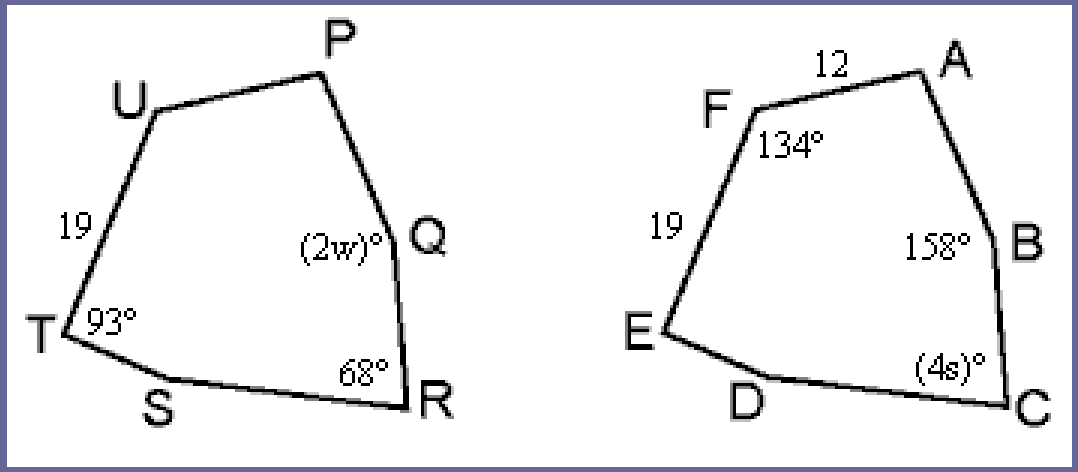
Try this one on your own…



Quadrilateral HEFG is congruent to Quadrilateral LMNK

Using Congruence Relationships to Find Unknown Values

- In the figure, hexagon PQRSTU is congruent to hexagon ABCDEF.



Find the value of w.

Step One: Figure out what angle corresponds with the angle you are trying to find.

.

< B

Step Two: Set up an equation.

<Q = <B

2w = 158

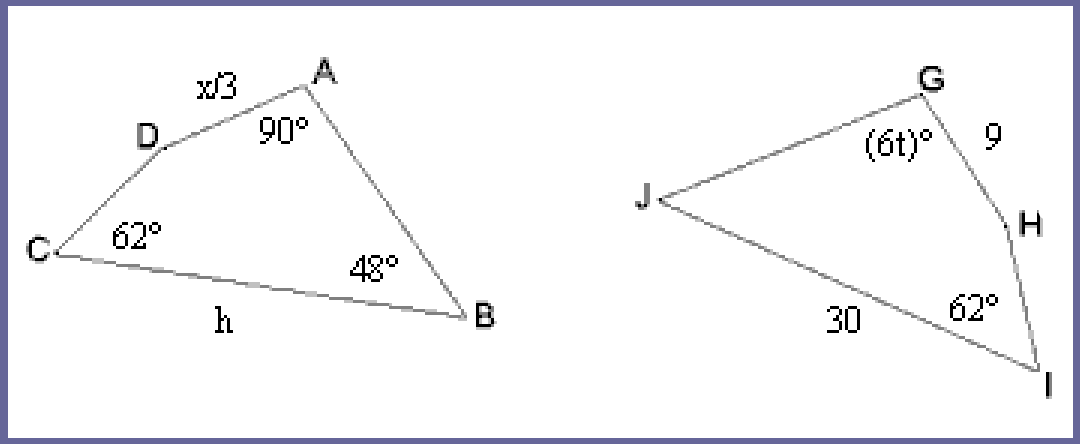
Step Three: Solve

2w = 158

$\frac{2w = 158}{2 \quad 2}$

w = 79

In the figure, quadrilateral ABCD is congruent to quadrilateral GJIH.



- Find x.
- Step One: Figure out which side is congruent to side with the variable.

  AD is congruent to GH.
- Step Two: Set up an equation.

  X / 3 = 9

  Step Three: Solve

  x / 3 = 9

  3 (x / 3) = 9

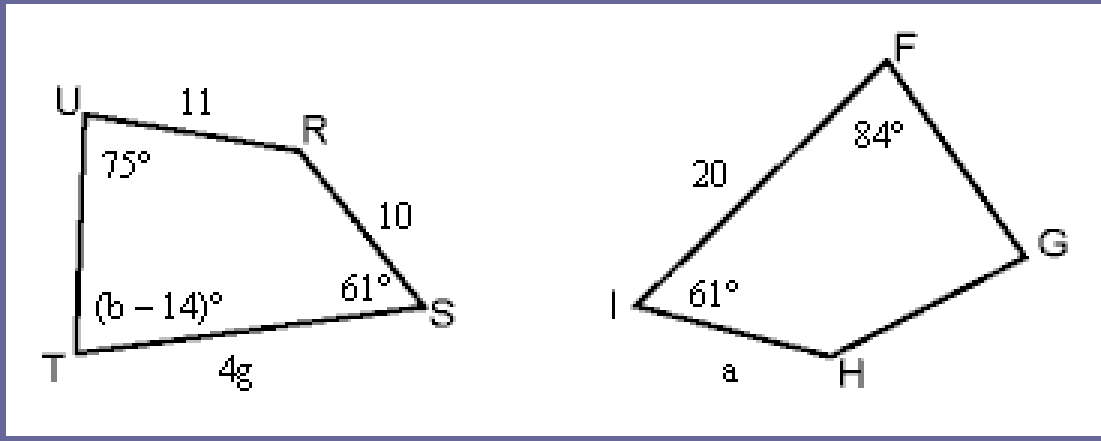
  x = 27

Try these on your own…

- Find b.

- (b-14) = 84
- b = 98

Find a.

a = 10

- In the figure, quadrilateral RSTU is congruent to quadrilateral HIFG.