Geometry: 5.1-5.4 Notes

NAME______________________

5.1 Classify Triangles______________________________________**Date:**________________

Define Vocabulary:

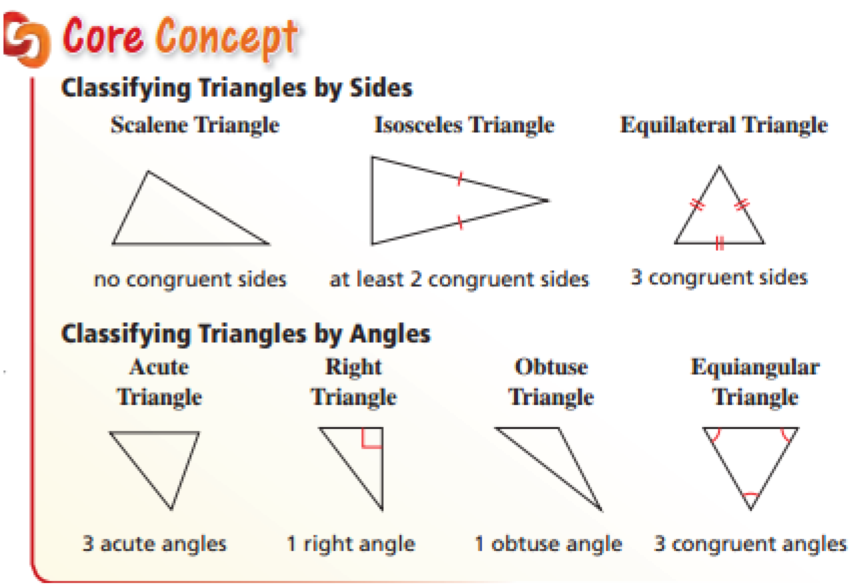
interior angles –

exterior angles –

corollary to a theorem –

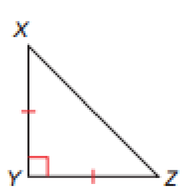
Classifying Triangles by Sides and by Angles

Recall that a *triangle* is a polygon with three sides. You can classify triangles by sides and by angles, as shown below.

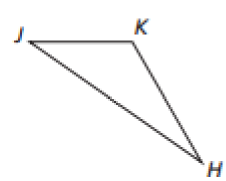


Examples: Classify the triangle by sides and angles.

WE DO



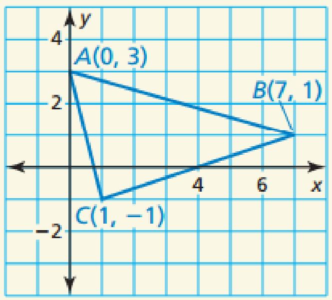
YOU DO



Examples: Classifying a triangle in a coordinate plane

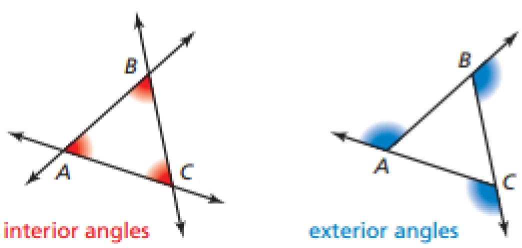
WE DO

Classify $\triangle ABC$ by its sides. Then determine whether it is a right triangle.



Finding Angle Measures of Triangles

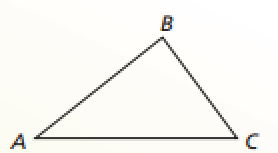
When the sides of a polygon are extended, other angles are formed. The original angles are the **interior angles**. The angles that form linear pairs with the interior angles are the **exterior angles**.



Theorem

Theorem 5.1 Triangle Sum Theorem

The sum of the measures of the interior angles of a triangle is 180°.



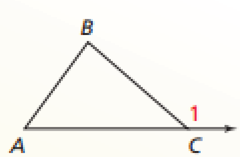
$m\angle A + m\angle B + m\angle C = 180°$

Proof p. 234; Ex. 53, p. 238

Theorem

Theorem 5.2 Exterior Angle Theorem

The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.



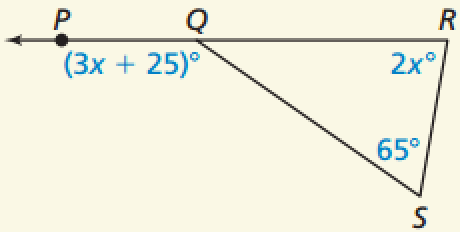
$m\angle 1 = m\angle A + m\angle B$

Proof Ex. 42, p. 237

Examples: Finding an angle measure

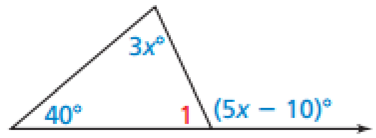
WE DO

Find $m\angle PQS$.



YOU DO

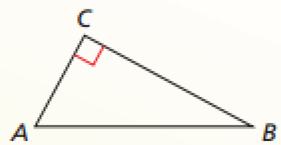
Find the measure of $\angle 1$.



Corollary

Corollary 5.1 Corollary to the Triangle Sum Theorem

The acute angles of a right triangle are complementary.



$m\angle A + m\angle B = 90°$

Proof Ex. 41, p. 237

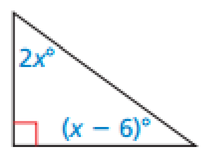
Examples: Translating a figure in a coordinate plane.

WE DO

The measure of one acute angle of a right triangle is 1.5 times the measure of the other acute angle. Find the measure of each acute angle.

YOU DO

Find the measure of each acute angle.



Assignment	

5.2 Identify corresponding angles.___________________________________ Date:___________

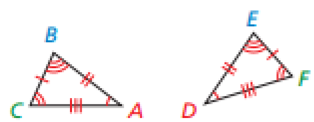
Define Vocabulary:

corresponding parts –

Identifying and Using Corresponding Parts

Recall that two geometric figures are congruent if and only if a rigid motion or a composition of rigid motions maps one of the figures onto the other. A rigid motion maps each part of a figure to a **corresponding part** of its image. Because rigid motions preserve length and angle measure, corresponding parts of congruent figures are congruent. In congruent polygons, this means that the *corresponding sides* and the *corresponding angles* are congruent.

When $\triangle DEF$ is the image of $\triangle ABC$ after a rigid motion or a composition of rigid motions, you can write congruence statements for the corresponding angles and corresponding sides.



Corresponding angles

$\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle C \cong \angle F$

Corresponding sides

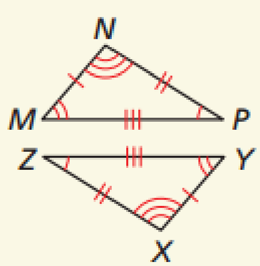
$\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\overline{AC} \cong \overline{DF}$

When you write a congruence statement for two polygons, always list the corresponding vertices in the same order. You can write congruence statements in more than one way. Two possible congruence statements for the triangles above are $\triangle ABC \cong \triangle DEF$ or $\triangle BCA \cong \triangle EFD$.

Examples: Write a congruence statement and identify all pairs of congruent corresponding parts.

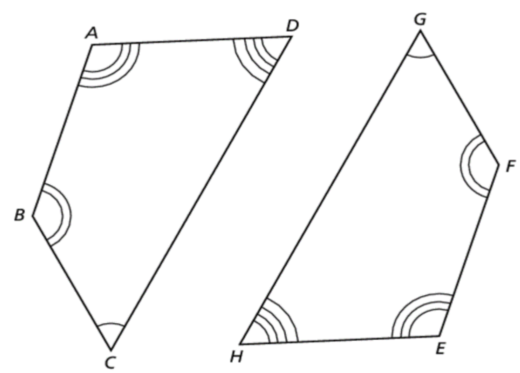
<u>WE DO</u>

Write a congruence statement for the triangles. Identify all pairs of congruent corresponding parts.



<u>YOU DO</u>

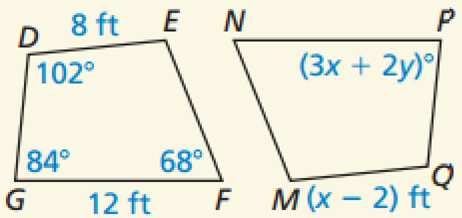
$ABCD \cong EFGH$



Examples: Use properties of congruent figures.

<u>WE DO</u>

In the diagram, $DEFG \cong QMNP$.

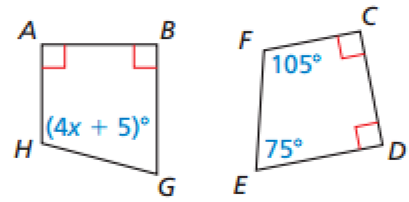


a. Find the value of x.

b. Find the value of y.

<u>YOU DO</u>

In the diagram, $ABGH \cong CDEF$.



Find the value of x.

Theorem

Theorem 5.3 Properties of Triangle Congruence

Triangle congruence is reflexive, symmetric, and transitive.

Reflexive For any triangle $\triangle ABC$, $\triangle ABC \cong \triangle ABC$.

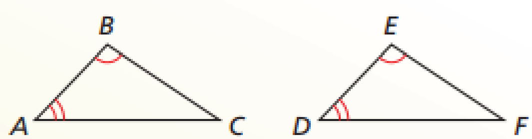
Symmetric If $\triangle ABC \cong \triangle DEF$, then $\triangle DEF \cong \triangle ABC$.

Transitive If $\triangle ABC \cong \triangle DEF$ and $\triangle DEF \cong \triangle JKL$, then $\triangle ABC \cong \triangle JKL$.

Theorem

Theorem 5.4 Third Angles Theorem

If two angles of one triangle are congruent to two angles of another triangle, then the third angles are also congruent.



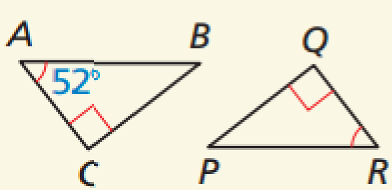
If $\angle A \cong \angle D$ and $\angle B \cong \angle E$, then $\angle C \cong \angle F$.

Proof Ex. 19, p. 244

Examples: Using the Third Angle Theorem

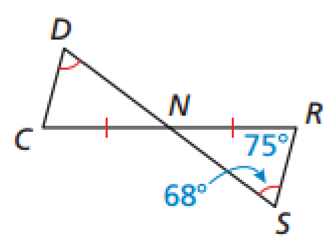
<u>WE DO</u>

Find $m\angle P$.



<u>YOU DO</u>

Find $m\angle DCN$.



Assignment	

5.3 Be able to use the side angle side congruence theorem.______________________Date:____________

Define Vocabulary:

congruent figures –

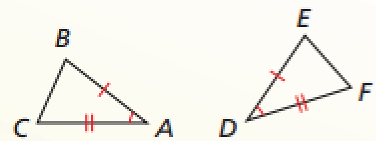
rigid motion –

Theorem

Theorem 5.5 Side-Angle-Side (SAS) Congruence Theorem

If two sides and the included angle of one triangle are congruent to two sides and the included angle of a second triangle, then the two triangles are congruent.

If $\overline{AB} \cong \overline{DE}$, $\angle A \cong \angle D$, and $\overline{AC} \cong \overline{DF}$, then $\triangle ABC \cong \triangle DEF$.



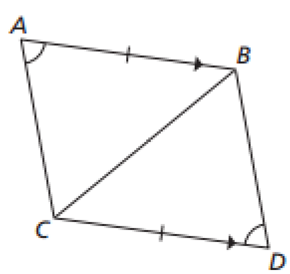
Proof p. 246

**The included angle of two sides of a triangle is the angle formed by the two sides.

Examples: Name the included angle between the given sides.

<u>WE DO</u>

$\overline{AC}$ and $\overline{CB}$



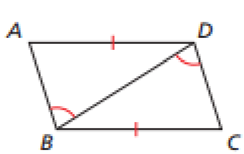
<u>YOU DO</u>

$\overline{BC}$ and $\overline{CD}$

Examples: Decide whether there is enough information is given to prove that the triangles are congruent using the SAS Congruence Theorem. Explain.

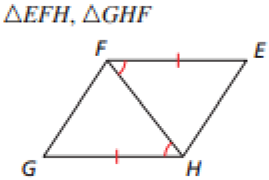
<u>WE DO</u>

$\triangle ABD$, $\triangle CDB$



<u>YOU DO</u>

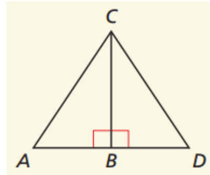
$\triangle EFH$, $\triangle GHF$



Examples: Write a proof.

WE DO

Given B is the midpoint of $\overline{AD}$. $\angle ABC$ and $\angle DBC$ are right angles.
Prove $\triangle ABC \cong \triangle DBC$

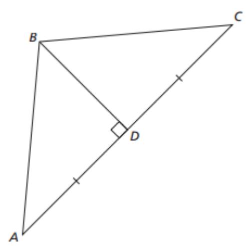


Statements	Reasons
1.	**1.**
2.	**2.**
3.	**3.**
4.	**4.**
5.	**5.**
6.	**6.**

YOU DO

Given $\overline{BD} \perp \overline{AC}$, $\overline{AD} \cong \overline{CD}$

Prove $\Delta ABD \cong \Delta CBD$



Statements	Reasons
1. $\overline{AD} \cong \overline{CD}$	**1.**
2. $\overline{BD} \perp \overline{AC}$	**2.**
3.	**3. Linear Pair Perpendicular Theorem (Ch. 3)**
4.	**4.**
5.	**5.**

Assignment	

5.4 Be able to apply the base angles theorem________________________________Date:____________

Define Vocabulary:

legs (of an isosceles triangle) –

vertex angle –

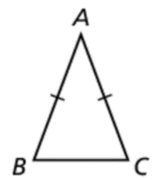
base (of an isosceles triangle) –

base angles (of an isosceles triangle) –

Theorem 5.6 Base Angles Theorem

If two sides of a triangle are congruent, then the angles opposite them are congruent.

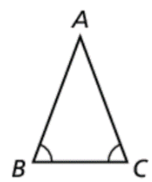
If $\overline{AB} \cong \overline{AC}$, then $\angle B \cong \angle C$.



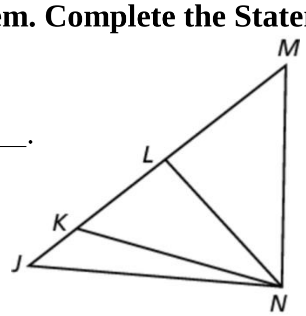
Theorem 5.7 Converse of the Base Angles Theorem

If two angles of a triangle are congruent, then the sides opposite them are congruent.

If $\angle B \cong \angle C$, then $\overline{AB} \cong \overline{AC}$.



Examples: Using the Base Angles Theorem. Complete the Statement.



WE DO

1. If $\overline{NJ} \cong \overline{NM}$, then $\angle$_______ $\cong$ $\angle$_______.

2. If $\angle NKM \cong \angle NMK$, then _______ $\cong$ _______.

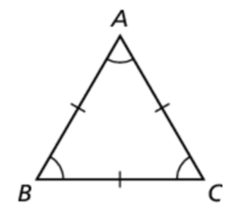
YOU DO

3. If $\overline{LM} \cong \overline{LN}$, then $\angle$_______ $\cong$ $\angle$_______.

4. If $\angle LJN \cong \angle LNJ$, then ______ $\cong$ ______.

Corollary 5.2 Corollary to the Base Angles Theorem

If a triangle is equilateral, then it is equiangular.

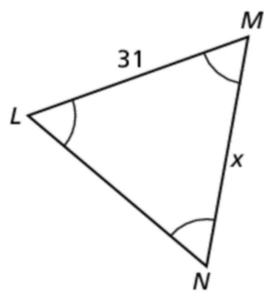


Corollary 5.3 Corollary to the Converse of the Base Angles Theorem

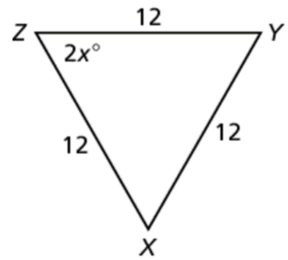
If a triangle is equiangular, then it is equilateral.

Examples: Find the values of x.

<u>WE DO</u>

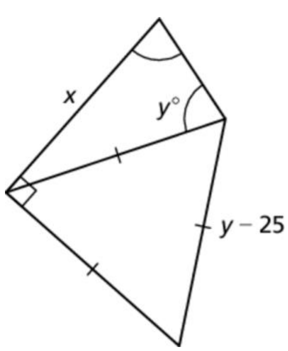


<u>YOU DO</u>

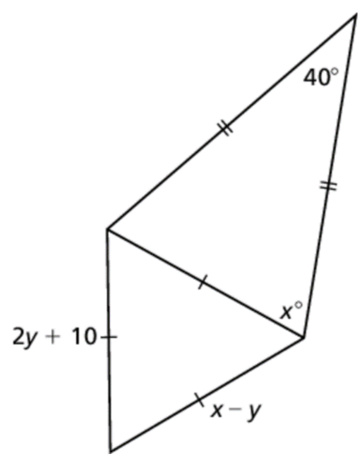


Examples: Find the values of x and y.

<u>WE DO</u>



<u>YOU DO</u>



Assignment	