Honors Geometry Chapter 4 Packet

4-1 Classifying Triangles

- Identify and classify triangles by angles and sides.

4-2 Angles of Triangles

- Apply the Angle Sum Theorem.
- Apply the Exterior Angle Theorem.

4-3 Congruent Triangles

- Name and label corresponding parts of congruent triangles.
- Identify congruence transformations.

4-4 Proving Congruence- SSS, SAS

- Use the SSS Postulate to test for triangle congruence.
- Use the SAS Postulate to test for triangle congruence.

4-5 Proving Congruence- ASA, AAS

- Use the ASA Postulate to test for triangle congruence.
- Use the AAS Theorem to test for triangle congruence.
- Use the HL-Postulate to test for right triangle congruence.

4-6 Isosceles Triangles

- Use properties of isosceles triangles.
- Use properties of equilateral triangles.

4-7 Triangles and Coordinate Proof

- Position and label triangles for use in coordinate proofs.
- Write coordinate proofs.

***Remember all postulates, theorems, and formulas from prior chapters.**

4-1 Classifying Triangles

Classifying Triangles by Angles

Acute Right Obtuse Equiangular

Classifying Triangles by Sides

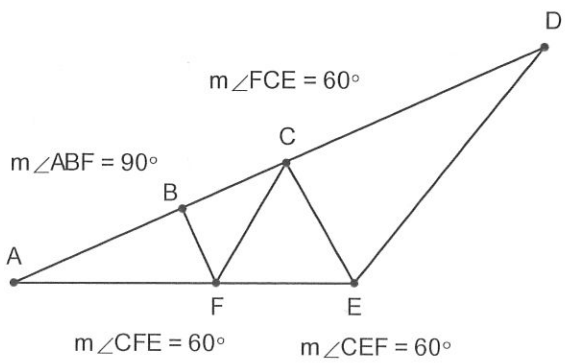
Scalene Isosceles Equilateral

Answer with always, sometimes or never.

An isosceles triangle is an equilateral triangle.

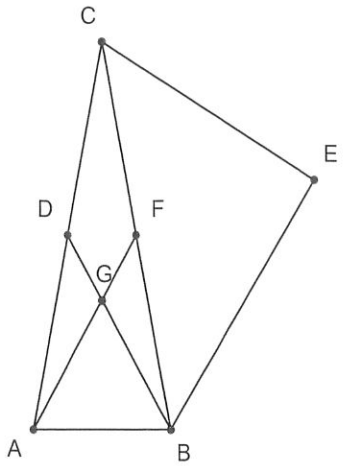
An equilateral triangle is an isosceles triangle.

Ex 1: The triangular truss below is modeled for steel construction. Classify ΔADE, ΔABF, and ΔFCE by angles.



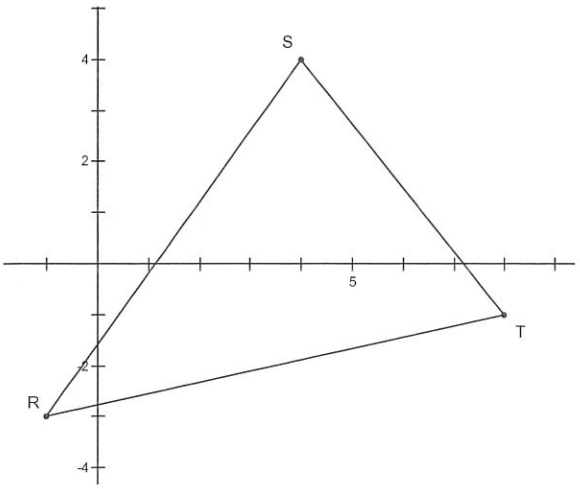
Is $\overline{BF} \parallel \overline{CE}$? Justify your answer.

Ex 2: Identify each triangle in the figure by sides if $\overline{CE} \perp \overline{BE}$, $\overline{AG} \cong \overline{GB}$, $\overline{AC} \cong \overline{CB}$.



Ex 3: Find d and the measure of each side of the equilateral ΔKLM if $KL = d + 2$, $LM = 12 - d$, and $KM = 4d - 13$.

Ex 4: Find the measures of the sides of ΔRST. Classify the triangle by sides.



Turn to **page 184** and complete the Geometry Activity. Answer the corresponding questions below.

1.

2.

3.

4.

5.

6.

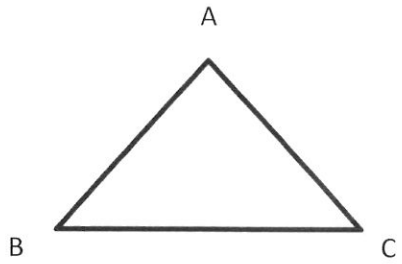
7.

12.

HW: pgs. 181-182 #28-31, 38, 40

4-2 Angles of Triangles

Angle Sum Theorem (4.1):

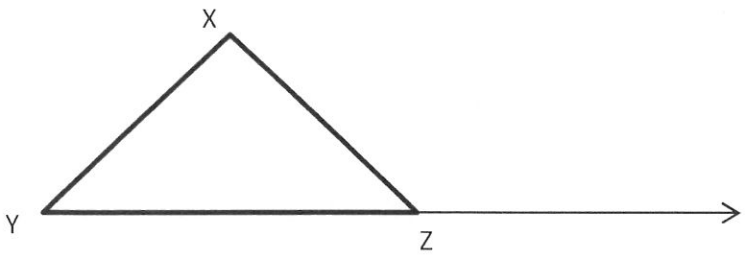


Proof of the Angle Sum Theorem

Statement	Reason
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

Third Angle Theorem (4.2):

Exterior Angle:



Remote Interior Angles:

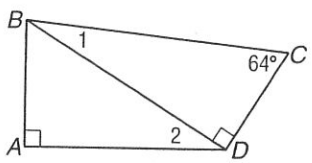
Exterior Angle Theorem (4.3):

Corollary:

Corollary 4.1:

Corollary 4.2:

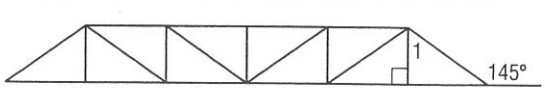
1. **Find the measure of each angle if $\angle BAD$ and $\angle BDC$ are right angles and $m\angle ABC = 84$.**



$m\angle 1$

$m\angle 2$

2. **CONSTRUCTION** The diagram shows an example of the Pratt Truss used in bridge construction. Use the diagram to find $m\angle 1$.



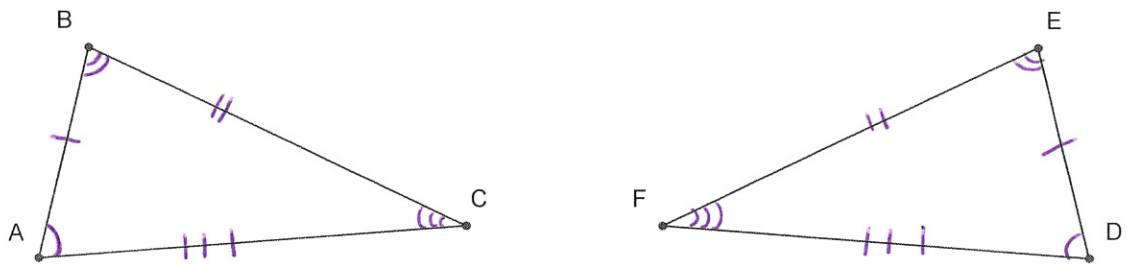
HW: pgs 189-190 #15-40

4-3 Congruent triangles

Congruent Triangles:

Definition of congruent Triangles (CPCTC):

CPCTC stands for:



$\triangle ABC \cong \triangle DEF$

* The corresponding vertices can be used to name the corresponding congruent sides and angles of the two triangles.

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

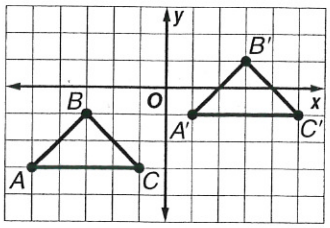
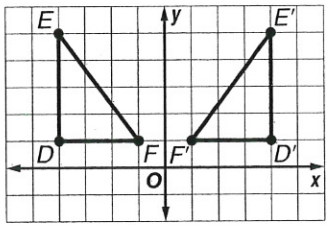
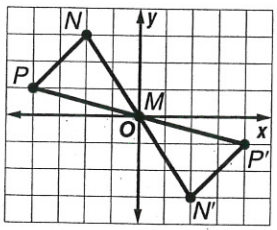
$\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\overline{CA} \cong \overline{FD}$

* Congruent sides are opposite congruent angles.

Thm 4.4: Congruence of triangles is also reflexive symmetric, and transitive.

Reflexive	Symmetric	Transitive

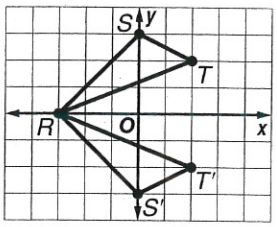
Congruence Transformations:

Slide	Flip	Turn
$\triangle ABC \cong \triangle A'B'C'$ 	$\triangle DEF \cong \triangle D'E'F'$ 	$\triangle MNP \cong \triangle MN'P'$ 

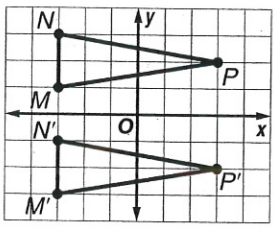
Exercises

Describe the congruence transformation between the two triangles as a *slide*, a *flip*, or a *turn*. Then name the congruent triangles.

1.



2.



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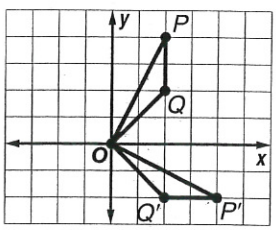
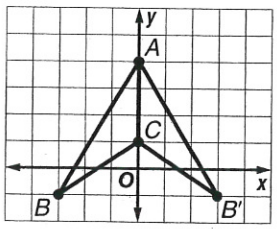
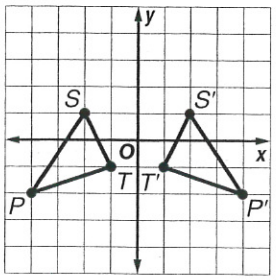


4.

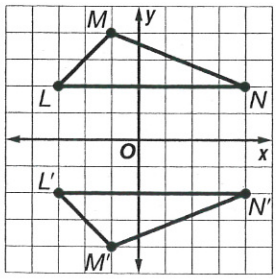


Verify that each of the following transformations preserves congruence, and name the congruence transformation.

5. $\triangle PST \cong \triangle P'S'T'$



6. $\triangle LMN \cong \triangle L'M'N'$



4-4 Proving Congruence- SSS, SAS

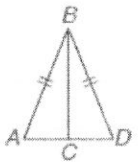
Warm-up: Currently, how can we prove triangles congruent?

SSS Postulate:

Example **Write a two-column proof.**

Given: $\overline{AB} \cong \overline{DB}$ and C is the midpoint of $\overline{AD}$.

Prove: $\triangle ABC \cong \triangle DBC$

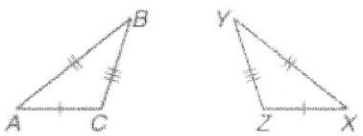


Statement	Reason

Exercises

Write a two-column proof.

1.

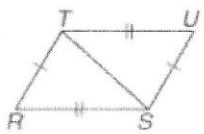


Given: $\overline{AB} \cong \overline{XY}, \overline{AC} \cong \overline{XZ}, \overline{BC} \cong \overline{YZ}$

Prove: $\triangle ABC \cong \triangle XYZ$

Statements	Reasons

2.



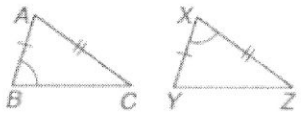
Given: $\overline{RS} \cong \overline{UT}, \overline{RT} \cong \overline{US}$

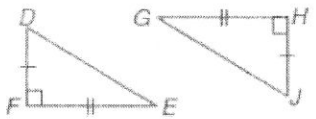
Prove: $\triangle RST \cong \triangle UTS$

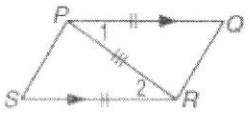
Statements	Reasons

SAS Postulate:

Example **For each diagram, determine which pairs of triangles can be proved congruent by the SAS Postulate.**

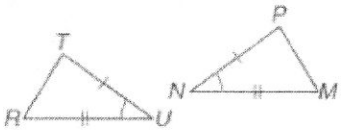
a. 

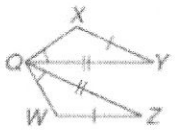
b. 

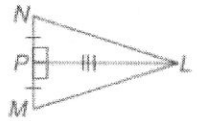
c. 

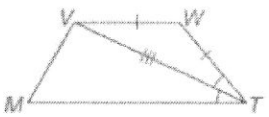
Exercises

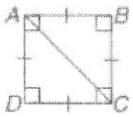
For each figure, determine which pairs of triangles can be proved congruent by the SAS Postulate.

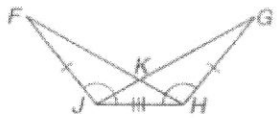
1. 

2. 

3. 

4. 

5. 

6. 

NAME _____ DATE _____ PERIOD _____

4-4

Skills Practice

Proving Congruence—SSS, SAS

Determine whether $\triangle ABC \cong \triangle KLM$ given the coordinates of the vertices. Explain.

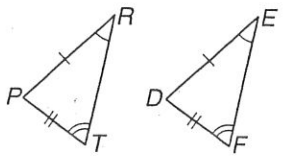
1. $A(-3, 3), B(-1, 3), C(-3, 1), K(1, 4), L(3, 4), M(1, 6)$

2. $A(-4, -2), B(-4, 1), C(-1, -1), K(0, -2), L(0, 1), M(4, 1)$

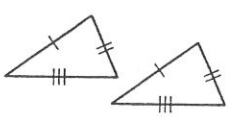
3. Write a ~~flow~~ two column proof.

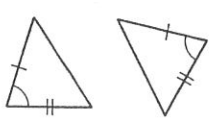
Given: $\overline{PR} \cong \overline{DE}, \overline{PT} \cong \overline{DF}$
$\angle R \cong \angle E, \angle T \cong \angle F$

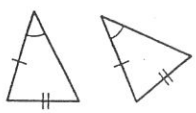
Prove: $\triangle PRT \cong \triangle DEF$



Determine which postulate can be used to prove that the triangles are congruent. If it is not possible to prove that they are congruent, write *not possible*.

4. 

5. 

6. 

Lesson 4-4

NAME _____ DATE _____ PERIOD ____

4-4 Practice

Proving Congruence—SSS, SAS

Determine whether $\triangle DEF \cong \triangle PQR$ given the coordinates of the vertices. Explain.

1. $D(-6, 1), E(1, 2), F(-1, -4), P(0, 5), Q(7, 6), R(5, 0)$

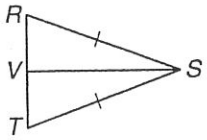
2. $D(-7, -3), E(-4, -1), F(-2, -5), P(2, -2), Q(5, -4), R(0, -5)$

3. Write a ~~flow proof~~ two column proof.

Given: $\overline{RS} \cong \overline{TS}$

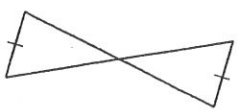
V is the midpoint of $\overline{RT}$.

Prove: $\triangle RSV \cong \triangle TSV$



Determine which postulate can be used to prove that the triangles are congruent. If it is not possible to prove that they are congruent, write *not possible*.

4.



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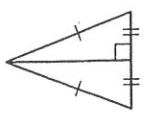

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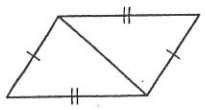
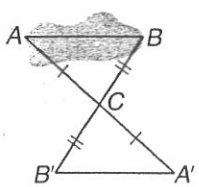


7. **INDIRECT MEASUREMENT** To measure the width of a sinkhole on his property, Harmon marked off congruent triangles as shown in the diagram. How does he know that the lengths $A'B'$ and AB are equal?



4-5 Proving Congruence – ASA, AAS

Included side:

Angle-Side-Angle Congruence Postulate (ASA post):

Angle-Angle-Side Congruence Theorem (AAS thm):

Proof of AAS Theorem:

Given:

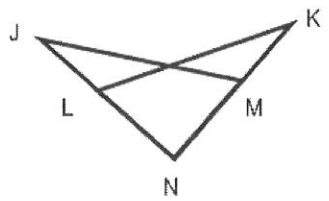
Proof:

Statement	Reason
1.	1.
2.	2.
3.	3.

Write a proof:

Given: $\angle NKL \cong \angle NJM, \overline{KL} \cong \overline{JM}$

Prove: $\overline{LN} \cong \overline{MN}$



Statement	Reason
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

NAME _____ DATE _____ PERIOD ____

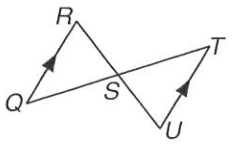
4-5 Practice

Proving Congruence—ASA, AAS

1. Write a two column proof.

Given: S is the midpoint of $\overline{QT}$.
$\overline{QR} \parallel \overline{TU}$

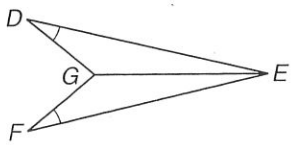
Prove: $\triangle QSR \cong \triangle TSU$



2. Write a two column proof.

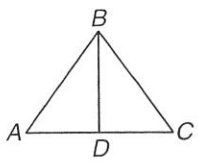
Given: $\angle D \cong \angle F$
$\overline{GE}$ bisects $\angle DEF$.

Prove: $\overline{DG} \cong \overline{FG}$



ARCHITECTURE For Exercises 3 and 4, use the following information.

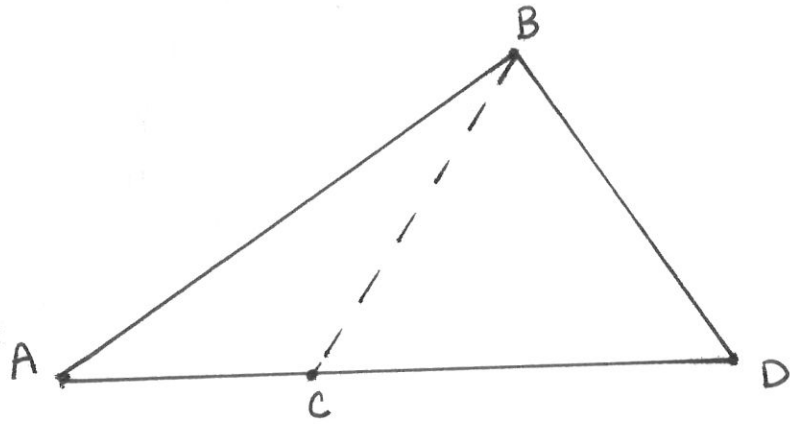
An architect used the window design in the diagram when remodeling an art studio. $\overline{AB}$ and $\overline{CB}$ each measure 3 feet.



3. Suppose D is the midpoint of $\overline{AC}$. Determine whether $\triangle ABD \cong \triangle CBD$. Justify your answer.

4. Suppose $\angle A \cong \angle C$. Determine whether $\triangle ABD \cong \triangle CBD$. Justify your answer.

4-5 Proving Congruence- ASS



Given: $\overline{BC} \cong \overline{BD}$

Prove: $\triangle ABC \cong \triangle ABD$

Statement	Reason
1.	1.
2.	2.
3.	3.
4.	4.

ASS Congruence Postulate:

4-5 Congruence in Right Triangles
Activity pgs. 214 to 215

Goal: Complete Activities 1 and 2 by answering the questions 1-6 in groups. Compare the Right Triangle Congruence theorems and postulates to the theorems and postulates we have already learned. Identify one we have not learned and record it in your notebook.
Challenge: Write a two-column proof for #10 &11

Activity 1:

1a.
b.
c.

2a.
b.
c.

3.

Activity 2:

Step 1: XY = 7cm
Step 2: YZ ⊥ XY
Step 3: XZ = 10 cm

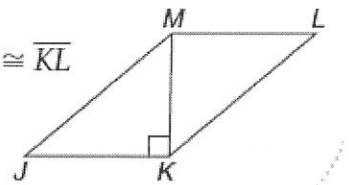
4.
5.
6.

Hypotenuse-Leg Congruence (HL Post): If the hypotenuse and a leg of one right triangle are congruent to the hypotenuse and corresponding leg of another right triangle, then the triangles are congruent.

Use the figure to write a two-column proof.

10. Given: $\overline{ML} \perp \overline{MK}, \overline{JK} \perp \overline{KM}$
$\angle J \cong \angle L$
Prove: $\overline{JM} \cong \overline{KL}$

11. Given: $\overline{JK} \perp \overline{KM}, \overline{JM} \cong \overline{KL}$
$\overline{ML} \parallel \overline{JK}$
Prove: $\overline{ML} \cong \overline{JK}$



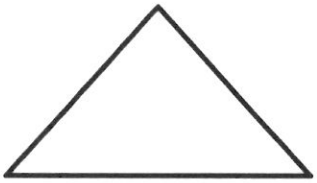
10. Statement	Reason

11. Statement	Reason

Summary of Methods to Prove Triangle Congruence

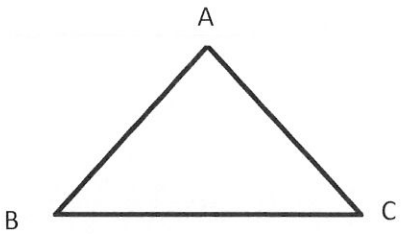
4-6 Isosceles Triangles

Vertex Angle:



Base Angles:

Isosceles Triangle Theorem (4.9):



Proof of the Isosceles Triangle Theorem

Given: $\overline{AB} \cong \overline{AC}$

Prove:

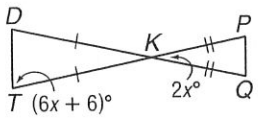
Statement	Reason
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.

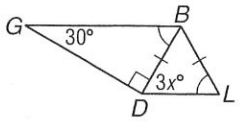
Converse of the Isosceles Triangle Theorem (4.10):

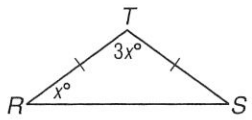
Corollaries

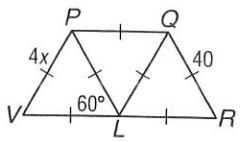
4.3	4.4

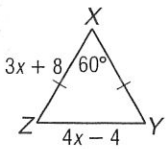
Practice: Find x

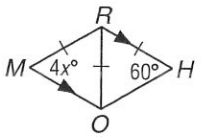
1. 

2. 

3. 

4. 

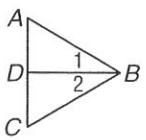
5. 

6. 

7. Write a two-column proof.

Given: $\triangle ABC$ is equilateral; $\angle 1 \cong \angle 2$.

Prove: $\angle ADB \cong \angle CDB$



Proof:

Statements	Reasons

HW: pgs 219-220 #15-29, 35-37

NAME _____ DATE _____ PERIOD ____

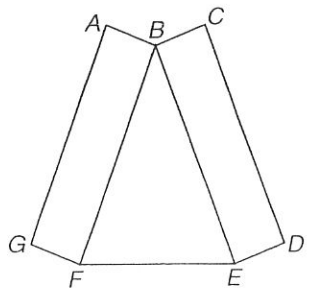
4-6 Enrichment

Triangle Challenges

Some problems include diagrams. If you are not sure how to solve the problem, begin by using the given information. Find the measures of as many angles as you can, writing each measure on the diagram. This may give you more clues to the solution.

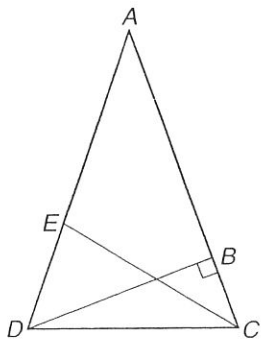
1. Given: $BE = BF$, $\angle BFG \cong \angle BEF \cong \angle BED$, $m\angle BFE = 82$ and $ABFG$ and $BCDE$ each have opposite sides parallel and congruent.

Find $m\angle ABC$.



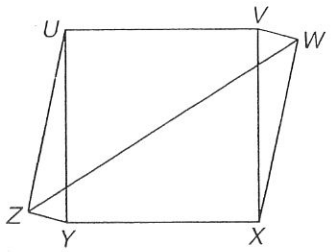
2. Given: $AC = AD$, and $\overline{AB} \perp \overline{BD}$, $m\angle DAC = 44$ and $\overline{CE}$ bisects $\angle ACD$.

Find $m\angle DEC$.



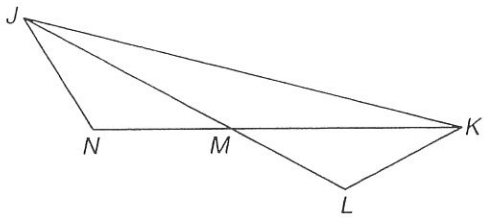
3. Given: $m\angle UZY = 90$, $m\angle ZWX = 45$, $\triangle YZU \cong \triangle VWX$, $UVXY$ is a square (all sides congruent, all angles right angles).

Find $m\angle WZY$.



4. Given: $m\angle N = 120$, $\overline{JN} \cong \overline{MN}$, $\triangle JNM \cong \triangle KLM$.

Find $m\angle JKM$.



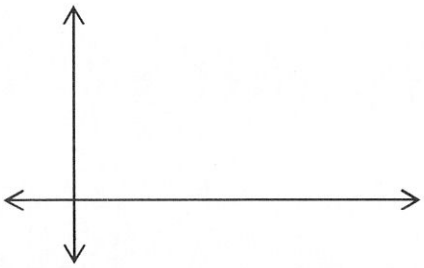
4-7 Triangles and Coordinate Proof

Coordinate proof:

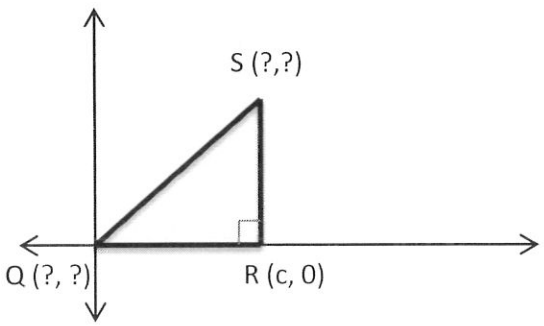
Placing Figures on the Coordinate Plane:

1.
2.
3.
4.

Example 1: Position and label isosceles triangle JKL on a coordinate plane so that base $\overline{JK}$ is a units long.



Example 2: Name the missing coordinates of isosceles right ΔQRS.



Write Coordinate Proofs: We can use coordinate proof to verify properties and to prove theorems.

The most common formulas used in coordinate proof:

1.

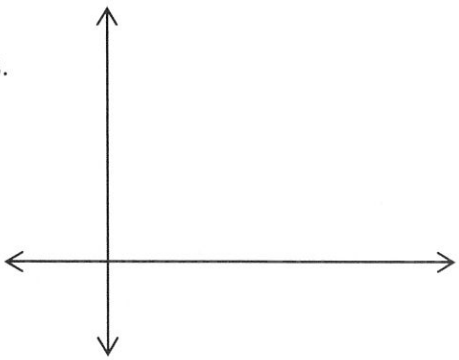
2.

3.

Example 3: Coordinate Proof

a: Write a coordinate proof to prove that the segment that joins the vertex of the right angle in a right triangle to the midpoint of the hypotenuse is one-half the measure of the hypotenuse.

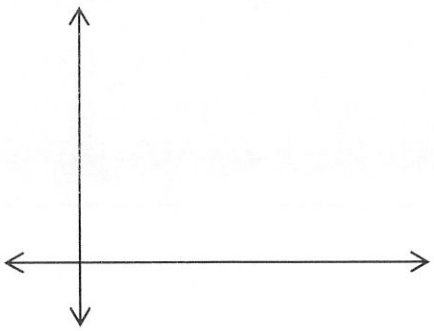
Step 1: Place the figure on the coordinate plane.
Step 2: Label the vertices and use variables for unknown coordinates.
(Hint: Use multiples of 2 when using the Midpoint Formula)
Step 3: Write the given and what you need to prove.
Step 4: Prove using a formula.



Given:

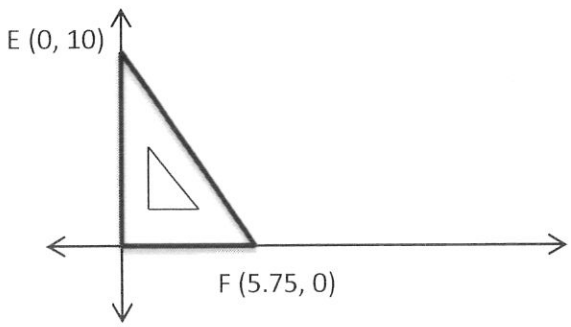
Prove:

b: Write a coordinate proof to prove that the segment that joints the vertex angle of an isosceles triangle to the midpoint of its base is perpendicular to the base.



Example 4: Classify Triangles

Write a coordinate proof to prove that this drafter's tool is shaped like a right triangle. The length of one side is 10 inches and the length of another side is 5.75 inches.



HW: pgs 224-225 #11-27 odd (Hint: #25 → Use Midpt. & slope; #27 → Use distance formula)

Name:_____ Period: ____

Chapter 4: Congruent Triangles Date: 1/19/12

Part 1: True or False

_____1. In a right triangle more than one angle can be right.

_____2. An isosceles triangle can be equilateral but an equilateral triangle cannot be isosceles.

_____3. The sums of the two remote interior angles are greater than its exterior angle.

_____4. A statement that can be easily proved using a theorem is called a corollary.

_____5. Triangles that are different sizes but the same shape are congruent.

_____6. The three congruence transformations are slide, flip, and turn.

_____7. The angle made by two lines that share a common vertex is an included angle.

_____8. Four methods to prove triangle congruence are SAS, SSS, ASS, and AAS.

_____9. If two angles in a triangle are congruent, the triangle is isosceles.

_____10. If the sides of one triangle are congruent to the sides of another triangle, then the triangles are congruent.

Part 2: Fill in the Blank

1. A _____ _____ uses figures in a coordinate plane and algebra to prove geometric concepts.
2. The angle formed by the congruent sides of a isosceles triangle is called the _____ _____.
3. The side between two given angles is called the _____ _____ .
4. The interior angles of the triangle not adjacent to a given exterior angle are called _____ _____ _____.
5. Three ways to classify a triangle by its sides are _____, _____, and _____.

Part 3: Multiple Choice

1. How many acute angles must an acute triangle have?
a.1 b. 2 c.3 d.0

2. Which postulate states that if the hypotenuse and the leg of one triangle are congruent to the hypotenuse and leg of another triangle then the triangles are congruent?
a. Leg-leg ≅ b. Hypotenuse angle ≅ c. Leg-angle ≅ d. Hypotenuse-leg ≅

3. How many obtuse angles must an obtuse triangle have?
a. 1 b. 2 c. 3 d. 0

Name:_____ Period: _____

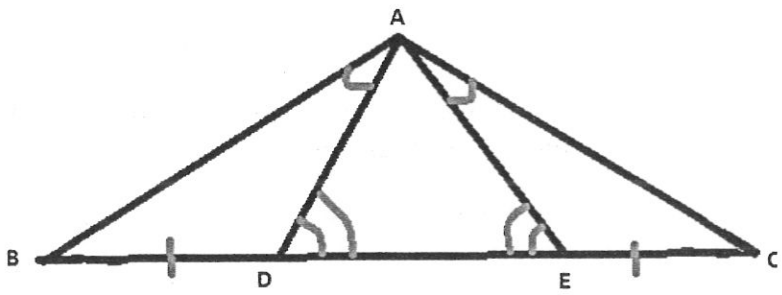
Chapter 4: Congruent Triangles Date: 1/19/12

Part 4: Short Answer

1. What are 4 methods to prove triangle congruence and give each ones explanation.

Part 5: Use a Two-Column Proof to Answer the Question in the Space Provided.

1. Given: <BAD≅<CAE, <ADE≅<AED, Side BD≅ Side CE
   Prove: Triangle BAD ≅ Triangle CAE



Statements	Reasons

Geometry Chapter 4 Notes:

1)CPCTC	*Corresponding Parts of Congruent Triangles are Congruent*
2)Angle Sum Thm.	*Interior angles of a Δ add up to 180°.*
3)3rd Angle Thm.	*If 2 angles of 2 triangles are ≅, then the 3rd angles are ≅.*
4)Exterior Angle Thm.	*Exterior angles of a Δ are = the sum of the remote interior angles.*
5)Δ Congruence	*Reflexive, Symmetric, and Transitive Properties of ≅ apply to Δ's.*
6)SSS Post.	*2 Δ's are ≅ if all 3 of their sides are ≅.*
7)SAS Post.	*2 Δ's are ≅ if 2 sides and the included angle are ≅.*
8)ASA Post.	*2 Δ's are ≅ if 2 angles and the included side are ≅.*
9)AAS Thm.	*2 Δ's are ≅ if 2 angles and the non-included side are ≅.*
10)Hypothesis Leg Postulate	*2 right Δ's are ≅ if hypotenuse and corresponding leg are ≅.*
11)Isosceles Δ Thm.	*If a Δ has 2 ≅ sides, its opposite angles are ≅.*
12)Conv. Isosceles Δ Thm.	*If a Δ has 2 ≅ angles, its opposite sides are ≅.*
13)Corollary 4.1	*The acute angles of a right Δ are complementary.*
14)Corollary 4.2	*A Δ can have at most 1 right/obtuse angle.*
15)Corollary 4.3	*An equilateral Δ is always equiangular, and vice versa.*
16)Corollary 4.4	*Each angle of an equiangular Δ is 60°.*

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8th Grade Challenge Geometry