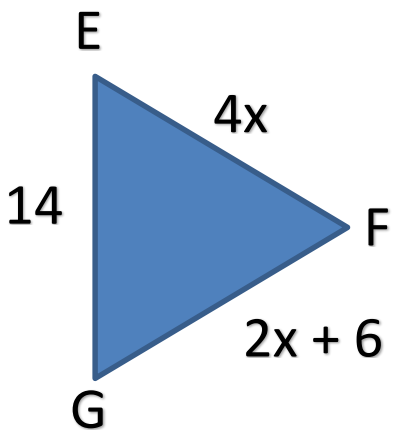
4.1: Classifying Triangles

Acute Triangle	Obtuse Triangle	Right Triangle

Equiangular Triangle:

Scalene Triangle	Isosceles Triangle	Equilateral Triangle

Ex1) Find x and the measure of each side of isosceles triangle EFG with vertex angle F.

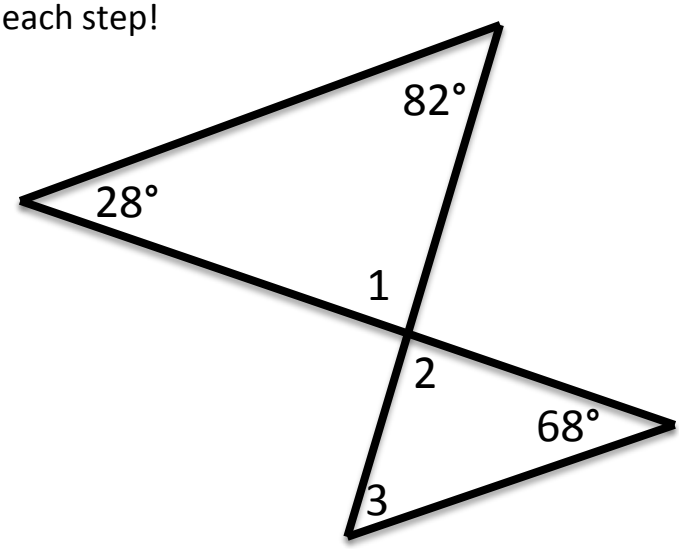


Lesson 4-2: Angles of Triangles

Angle Sum Theorem

- The sum of the measures of the angles of a triangle is _____.
- Picture:

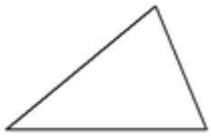
Ex1) Find the missing angle measures. Justify each step!

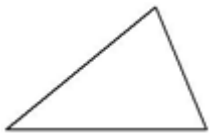


Third Angle Theorem:

- If two angles of one triangle are congruent to two angles of a second triangles, then the third angles of the triangles are congruent.
- Picture:

Ex2) Given: $\angle C \cong \angle D$, $\angle A \cong \angle O$, $m\angle T = (2x - 10)°$, $m\angle G = 4(x - 25)°$
Prove: $x = 45$

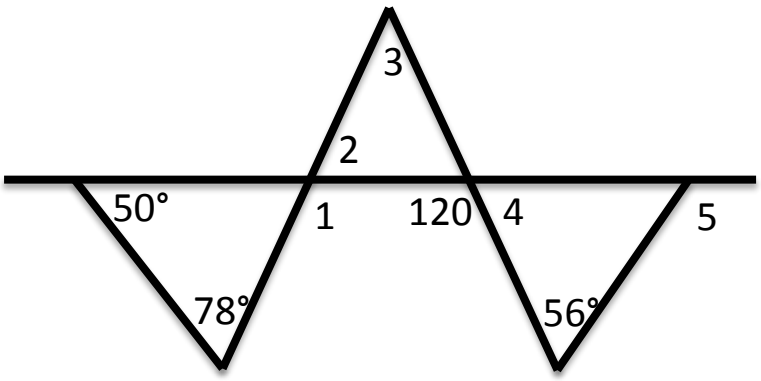




Exterior Angle Theorem:

- The measure of an exterior angle of a triangle is equal to the sum of the measures of the two remote interior angles.
- Picture:

Ex3) Find the missing angles.



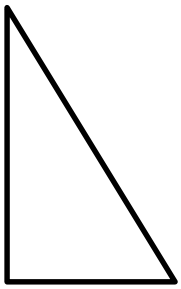
Corallaries:

4.1 The acute angles of a right triangle are complementary

4.2 There can be at most one right or obtuse angle in a triangle

Ex4) Given: $\Delta\mathbf{FOX}$ **with** $\mathbf{m\angle F = 90, m\angle O = 3a + 2, m\angle X = 2a + 8}$

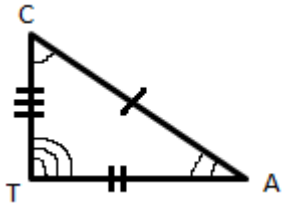
Prove: a = 16



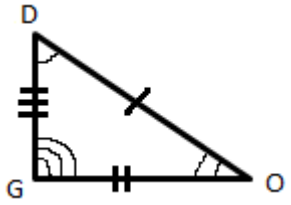
Lesson 4-3: Congruent Triangles

Congruent Triangles: triangles that are the same _____ and _____.

- **ALL SIX** corresponding parts (the 3 _____ and 3 _____) must be congruent for the triangle to be congruent.



$\Delta CAT \cong \Delta DOG$



$\angle C \cong \angle$ $\qquad$ $\overline{CA} \cong$

$\angle A \cong \angle$ $\qquad$ $\overline{AT} \cong$

$\angle T \cong \angle$ $\qquad$ $\overline{TC} \cong$

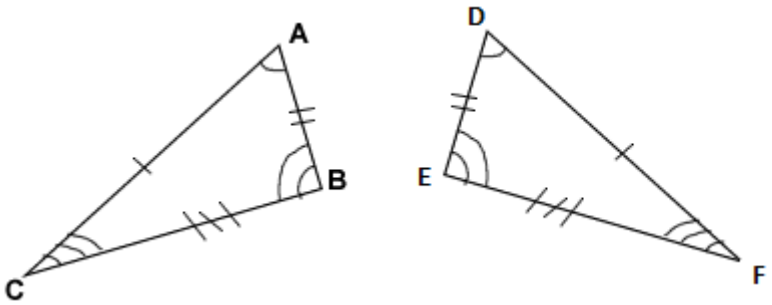
Which is an **incorrect** way to name the congruent triangles?

$\Delta ACT \cong \Delta ODG$ $\qquad$ $\Delta CTA \cong \Delta OGD$ $\qquad$ $\Delta TAC \cong \Delta GOD$

We **must** write the triangle congruence by **matching** the corresponding and angles and sides.

Ex1: Identify the congruent triangles in the figure.

Ex2: Name the congruent angles and sides for congruent triangles $\Delta ABC \cong \Delta DGH$



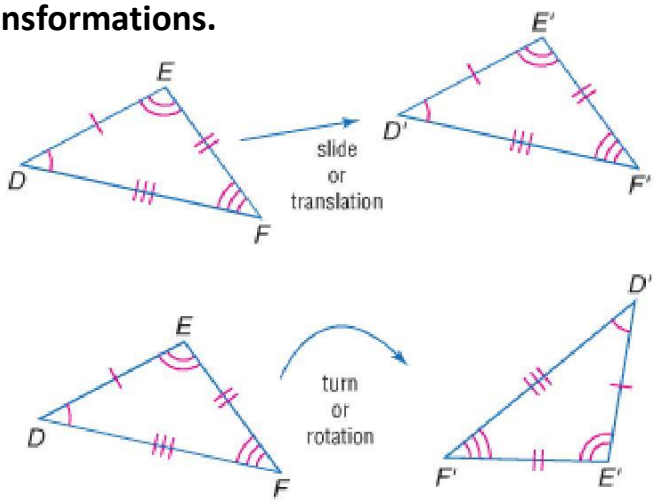
❖ **CPCTC:** Corresponding Parts of Congruent Triangles are Congruent!

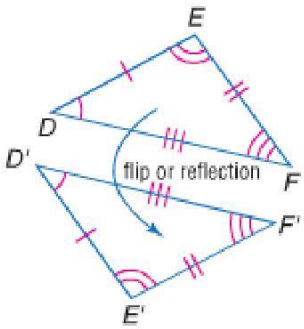
Given: $\Delta BOY \cong \Delta ELF$; $m\angle B = (8x)°$, $m\angle E = 3(2x + 5)°$

Prove: $x = 5$

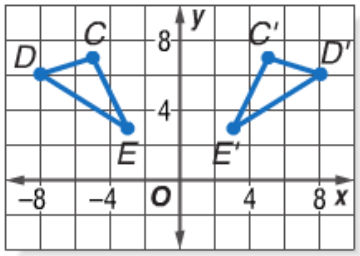
<u>Congruence Transformations:</u>

If you slide (_____), flip (_____) , or turn (_____) a triangle, the size and shape do not change. These three moves are called **congruence transformations.**





COORDINATE GEOMETRY **The vertices of $\triangle CDE$ are $C(-5, 7)$, $D(-8, 6)$, and $E(-3, 3)$. The vertices of $\triangle C'D'E'$ are $C'(5, 7)$, $D'(8, 6)$, and $E'(3, 3)$.**



a. Verify that $\triangle CDE \cong \triangle C'D'E'$.

Use the Distance Formula to find the length of each side in the triangles.

Lesson 4-4: Proving Congruence

Postulate : Side-Side-Side Congruence

If the sides of one triangle are congruent to the sides of a second triangle, then the triangles are congruent.

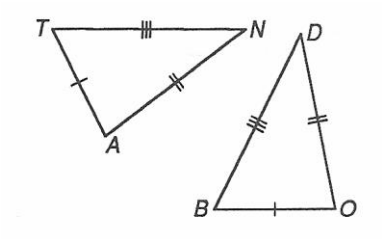
Abbreviation: SSS

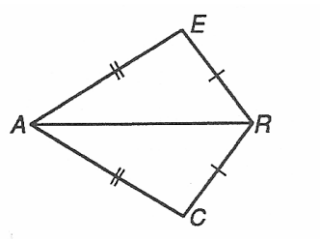
Postulate: Side-Angle-Side Congruence

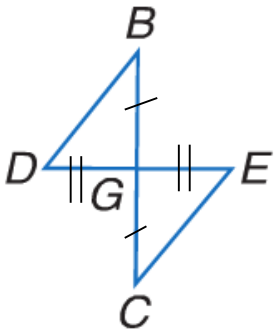
If two sides and the **included** angle of one triangle are congruent to two sides and the **included** angle of another triangle, then the triangles are congruent.

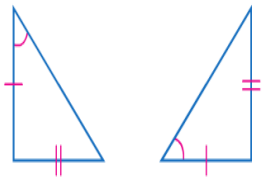
Abbreviation: SAS

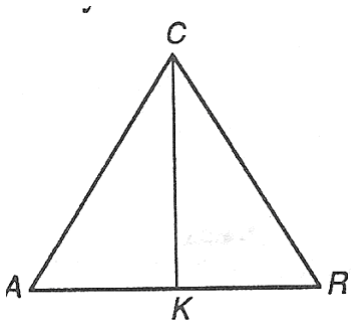
Determine which postulate can be used to prove that the triangles are congruent. If it is not possible, write *not possible*.



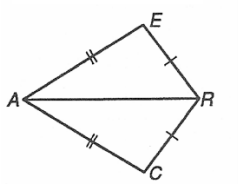




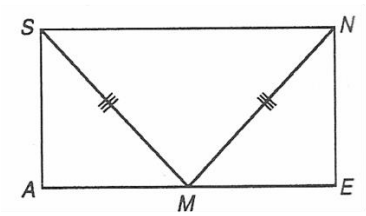




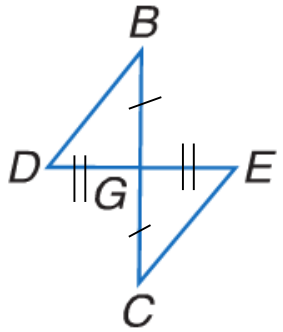
ΔARC is isosceles with
$\angle C$ the vertex angle.
$\overline{CK}$ is a median.
$\Delta AKC \cong \Delta$ —?—
Why?



Given: ER ≅CR,
AE ≅AC
Prove: ΔAER≅ΔACR



Given: MS ≅MN
∠SMA ≅∠NME
M is the midpoint of AE
Prove: ΔSAM≅ΔNEM



Given: G is the midpoint of DE
G is the midpoint of BC
Prove: $\Delta BGD \cong \Delta CGE$

Lesson 4-5: Proving Congruence – ASA, AAS

Postulate : Angle-Side-Angle Congruence

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.

Abbreviation: ASA

Postulate: Side-Angle-Side Congruence

If two angles and a nonincluded side of one triangle are congruent to the corresponding two angles and nonincluded side of a second triangle, then the two triangles are congruent.

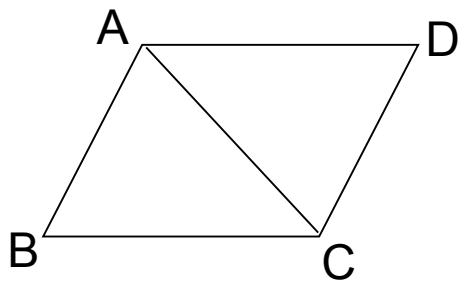
Abbreviation: SAS

Triangle Congruence "Shortcuts"

These work:	These **DON'T**
SSS	SSA / ASS
SAS	AAA
ASA	
SAA or AAS	

Triangle Congruence Proof:

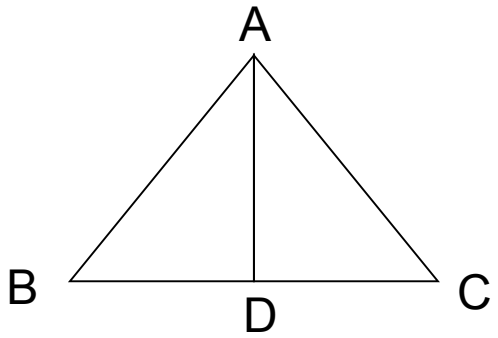
1) Mark the Given
2) Is there anything that can be concluded from the given?
3) Are there any shared sides or vertical angles?
4) Which Shortcut will prove the triangles congruent?



Given: $\angle B \cong \angle D$

BC || DA

Prove: $\Delta ABC \cong \Delta CDA$

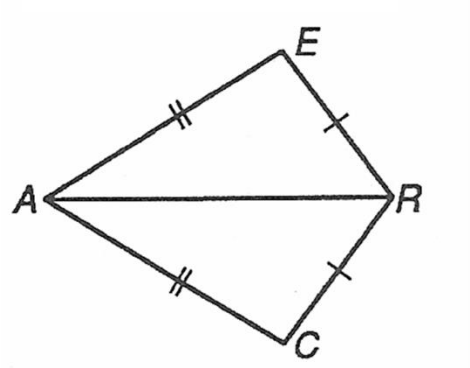


Given: ΔABC is isosceles

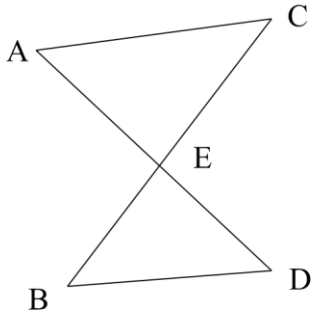
$\overline{AD}$ bisects $\angle BAC$

Prove: $\Delta ABD \cong$

CPCTC: Corresponding Parts of Congruent Triangles are Congruent!



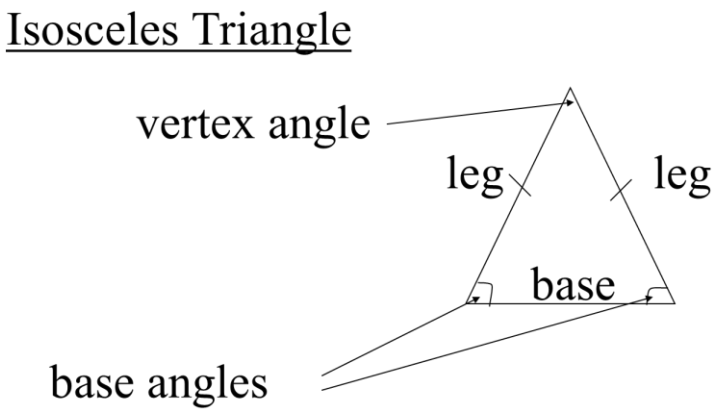
Given: ER ≅CR,
AE ≅AC
Prove: ∠CRA ≅∠ERA



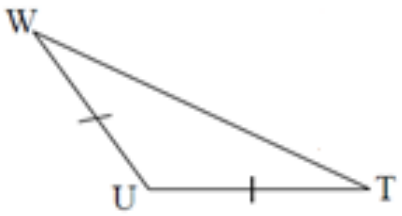
Given: AC||BD
E is the midpoint of AD

Prove: AC ≅BD

Lesson 4.6: Isosceles Triangles



Name the legs, base, vertex angle, and base angles for the following isosceles triangle:



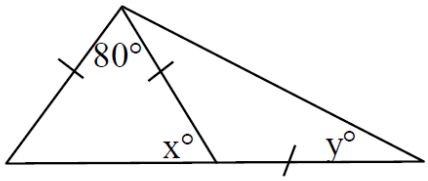
Isosceles Triangle Theorem: If two sides of a triangle are congruent, then the angles opposite those sides are congruent.

Converse of Isosceles Triangle Theorem: If two angles of a triangle are congruent, then the sides opposite those angles are congruent.

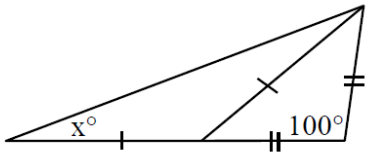
Corollaries–

- A triangle is equilateral if it is equiangular.
- (Converse) – If a triangle is equilateral, then it is equiangular.

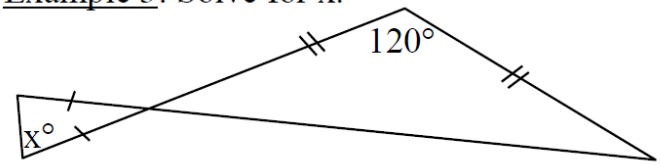
Example 1: Solve for x and y.



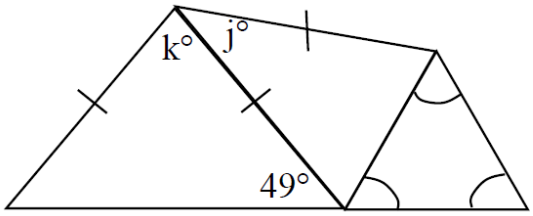
Example 2: Solve for x.



Example 3: Solve for x.



Example 4: Solve for j and k.



Example 5: Solve for *w*, *x* and *y* if ΔWHT is equilateral.