Math 2 Honors Name:_____ Block:_____

Unit 3: Triangle Congruence

Unit 3 Main Objectives:

- ☐ I can compare congruence to rigid motions.
- ☐ I can demonstrate that two figures are congruent by using one or more rigid motions to map one onto the other.
- ☐ I can use triangle congruence to solve problems.
- ☐ I can apply properties and theorems about isosceles and equilateral triangles to solve problems.
- ☐ I can prove triangles are congruent by identifying corresponding parts and applying correct congruence theorems.
- ☐ I can write triangle congruence statements.
- ☐ I can justify statements of a proof with definitions,theorems, and properties.
- ☐ I can explain that corresponding parts of congruent triangles are congruent.
- ☐ I can apply congruence criteria to intricate problems involving overlapping triangles and multiple triangles.

Key Vocabulary: I can define the following vocabulary terms.

☐ Congruent	☐ Rigid Motion	☐ Corresponding
☐ ASA	☐ SAS	☐ AAS
☐ HL	☐ SSS	☐ Hypotenuse
☐ Bisector	☐ Leg	☐ CPCTC
☐ Isosceles	☐ Equilateral	☐ Criteria
☐ Postulate	☐ Theorem	☐ Reflexive
☐ Vertical Angles	☐ Midpoint	☐ Alternate Interior

Day 1 - CONGRUENCE STATEMENTS

Explore and Reason

Some corporate logos are distinctive because they make use of repeated shapes.

Part A: Bolt company wants to update their logo. Draw a new logo next to the original.

Original Image

New Logo

Part B: The owner of the company says "I like your designs, but it is important that the logo be the same size and same shape as the original image." What would you do to comply with the owner's requirement?

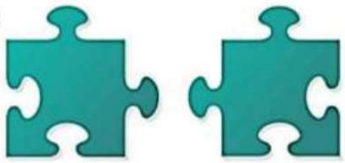
Part C: Is comparing the measures of all the angles in the preimage and in the image sufficient to guarantee the figures are congruent?

EXAMPLE 4 Determine Congruence

Which pairs of objects are congruent? If a pair of objects is congruent, describe a composition of rigid motions that maps one to the other.

(Complete Try It 4 on Pg. 250)

A.



congruent, reflection

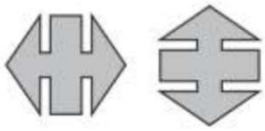
B.

NO!

C.

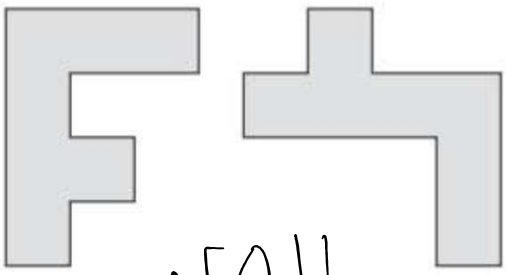
congruent, reflect and rotate

a.



congruent, rotation

b.



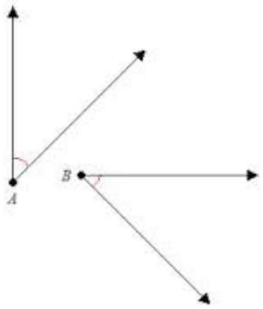
NO!!

Congruence: Guided Notes

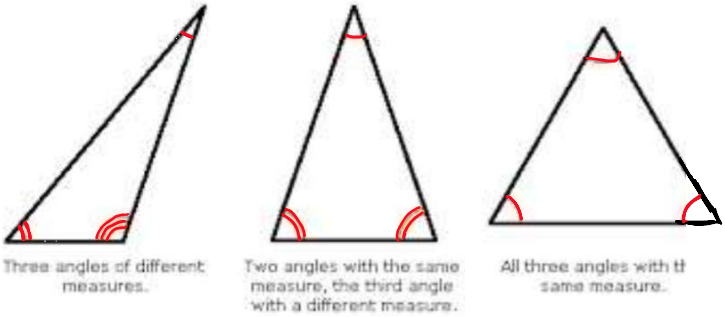
Congruent Angles

→ Angles can be marked with angle markings to determine congruent and non-congruent angles.

Ex.)

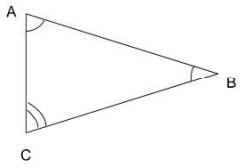


Ex.)

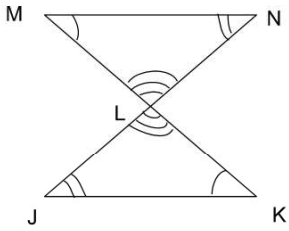


You Try: Which angles are congruent to each other based off of the markings?

∠A and ∠B are congruent.



You Try: Which angles are congruent to each other based off of the markings?



∠M and ∠K are congruent.

∠L and ∠L are congruent.

∠J and ∠N are congruent.

Congruent Figures (The symbol for "congruent" is ≅)

→ Figures can be stated as congruent using a congruency statement, or a marked picture.

→ If two figures are congruent, then all corresponding sides and angles are also congruent.

→ When naming sides and angles, ORDER MATTERS! Corresponding congruent angles and sides are always named in the same order.

Ex.) Given △ABC ≅ △WXY

a. ∠B ≅ ∠X

b. ∠Y ≅ ∠C

c. ∠BCA ≅ ∠XYW

d. ∠YXW ≅ ∠CBA

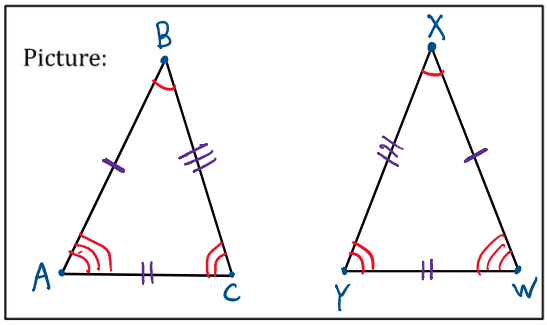
e. $\overline{AB}$ ≅ $\overline{WX}$

f. $\overline{WY}$ ≅ $\overline{AC}$

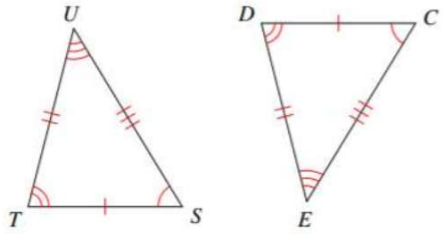
g. $\overline{BC}$ ≅ $\overline{XY}$

h. $\overline{YX}$ ≅ $\overline{CB}$

Picture:



You Try: Complete all congruency statements based on the diagram below:



a. $\triangle STU \cong$ $\triangle CDE$

b. $\angle U \cong$ $\angle E$

c. $\angle S \cong$ $\angle C$

d. $\angle T \cong$ $\angle D$

e. $\angle TUS \cong$ $\angle DEC$

f. $\overline{UT} \cong$ $\overline{ED}$

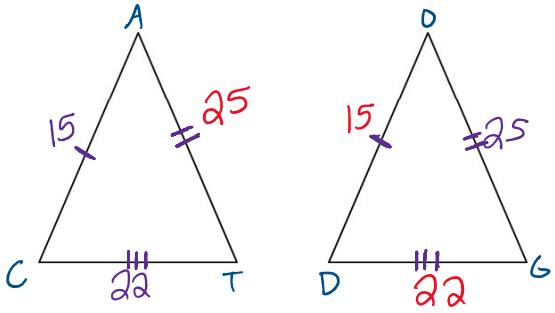
g. $\overline{EC} \cong$ $\overline{US}$

h. $\overline{DE} \cong$ $\overline{TU}$

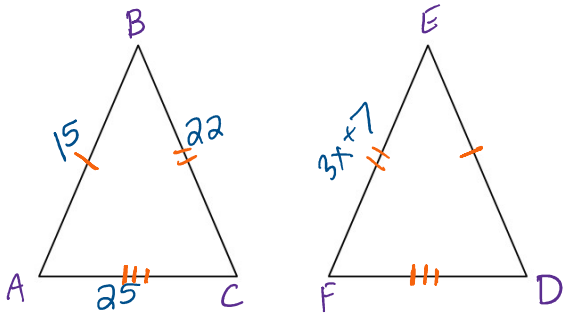
i. $\overline{ST} \cong$ $\overline{CD}$

Finding Missing Sides/ Angles of Congruent Figures

Ex.) Given $\triangle CAT \cong \triangle DOG$, $\overline{AC} = 15$, $\overline{CT} = 22$, and $\overline{OG} = 25$. Using this information, label both triangles and then find the lengths of $\overline{AT}$, $\overline{DG}$, and $\overline{OD}$.



Ex.) Given $\triangle ABC \cong \triangle DEF$, $\overline{AB} = 15$, $\overline{BC} = 22$, $\overline{AC} = 25$, $\overline{EF} = 3x + 7$. Label the triangles and set up an equation to solve for the value of x and $\overline{EF}$



$\overline{EF} = 22$

$3x + 7 = 22$

$-7 \quad -7$

$\frac{3x}{3} = \frac{15}{3}$

$x = 5$

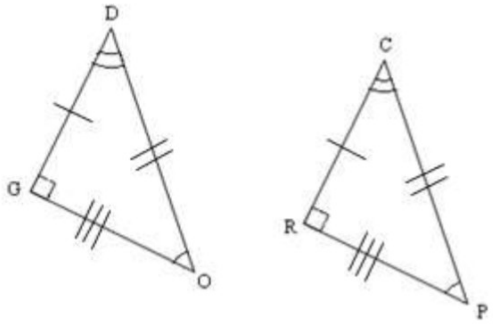
You Try! Classwork

1. Given that If △ARN ≅ △JKL, complete the congruence statements

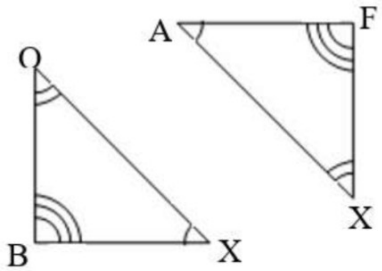
a. ∠L = ∠N b. ∠A= ∠J c. $\overline{AN}$= $\overline{JL}$ d. $\overline{JK}$= $\overline{AR}$

Name the following triangles in corresponding order.

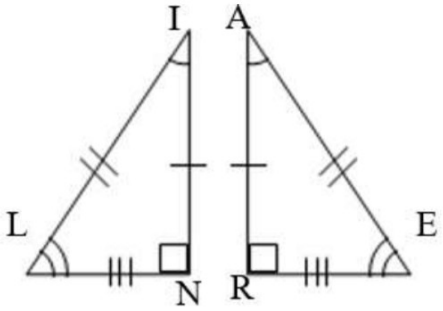
2. △ODG ≅ △PCR



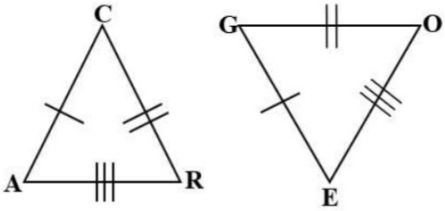
3. △BOX ≅ △FXA



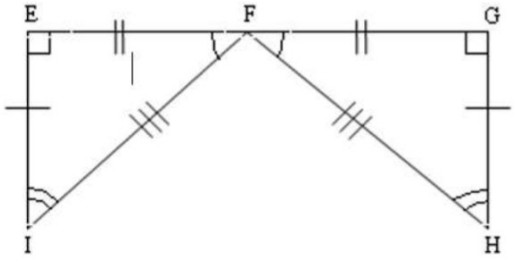
4. △LIN ≅ △EAR



5. △CAR ≅ △GEO



6. △FEI ≅ △FGH

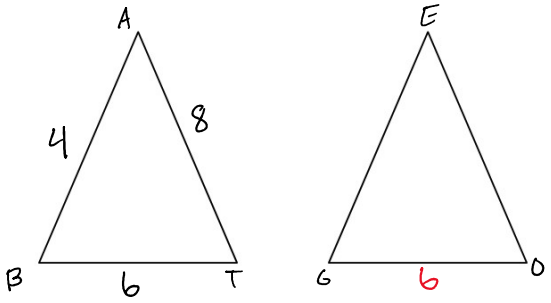


a. ∠EFI ≅ ∠GFH d. $\overline{FG}$≅ $\overline{FE}$

b. ∠G ≅ ∠E e. $\overline{GH}$≅ $\overline{EI}$

c. ∠H ≅ ∠I f. $\overline{FH}$≅ $\overline{FI}$

7. $\Delta BAT \cong \Delta GEO$, $\overline{AB} = 4$, $\overline{BT} = 6$, and $\overline{AT} = 8$. What is the length of $\overline{GO}$? How do you know?



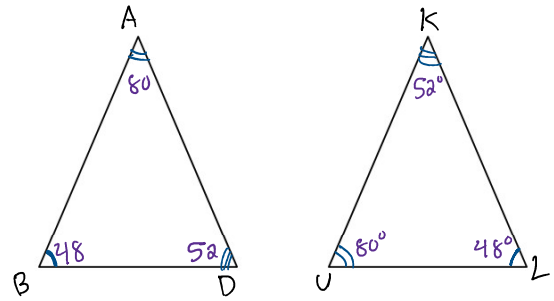
$\overline{GO} \cong \overline{BT}$

$\overline{BT} = 6$ so $\overline{GO} = 6$

8. $\Delta BAD \cong \Delta LUK$, $m\angle D = 52°$, $m\angle B = 48°$, and $m\angle A = 80°$

a. What is the largest angle of ΔLUK? $\angle U$

b. What is the smallest angle of ΔLUK? $\angle L$

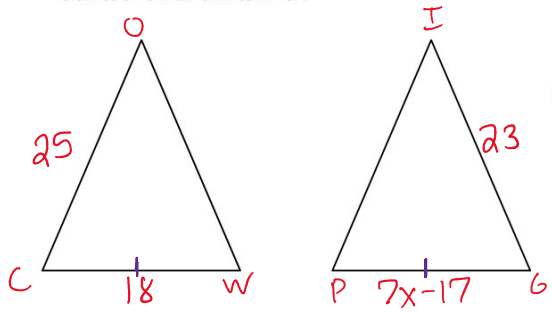


9. If $\Delta COW \cong \Delta PIG$, and $\overline{CO} = 25$, $\overline{CW} = 18$, $\overline{IG} = 23$, and $\overline{PG} = 7x - 17$. Find the value of x and $\overline{PG}$.

$7x - 17 = 18$

$7x = 35$

$x = 5$



x = 5

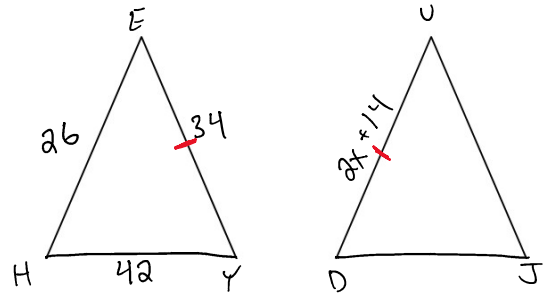
PG = 18

10. Given $\triangle HEY \cong \triangle JUD$, $\overline{HE}$=26, $\overline{HY}$=42, $\overline{EY}$ = 34, and $\overline{DU}$ = 2x+14, find x.

$2x + 14 = 34$

$2x = 20$

$x = 10$

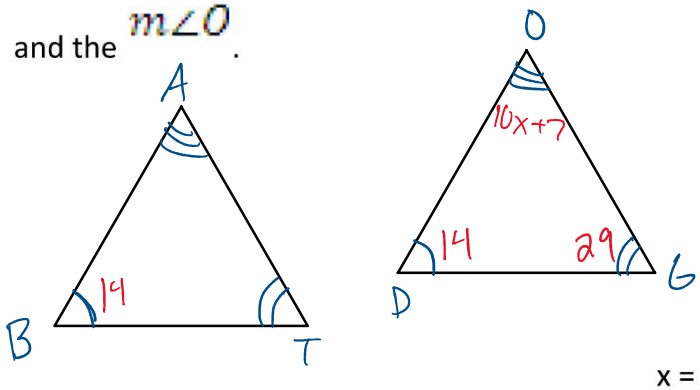


x = 10

DU = 34

Draw and label a diagram. Then solve for the variable and the missing measure or length.

1. If $\Delta BAT \cong \Delta DOG$, and $m\angle B = 14,\ m\angle G = 29,\ and\ m\angle O = 10x + 7$. Find the value of x and the $m\angle O$.



$14 + 29 + 10x + 7 = 180$

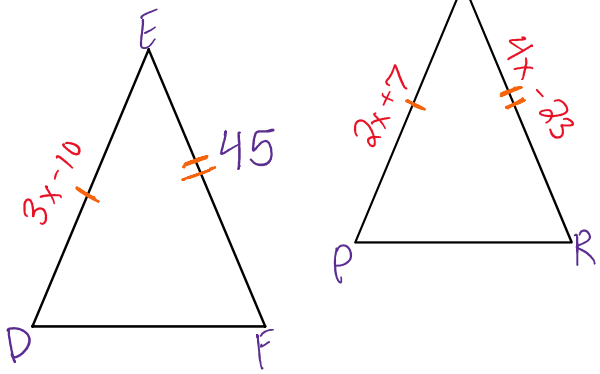
$10x + 50 = 180$

$10x = 130$

$x = 13$

x = 13 $m\angle O$ = 137°

2. If $\Delta DEF \cong \Delta PQR$ and $DE = 3x - 10, QR = 4x - 23, and\ PQ = 2x + 7$. Find the value of x and EF.



$3x - 10 = 2x + 7$

$x - 10 = 7$

$x = 17$

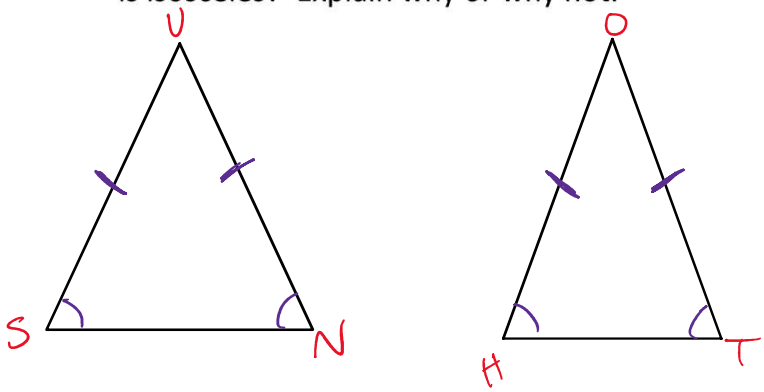
$4(17) - 23$

$68 - 23$

45

x = 17 EF = 45

3. $\Delta SUN \cong \Delta HOT$. ΔSUN is isosceles. Is there enough information to determine if ΔHOT is isosceles? Explain why or why not.



$\overline{SU} \cong \overline{HO}$

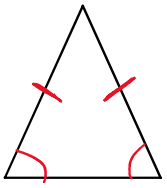
$\overline{UN} \cong \overline{OT}$

$\angle S \cong \angle H$

$\angle N \cong \angle T$

Yes, b/c of congruency statement.

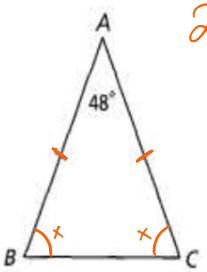
Day 2 - ISOSCELES TRIANGLE THEOREM



Isosceles Triangle Theorem:

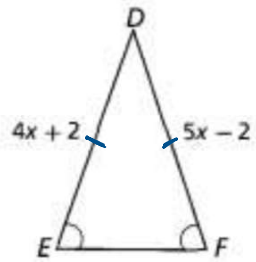
- Isosceles triangles have two congruent sides and two congruent angles.
- **Isosceles Triangle Theorem:** If two sides of a triangle are congruent, then the two opposite angles will be congruent.
- It works the other way too! If two angles in a triangle are congruent, then the two opposite sides will be congruent.

1. Find $m\angle B$



$2x + 48 = 180$
$-48 \quad -48$
$2x = 132$
$\frac{2x}{2} = \frac{132}{2}$
$x = 66$
$m\angle B = 66°$

2. Find $\overline{DF}$

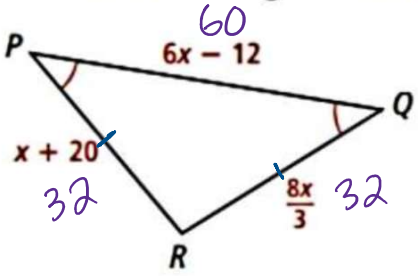


$4x + 2 = 5x - 2$
$-4x \quad +2 \quad -4x \quad +2$
$4 = x$

$\overline{DF} = 5(4) - 2$
$= 20 - 2$
$\overline{DF} = 18$

EXAMPLE 3 Use the Converse of the Isosceles Triangle Theorem

What are the lengths of all three sides of the triangle?

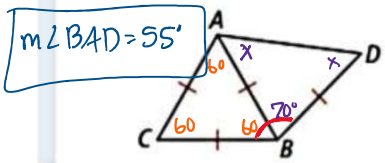


$3(x + 20) = \frac{8x}{3}(3)$
$3x + 60 = 8x$
$-3x \quad -3x$
$60 = 5x$
$12 = x$

- Similar rules apply for equilateral triangle but now all sides are equal and all angles are equal with a measure of 60 degrees.

EXAMPLE 6 **Find Angle Measures in Isosceles and Equilateral Triangles**

A. If $m\angle CBD = 130$, what is $m\angle BAD$?



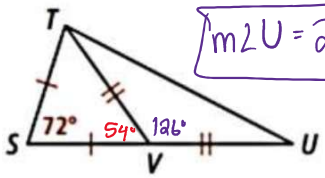
$m\angle BAD = 55°$

$2x + 70 = 180$
$2x = 110$
$x = 55$

$m\angle CBA + m\angle ABD = m\angle CBD$
$60 + m\angle ABD = 130$
$m\angle ABD = 70°$

B. What is $m\angle U$?

$2x + 72 = 180$
$2x = 108$
$x = 54$



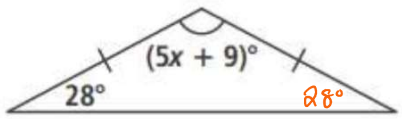
$m\angle U = 27°$

$2y + 126 = 180$
$2y = 54$
$y = 27$

Try It! Use the Isosceles Triangle Theorem

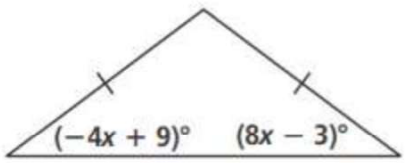
2. What is the value of x?

a.



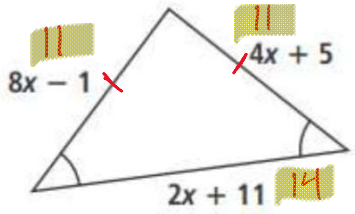
$28 + 28 + 5x + 9 = 180$
$65 + 5x = 180$
$5x = 115$
$x = 23$

b.



$-4x + 9 = 8x - 3$
$+4x \quad +3 \quad +4x \quad +3$
$12 = 12x$
$1 = x$

3. Use the figure shown.

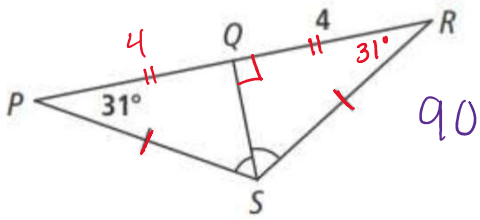


$8x - 1 = 4x + 5$
$-4x \quad +1 \quad -4x \quad +1$
$4x = 6$
$x = \frac{6}{4} = \boxed{\frac{3}{2}}$

a. What is the value of x?

b. What are the lengths of all three sides of the triangle?

4. Use the figure shown.



$90 + m\angle RSQ + 31 = 180$

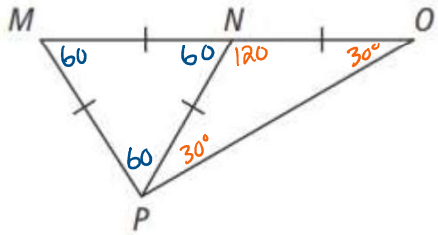
a. What is $m\angle RSQ$?

$m\angle RSQ = 59°$

b. What is PR?

$\overline{PR} = 8$

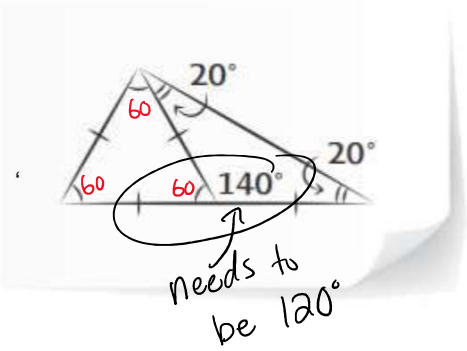
6. Find each angle measure in the figure.



a. $m\angle PNO = 120°$

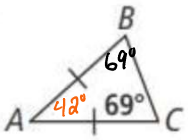
b. $m\angle NOP = 30°$

Error Analysis Nate drew the following diagram to represent an equilateral triangle and an isosceles triangle. What mistake did Nate make?

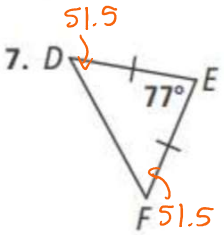


For Exercises 6 and 7, find the unknown angle measures.

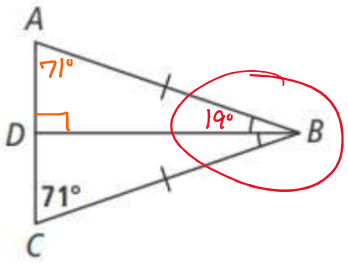
6.



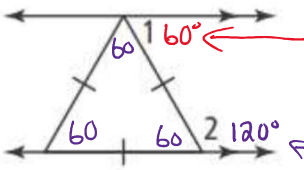
7.



10. What is $m\angle ABD$ in the figure?



12. Mathematical Connections What are the measures of $\angle 1$ and $\angle 2$? Explain.

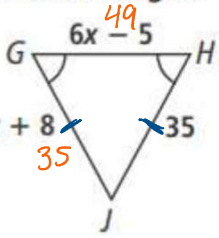


alternate interior angles

linear pair

For Exercises 8 and 9, find the lengths of all three sides of the triangle.

8.

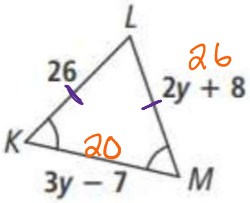


$35 = 3x + 8$

$27 = 3x$

$9 = x$

9.



$26 = 2y + 8$

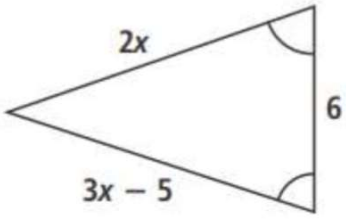
$18 = 2y$

$9 = y$

Day 3 - CONGRUENCE TRIANGLE POSTULATES

Warm- UP

15. **Error Analysis** Amaya is asked to find the side lengths of the triangle shown. What is her error?



$2x = 3x - 5$

From the top leg and the base, $2x = 6$, so $x = 3$. Substitute x into the expression for the bottom leg's length to get $3(3) - 5 = 4$.

X

Warm-Up: Complete the following! It is review for your quiz tomorrow!(:

1. Given $\triangle BAT \cong \triangle GEO$, $AB = 4x+2$, $BT = 6x+15$, and $GE = 18$. What is the length of GO?

$\overline{AB} \cong \overline{GE}$

$4x+2 = 18$

$4x = 16$

$x = 4$

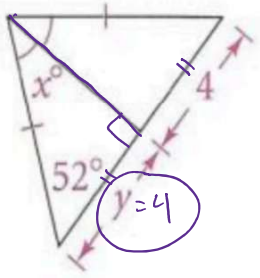
$\overline{BT} \cong \overline{GO}$

$6(4)+15$

$24+15$

$\overline{GO} = 39$

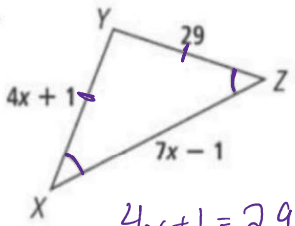
2.



$90 - 52 = 38$

$m\angle X = 38°$

3.

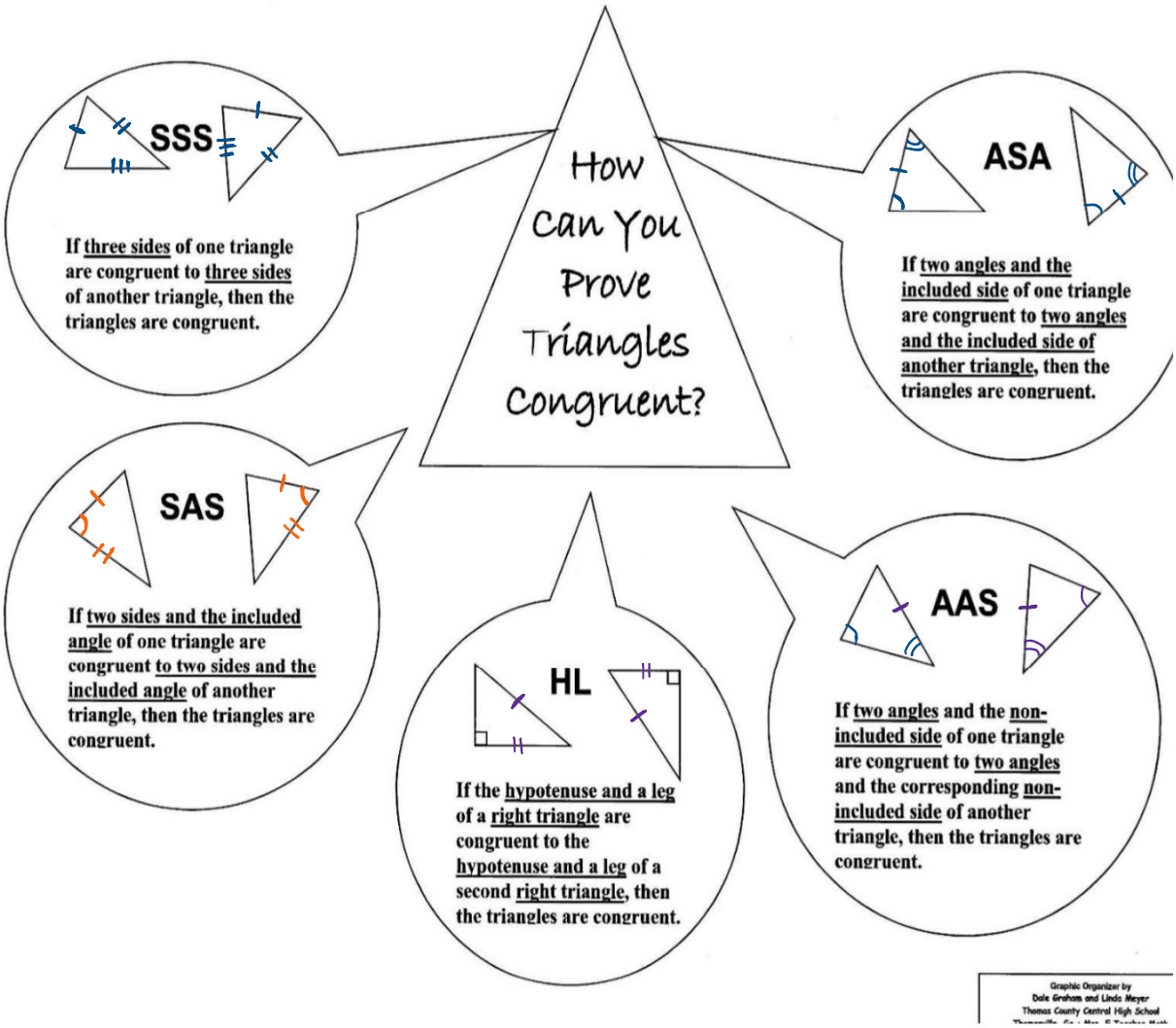


$4x+1 = 29$

$4x = 28$

$x = 7$

Take out your notes and a calculator!(:


How Can You Prove Triangles Congruent?
SSS
If three sides of one triangle are congruent to three sides of another triangle, then the triangles are congruent.
ASA
If two angles and the included side of one triangle are congruent to two angles and the included side of another triangle, then the triangles are congruent.
SAS
If two sides and the included angle of one triangle are congruent to two sides and the included angle of another triangle, then the triangles are congruent.
HL
If the hypotenuse and a leg of a right triangle are congruent to the hypotenuse and a leg of a second right triangle, then the triangles are congruent.
AAS
If two angles and the non-included side of one triangle are congruent to two angles and the corresponding non-included side of another triangle, then the triangles are congruent.
Graphic Organizer by
Dale Graham and Linda Meyer
Thomas County Central High School

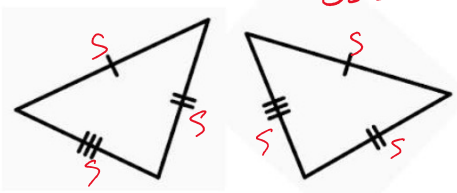
Lesson 3

SET

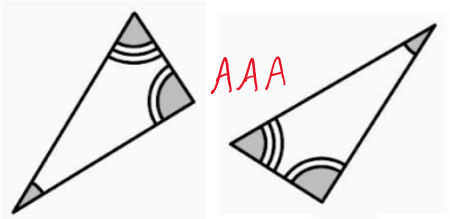
Topic: Triangle Congruence

Determine whether or not the triangles are congruent based on the markings that indicate congruence. For congruent triangles, list the congruence criteria that justifies why the triangles are congruent.

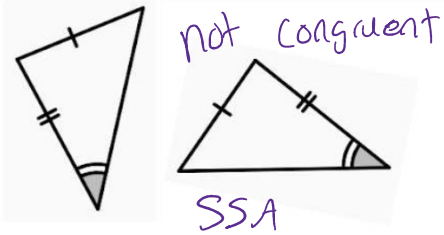
3. Congruent, SSS



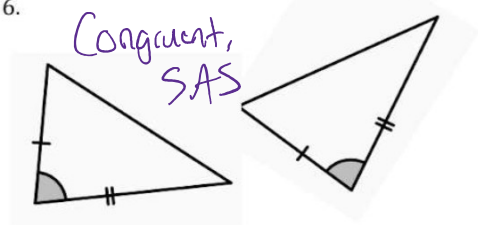
4. not congruent,



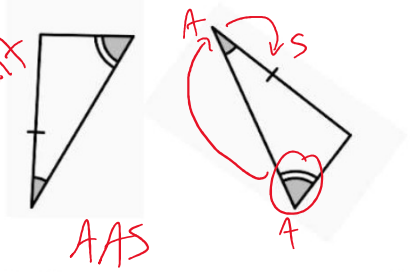
5. not congruent



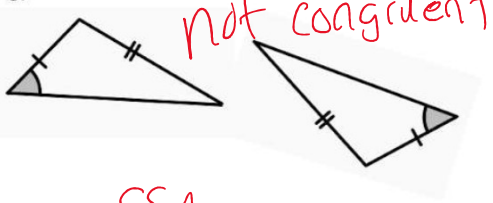
6. Congruent, SAS



7. Congruent

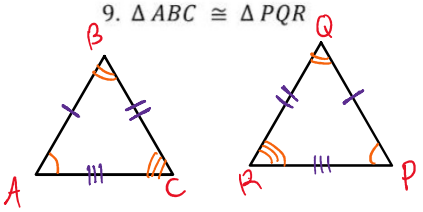


8. not congruent

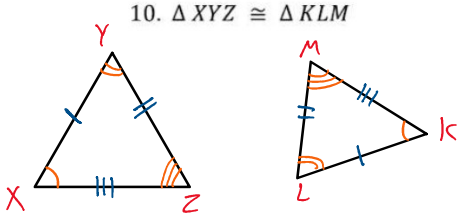


Use the given congruence statement to draw and label two triangles that have the proper corresponding parts congruent to one another.

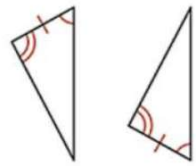
9. $\Delta ABC \cong \Delta PQR$

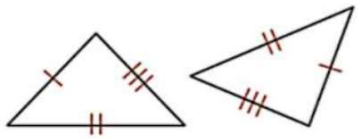


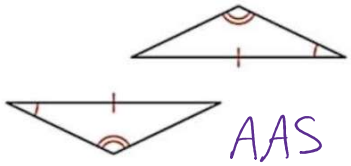
10. $\Delta XYZ \cong \Delta KLM$

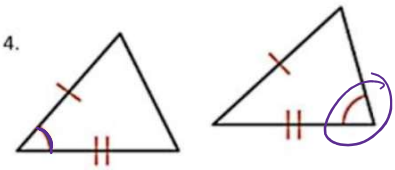


A. State whether each pair of triangles is congruent by SAS, SSS, ASA, or AAS, or if the congruence cannot be determined.

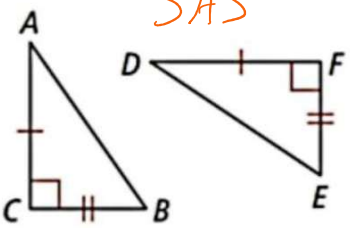
1.  ASA

2.  SSS

3.  AAS

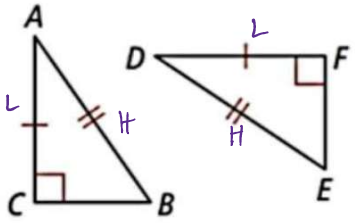
4.  not congruent ∴

When any two pairs of corresponding sides are congruent, can you show that two right triangles $\triangle ABC$ and $\triangle DEF$ are congruent? Explain.



SAS

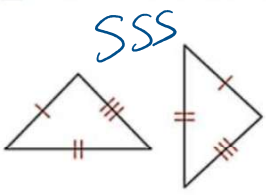
right angles are congruent to right angles

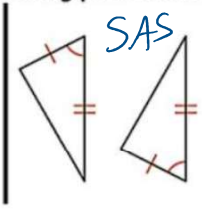


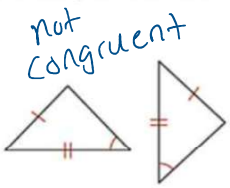
HL

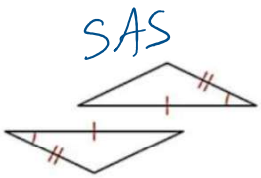
EXAMPLE 4 **Determine Congruent Triangles**

A. Which of the following pairs are congruent by SAS or SSS?

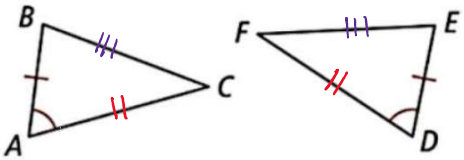
 SSS

 SAS

 not congruent

 SAS

B. What additional information is needed to show $\triangle ABC \cong \triangle DEF$ by SAS? By SSS?



For SAS:

$\overline{AC} \cong \overline{FD}$

For SSS:

$\overline{AC} \cong \overline{FD}$,

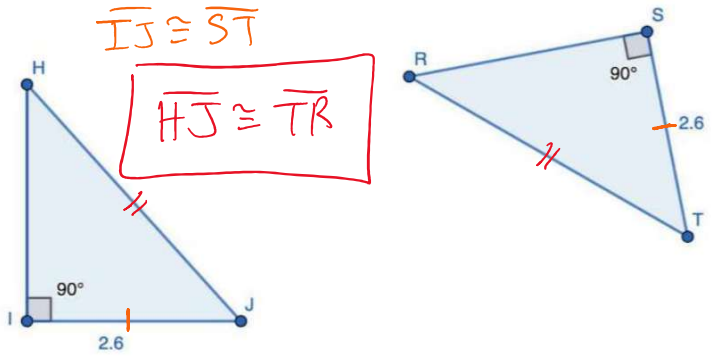
$\overline{FE} \cong \overline{BC}$

11. What fact(s) do we need to know in order to say that ΔHIJ ≅ ΔRST by HL?

Both Δ's are right triangles

$\overline{IJ} \cong \overline{ST}$

$\overline{HJ} \cong \overline{TR}$



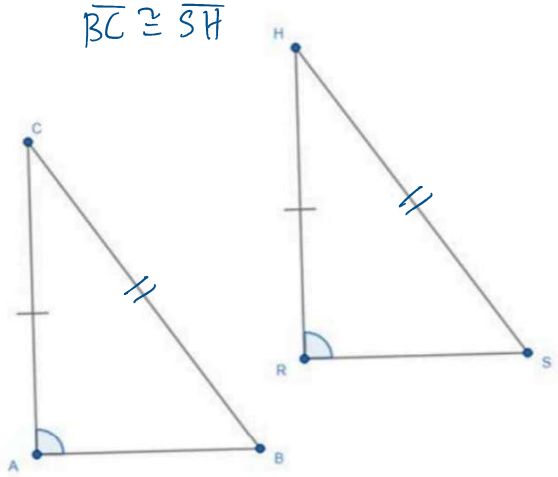
12. What fact(s) do we need to know in order to say Δ CAB ≅ ΔHRS

By ASA criteria: $\angle C \cong \angle H$

By AAS criteria: $\angle S \cong \angle B$

By HL criteria: $\angle A$ and $\angle R$ are right $\angle$'s.

$\overline{BC} \cong \overline{SH}$

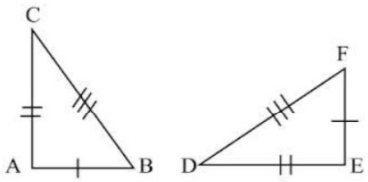


Page 21

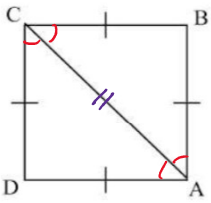
Triangle Congruence Shortcuts Worksheet #1

For each pair of triangles, tell which postulates, **if any**, make the triangles congruent.

12. $\triangle ABC \cong \triangle EFD$ SSS

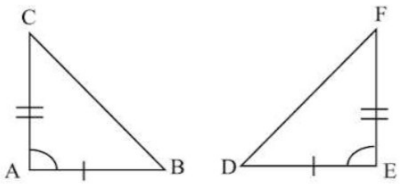


13. $\triangle ABC \cong \triangle CDA$ SAS

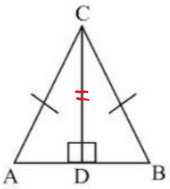


$\overline{CA} \cong \overline{AC}$ by the reflexive property

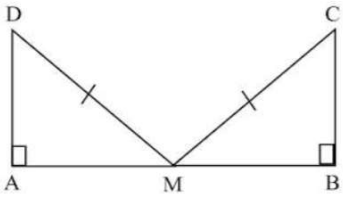
14. $\triangle ABC \cong \triangle EFD$ SAS



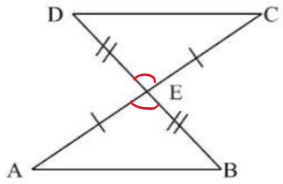
15. $\triangle ADC \cong \triangle BDC$ HL



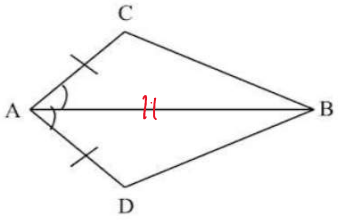
21. $\triangle MAD \cong \triangle MBC$ not enough info



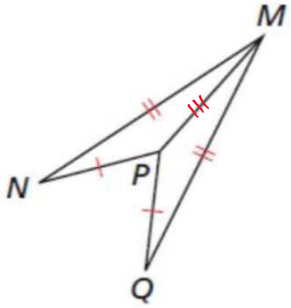
$\triangle ABE \cong \triangle CDE$ SAS



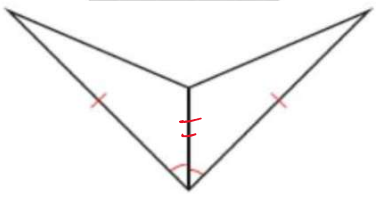
23. $\triangle ACB \cong \triangle ADB$ SAS



23. $\triangle MNP \cong \triangle MQP$ SSS



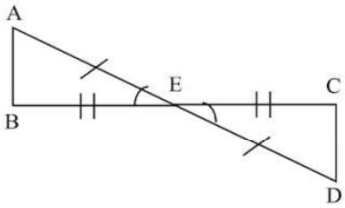
23. SAS



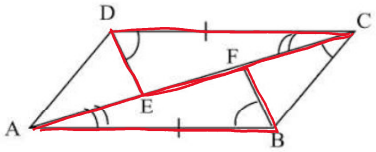
Triangle Congruence Shortcuts Worksheet #2

I. For each pair of triangles, tell which postulate, if any, can be used to prove the triangles congruent.

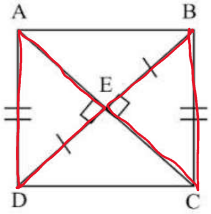
1. $\triangle AEB \cong \triangle DEC$ SAS



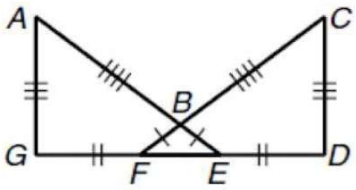
2. $\triangle CDE \cong \triangle ABF$ ASA



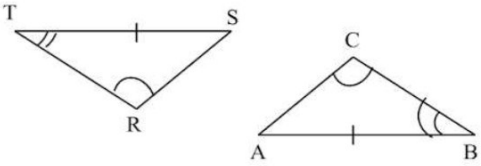
3. $\triangle DEA \cong \triangle BEC$ HL



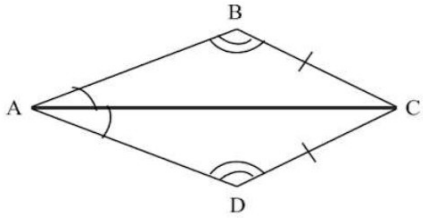
4. $\triangle AGE \cong \triangle CDF$ SSS



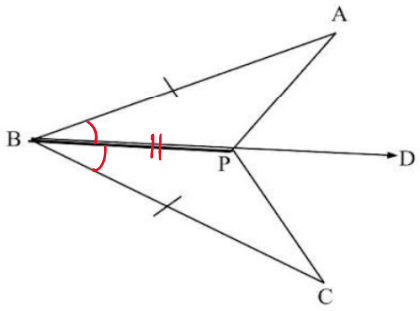
5. $\triangle RTS \cong \triangle CBA$ AAS



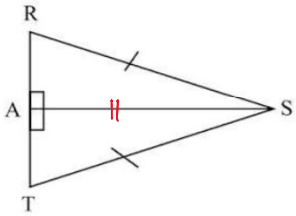
6. $\triangle ABC \cong \triangle ADC$ AAS



7. $\triangle BAP \cong \triangle BCP$ SAS
Given: $\overrightarrow{BD}$ bisects $\angle ABC$



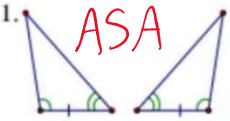
8. $\triangle SAT \cong \triangle SAR$ HL



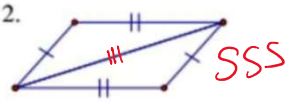
Unit 2- Triangle Congruence Postulates

I. If the triangles can be proven congruent, give the reason (SSS, SAS, ASA, or AAS). If there is not enough information to prove the triangles congruent, write "none."

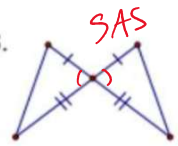
1. ASA



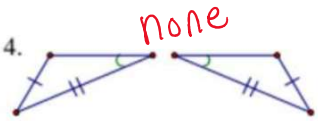
2. SSS



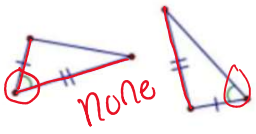
3. SAS



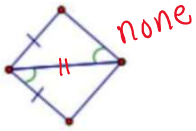
4. none



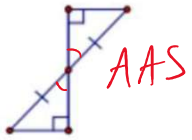
5. none



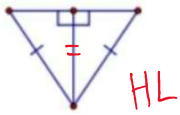
6. none



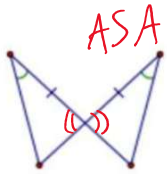
7. AAS



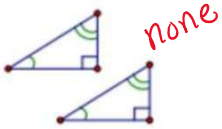
8. HL



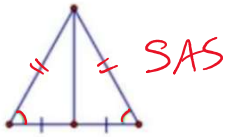
9. ASA



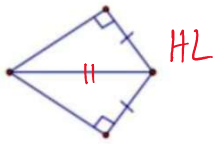
10. none



11. SAS

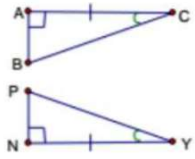


12. HL

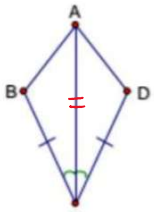


II. Determine whether you can conclude that another triangle is congruent to ΔABC.

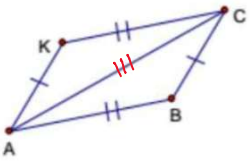
- If so, complete the congruence statement and give the reason (SSS, SAS, ASA, or AAS).
- If not, write "none."

1. 

$\Delta ABC \cong \Delta$ NPY
by ASA

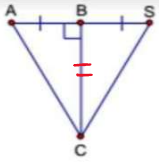
2. 

$\Delta ABC \cong \Delta$ ADC
by SAS

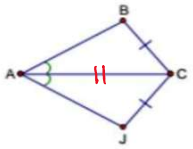
3. 

$\Delta ABC \cong \Delta$ CKA
by SSS

Day 4- CONGRUENCE TRIANGLE POSTULATES and START PROOFS

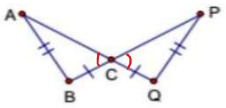
4. 

$\Delta ABC \cong \Delta$ SBC
by SAS

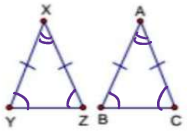
6. 

$\Delta ABC \cong \Delta$ _____
by _____

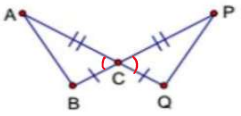
Not congruent

8. 

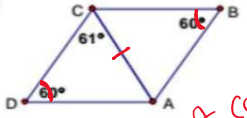
$\Delta ABC \cong \Delta$ non congruent
by _____

5. 

$\Delta ABC \cong \Delta$ XYZ
by ASA

7. 

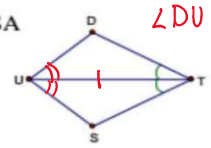
$\Delta ABC \cong \Delta$ PQC
by SAS

9. 

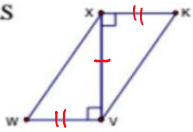
$\Delta ABC \cong \Delta$ _____
by _____

not congruent

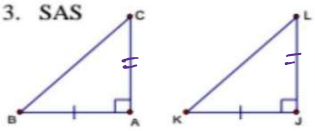
What additional information is required in order to know that the triangles are congruent by the given reason?

1. ASA 

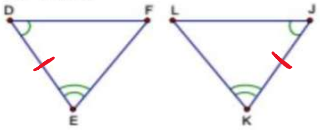
$\angle DUT \cong \angle SUT$

2. SAS 

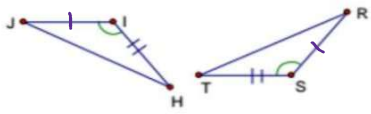
$\overline{XK} \cong \overline{WV}$

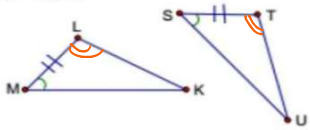
3. SAS 

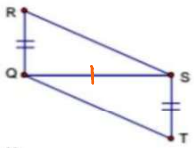
$\overline{AC} \cong \overline{JL}$

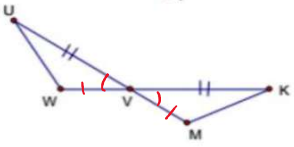
4. ASA 

$\overline{DE} \cong \overline{JK}$

5. SAS $\overline{JI} \cong \overline{RS}$ 

6. ASA $\angle L \cong \angle T$ 

7. SSS $\overline{QT} \cong \overline{RS}$ 

8. SAS 

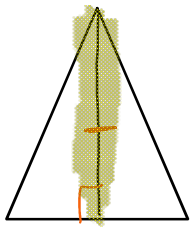
$\overline{WV} \cong \overline{MV}$

Congruence Proofs

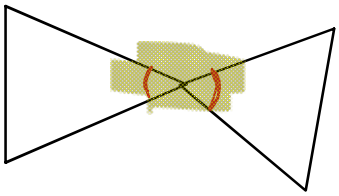
- Label everything on your picture!
  - Start with the given!
  - Add your own sides/angles as you go!

We must look for:

→ refluxive property



→ vertical angles



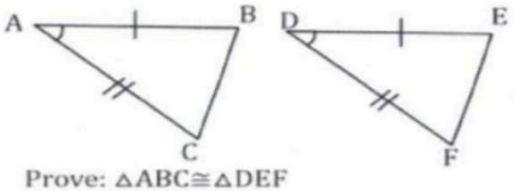
- Statement/reasoning: We need to explain our thinking process! Every step must have a reason!
  - Start with the given, our reason in the table will simply be given.
  - State all congruent sides or angles and how we know!
  - End with the prove statement.
  - Proving Triangles are Congruent: We must also say which congruence postulate allowed us to say that!

SSS, ASA, AAS, SAS, HL

  - Proving Sides or Angles are Congruent: We will use CPCTC!

Corresponding Parts of Congruent Triangles are Congruent.

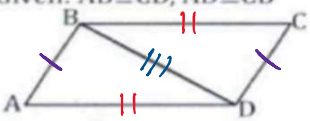
Given: $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, and $\angle A \cong \angle D$



Prove: $\triangle ABC \cong \triangle DEF$

Statements	Reasons
1. $\overline{AB} \cong \overline{DE}$	1. Given
2. $\overline{AC} \cong \overline{DF}$	2. Given
3. $\angle A \cong \angle D$	3. Given
4. $\triangle ABC \cong \triangle DEF$	4. SAS

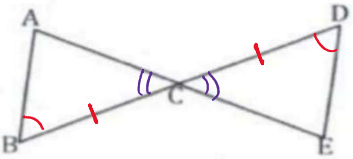
Given: $\overline{AB} \cong \overline{CD}$, $\overline{AD} \cong \overline{CB}$



Prove: $\triangle ABD \cong \triangle BCD$

Statements	Reasons
1. $\overline{AB} \cong \overline{CD}$	1. Given
2. $\overline{AD} \cong \overline{CB}$	2. Given
3. $\overline{BD} \cong \overline{BD}$	3. reflexive property
4. $\triangle ABD \cong \triangle CDB$	4. SSS

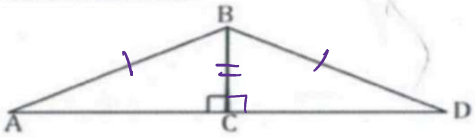
Given: $\overline{AE}$ Bisects $\overline{BD}$, $\angle B \cong \angle D$



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

Statements	Reasons
1. $\angle B \cong \angle D$	1. given
2. $\overline{AC}$ Bisects $\overline{BD}$	2. given
3. $\overline{BC} \cong \overline{DC}$	3. def of line bisector
4. $\angle ACB \cong \angle DCE$	4. vertical $\angle$'s
5. $\triangle ABC \cong \triangle DBC$	5. ASA

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



Prove: $\triangle ABD \cong \triangle BCD$

Statements	Reasons
1. $\overline{AB} \cong \overline{BD}$	1. given
2. $\overline{BC} \cong \overline{BC}$	2. reflexive property
3. $\triangle ABC \cong \triangle DBC$	3. HL

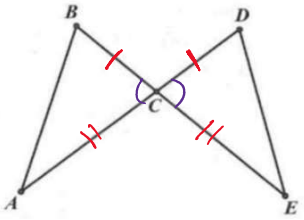
Day 5- PROOFS

Geometry, Unit 5 – Congruent Triangles Proof Activity – Part I Name _____

For each problem, do the following:

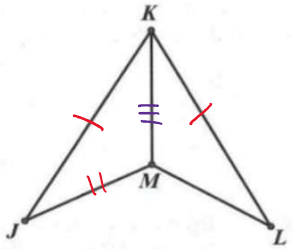
a. Show the given information in the diagram (using tick marks to show congruent sides and arcs to show congruent angles)
b. Show any other congruent parts you notice (from vertical angles, sides shared in common, or alternate interior angles with parallel lines)
c. Give the postulate or theorem that proves the triangles congruent (SSS, SAS, ASA, AAS, HL)
d. Finally, fill in the blanks to complete the proof.

1. Given: $\overline{BC} \cong \overline{DC}$; $\overline{AC} \cong \overline{EC}$
Prove: $\Delta BCA \cong \Delta DCE$



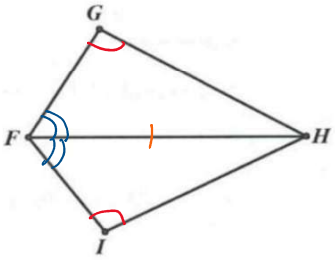
Statements	Reasons
1. $\overline{BC} \cong \overline{DC}$; $\overline{AC} \cong \overline{EC}$	1. Given
2. $\angle BCA \cong \angle DCE$	2. Vertical ∠s Theorem
3. $\Delta BCA \cong \Delta DCE$	3. SAS

2. Given: $\overline{JK} \cong \overline{LK}$; $\overline{JM} \cong \overline{LM}$
Prove: $\Delta KJM \cong \Delta KLM$



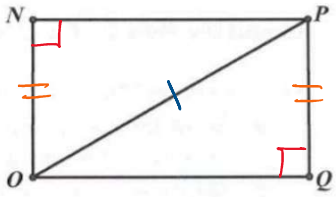
Statements	Reasons
1. $\overline{JK} \cong \overline{LK}$; $\overline{JM} \cong \overline{LM}$	1. Given
2. $\overline{KM} \cong \overline{KM}$	2. Reflexive Prop.
3. $\Delta KJM \cong \Delta KLM$	3. SSS

3. Given: $\angle G \cong \angle I$; $\overline{FH}$ bisects ∠GFI
Prove: $\Delta GFH \cong \Delta IFH$



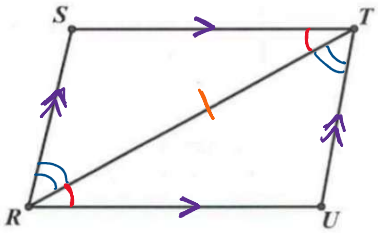
Statements	Reasons
1. $\angle G \cong \angle I$; $\overline{FH}$ bisects ∠GFI	1. Given
2. $\angle GFH \cong \angle IFH$	2. Def. of angle bisector
3. $\overline{FH} \cong \overline{FH}$	3. Reflexive Prop.
4. $\Delta GFH \cong \Delta IFH$	4. AAS

4. Given: ∠N and ∠Q are right angles; $\overline{NO} \cong \overline{PQ}$
Prove: $\Delta ONP \cong \Delta PQO$



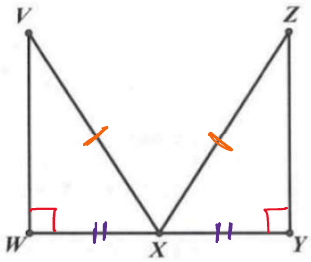
Statements	Reasons
1. ∠N and ∠Q are right angles	1. Given
2. ΔONP and ΔPQO are right triangles	2. Def. of right triangle
3. $\overline{OP} \cong \overline{PO}$	3. Reflexive Prop.
4. $\overline{NO} \cong \overline{PQ}$	4. Given
5. $\Delta ONP \cong \Delta PQO$	5. HL

5. Given: $\overline{ST} \parallel \overline{RU}$; $\overline{SR} \parallel \overline{TU}$
Prove: $\Delta SRT \cong \Delta UTR$



Statements	Reasons
1. $\overline{ST} \parallel \overline{RU}$	1. Given
2. $\angle STR \cong \angle URT$	2. If lines ||, alt. int. ∠s ≅
3. $\overline{SR} \parallel \overline{TU}$	3. Given
4. $\angle SRT \cong \angle UTR$	4. alt int ∠'s are ≅
5. $\overline{RT} \cong \overline{TR}$	5. Reflexive property
6. $\Delta SRT \cong \Delta UTR$	6. ASA

6. Given: ∠W and ∠Y are right angles; $\overline{VX} \cong \overline{ZX}$; X is the midpoint of $\overline{WY}$
Prove: $\Delta VWX \cong \Delta ZYX$



Statements	Reasons
1. ∠W and ∠Y are right angles	1. Given
2. ΔVWX and ΔZYX are right Δ	2. Def. of right triangle
3. $\overline{VX} \cong \overline{ZX}$; X is the midpoint of $\overline{WY}$	3. Given
4. $\overline{WX} \cong \overline{YX}$	4. Def. of midpoint
5. $\Delta VWX \cong \Delta ZYX$	5. HL

Taking Proofs a Step Further!

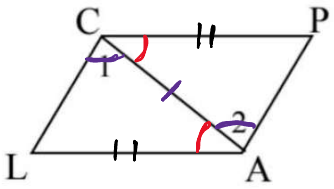
We can also use another property!

CPCTC: Congruent Parts of Congruent Triangles are Congruent

- We can use this to prove that ∠'s or sides are congruent.
- Before we can do this, we must prove triangles are congruent first.

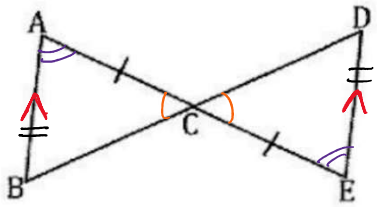
Given: $\angle LAC \cong \angle PCA$, $\angle 1 \cong \angle 2$

Prove: $\overline{LA} \cong \overline{CP}$



Statement	Reasons
1. $\angle LAC \cong \angle PCA$	1. Given
2. $\angle 1 \cong \angle 2$	2. Given
3. $\overline{CA} \cong \overline{AC}$	3. Reflexive property
4. $\triangle LAC \cong \triangle PCA$	4. ASA
5. $\overline{LA} \cong \overline{CP}$	5. CPCTC

Given $\overline{AB} \parallel \overline{ED}$, $\overline{AC} \cong \overline{EC}$



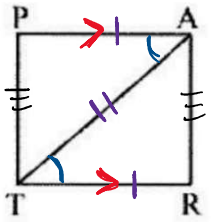
Prove: $AB \cong ED$

Statement	Reasons
1. $\overline{AB} \parallel \overline{ED}$	1. Given
2. $\overline{AC} \cong \overline{EC}$	2. Given
3. $\angle ACB \cong \angle ECD$	3. Vertical $\angle$'s
4. $\angle BAC \cong \angle DEC$	4. Alt. int. $\angle$'s
5. $\triangle ACB \cong \triangle ECD$	5. ASA
6. $\overline{AB} \cong \overline{ED}$	6. CPCTC

Given: $\overline{PA} \parallel \overline{TR}$

$\overline{PA} \cong \overline{TR}$

Prove: $\overline{PT} \cong \overline{AR}$



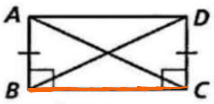
Statement	Reasons
1. $\overline{PA} \parallel \overline{TR}$	1. Given
2. $\overline{PA} \cong \overline{TR}$	2. Given
3. $\angle PAT \cong \angle RTA$	3. Alt. int. $\angle$'s
4. $\overline{AT} \cong \overline{TA}$	4. Reflexive property
5. $\triangle PAT \cong \triangle RTA$	5. SAS
6. $\overline{PT} \cong \overline{AR}$	6. CPCTC

Day 6 OVERLAPPING TRIANGLES

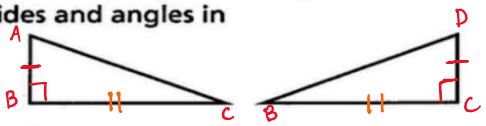
9-6 Overlapping Triangles (V2: 295 - 302)

EXAMPLE 1 Identify Corresponding Parts in Triangles

Figure *ABCD* is a rectangle with diagonals $\overline{AC}$ and $\overline{BD}$. Why is it important to identify corresponding parts of overlapping triangles?



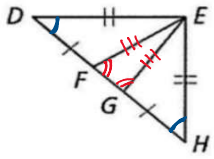
Consider $\triangle ABC$ and $\triangle DCB$. Identify the corresponding sides and angles in the two triangles by first determining congruent parts.



(Complete Try It 1 on Pg. 296)

EXAMPLE 2 Use Common Parts of Triangles

Is $\angle EGD \cong \angle EFH$? YES



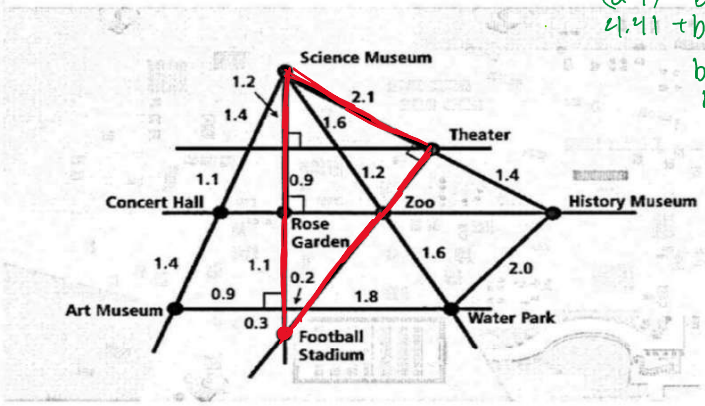
$\triangle FEG$ is isosceles so, $\angle EGD \cong \angle EFH$

(Complete Try It 2 on Pg. 296)

(Complete Try It 3 on Pg. 297)

EXAMPLE 4 Separate Overlapping Triangles

A city runs three triangular bus routes to various attractions. How can you draw a separate triangle for each route? Are any of the routes the same length?



Green Route Stops:
Science Museum
Theater
History Museum
Zoo
Rose Garden
Science Museum

Purple Route Stops:
Water Park
Art Museum
Concert Hall
Science Museum
Zoo
Water Park

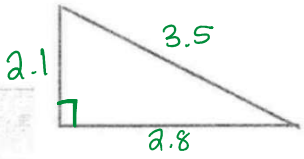
Red Route Stops:
Football Stadium
Zoo
Theater
Science Museum
Rose Garden
Football Stadium

(Complete Try It 4 on Pg. 297)

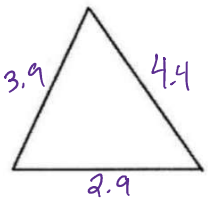
Green and red are same length.

Green Route

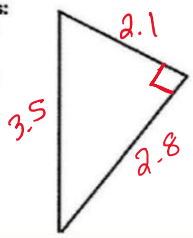
$(2.1)^2 + b^2 = (3.5)^2$
$4.41 + b^2 = 12.25$
$b^2 = 7.84$
$b = 2.8$



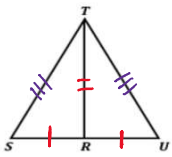
Purple Route



Red Route



Segment RT bisects the base, side SU, of isosceles triangle STU.



The table shows the steps to prove $\angle STR \cong \angle UTR$.

Step	Statement	Reason
1	$\overline{RT}$ bisects side SU.	Given
2	$\overline{SR} \cong \overline{UR}$	Definition of segment bisector
3	$\overline{RT} \cong \overline{RT}$	?
4	$\overline{ST} \cong \overline{UT}$	Definition of isosceles triangle
5	$\triangle STR \cong \triangle UTR$	?
6	$\angle STR \cong \angle UTR$	Corresponding parts of congruent triangles are congruent.

Which reasons are needed to complete the proof?

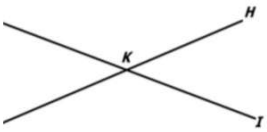
A. Reason 3: Reflexive Property
Reason 5: Side-Angle-Side postulate

B. Reason 3: Reflexive Property
Reason 5: Side-Side-Side postulate

C. Reason 3: Symmetric Property
Reason 5: Side-Angle-Side postulate

D. Reason 3: Symmetric Property
Reason 5: Side-Side-Side postulate

segment GI intersects segment JH at point K. The table outlines a proof showing that
$\angle H \cong \angle JKI$.



	Statement	Justification
	Segment GI intersects segment JH at point K.	Given
	$m\angle GKH + m\angle HKI = 180°$	Definition of linear pair
	$m\angle JKI + m\angle HKI = 180°$	Definition of linear pair
	$m\angle GKH + m\angle HKI = m\angle JKI + m\angle HKI$	Substitution Property
	_____	_____
	$\angle GKH \cong \angle JKI$	Definition of congruent angles

A. $m\angle GKH = m\angle JKI$; Subtraction Property

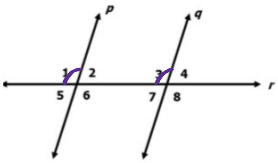
B. $m\angle GKH = m\angle JKI$; Commutative Property

C. $m\angle GKH = m\angle HKI$; Transitive Property

D. $m\angle GKH = m\angle HKI$; Addition Property

h statement and justification *best* fill in the blanks to complete the proof that vertical angles are
uent?

arallel lines p and q are cut by transversal r.



student starts a proof to show that alternate interior angles $\angle 2$ and $\angle 7$ are congruent.

Statement	Justification
Lines p and q are parallel.	Given
$\angle 1 \cong \angle 3$	?
$m\angle 1 = m\angle 3$	Definition of congruence
$m\angle 1 + m\angle 2 = 180°$ and $m\angle 3 + m\angle 7 = 180°$	?
$m\angle 1 + m\angle 7 = 180°$	Substitution Property
$m\angle 7 = 180° - m\angle 1$ and $m\angle 2 = 180° - m\angle 1$	?
$m\angle 2 = m\angle 7$	Substitution Property
$\angle 2 \cong \angle 7$	Definition of congruence

Which justifications, in order, complete the proof?

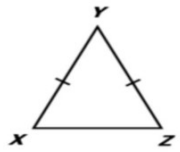
A. Alternate Interior Angles Theorem, definition of a linear pair, and Distributive Property

B. Alternate Interior Angles Theorem, definition of a linear pair, and Subtraction Property

C. Corresponding Angles Theorem, definition of a linear pair, and Distributive Property

D. Corresponding Angles Theorem, definition of a linear pair, and Subtraction Property

Triangle XYZ is an isosceles triangle.



The table shows the steps used to prove that the base angles of triangle XYZ, $\angle X$ and $\angle Z$, are congruent.

Step	Explanation
1	Triangle XYZ is isosceles, therefore $XY = YZ$.
2	Use the Reflexive Property to show that $WY = WY$, and therefore $\Delta XWY \cong \Delta ZWY$ by the Side-Side-Side Postulate.
3	Plot point W at the midpoint of line segment XZ.
4	Since $\Delta XWY \cong \Delta ZWY$, $\angle X \cong \angle Z$ because corresponding parts of congruent triangles are congruent.
5	Since point W is the midpoint of XZ, $XW = WZ$.

What is the correct order of the steps?

A. 1, 3, 2, 5, 4

B. 1, 3, 2, 4, 5

C. 1, 3, 5, 4, 2

D. 1, 3, 5, 2, 4