Name: ______________________________ Lesson #29 Date: __________

Common Core Geometry Period: __________

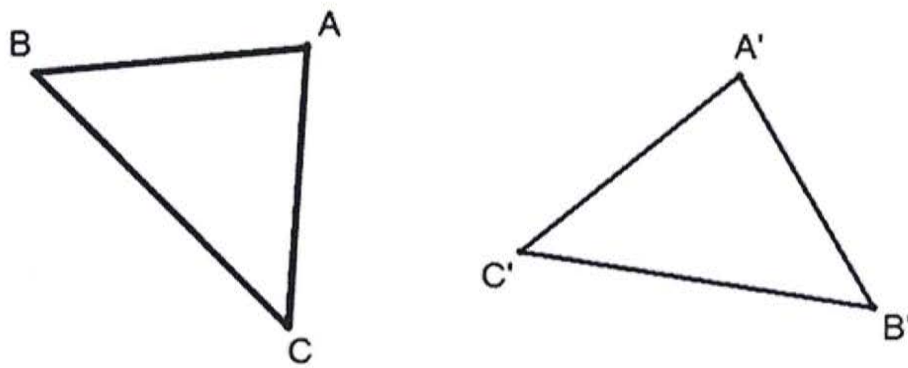
OBJECTIVE: How do we prove that triangles are congruent?

I. Important Statements:

1. Segments can be mapped onto segments **IF AND ONLY IF** they are ≅

2. Angles can be mapped onto angles **IF AND ONLY IF** they are ≅

Definition of Congruent: Two triangles (or figures) are aid to be congruent **IF AND ONLY IF** there is a series of rigid motions that maps the figure onto the other.



Given two triangles ΔABC and $\Delta A'B'C'$ such that $m\angle A \cong m\angle A'$, $\overline{AC} \cong \overline{A'C'}$, $\overline{AB} \cong \overline{A'B'}$.

Name the missing corresponding sides and angles

Find a composition of rigid motions to map ΔABC onto $\Delta A'B'C'$

I. Some new statements that we can use in a proof:

A. An **EQUILATERAL** triangle has 3 ≅ sides

B. Base angles in an isosceles triangle are ≅

C. A median of a triangle creates a **MIDPOINT** on one side of the triangle

II. There are 5 ways to prove triangles are congruent

- **SSS – Side Side Side**
- **ASA – Angle Side Angle**
- **AAS – Angle Angle Side**
- **SAS – Side Angle Side**
- **HL – Hypotenuse Leg**

III. How to Prove Triangles are Congruent

Step 1: Write down the given information

Step 2: Use the given information to determine what you know about the picture

- Mark off congruent pieces on the picture after stating them in the proof

Step 3: The only congruency not from the given will be

- **REFLEXIVE**
- **VERTICAL ANGLES**

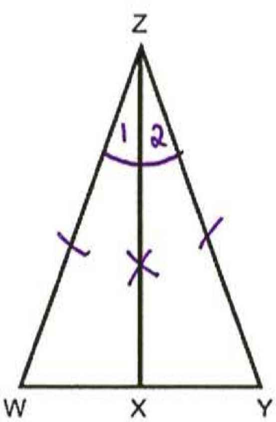
Step 4: Your last statement is **ALWAYS** the **PROVE**

Step 5: Your last reason is always one of the 5 ways to prove triangles are congruent

1. Given: Isosceles ΔZYW

$\overline{XZ}$ bisects $\angle WZY$

Prove $\Delta WZX \cong \Delta YZX$

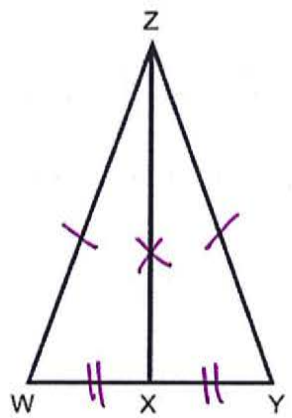


S	R
1. Iso ΔZYW $\overline{XZ}$ bisects $\angle WZY$	1. Given
2. $\overline{WZ} \cong \overline{YZ}$	2. An Iso Δ has 2 $\cong$ sides
3. $\angle 1 \cong \angle 2$	3. An $\angle$ bisector creates 2 $\cong$ $\angle$s
4. $\overline{XZ} \cong \overline{XZ}$	4. Reflexive
5. $\Delta WZX \cong \Delta YZX$	5. SAS

2. Given: Isosceles ΔZYW

$\overline{XZ}$ bisects $\overline{WY}$

Prove $\Delta WZX \cong \Delta YZX$

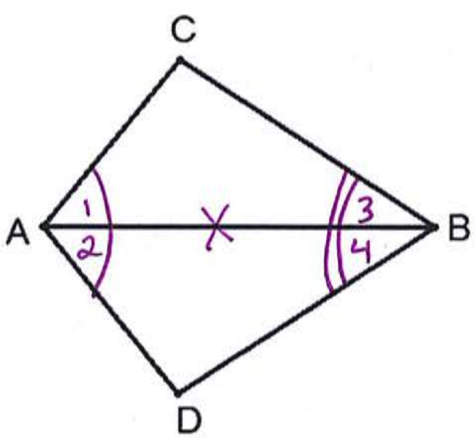


S	R
① Iso ΔZYW, $\overline{XZ}$ bisects $\overline{WY}$	① Given
② $\overline{WZ} \cong \overline{YZ}$	② An iso Δ has 2 $\cong$ sides
③ $\overline{XZ} \cong \overline{XZ}$	③ Reflexive
④ X is a mdpt of $\overline{WY}$	④ Seg bisector creates a mdpt
⑤ $\overline{WX} \cong \overline{YX}$	⑤ Mdpt creates 2 $\cong$ segments
⑥ $\Delta WZX \cong \Delta YZX$	⑥ SSS

CAD CBD

3. Given $\overline{AB}$ bisects both $\angle \cancel{BAD}$ and $\angle \cancel{BCD}$

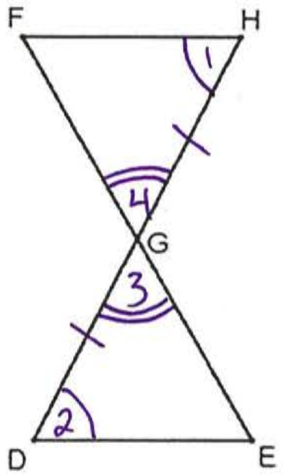
Prove $\Delta ABD \cong \Delta ABC$



S	R
① $\overline{AB}$ bisects both $\angle CBD$ & $\angle CAD$	① Given
② $\angle 1 \cong \angle 2$, $\angle 3 \cong \angle 4$	② An $\angle$ bisector creates 2 $\cong$ $\angle$s
③ $\overline{AB} \cong \overline{AB}$	③ Reflexive
④ $\Delta ABD \cong \Delta ABC$	④ ASA

4. Given $\overline{FH} \parallel \overline{DE}$, G is the midpoint of $\overline{DH}$

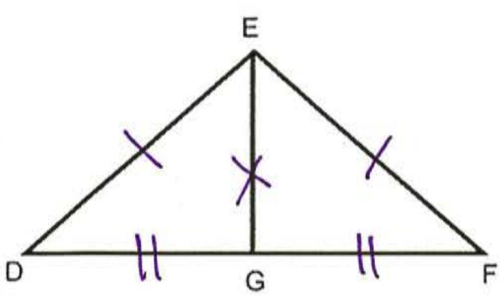
Prove $\Delta FHG \cong \Delta EDG$



S	R
① $\overline{FH} \parallel \overline{DE}$ G is mdpt of $\overline{DH}$	① Given
② $\angle 1 \cong \angle 2$	② If 2 ∥ lines are cut by a transversal, alt int are ≅
③ $\overline{DG} \cong \overline{HG}$	③ A mdpt creates 2 ≅ seg
④ $\angle 3 \cong \angle 4$	④ Vertical ∠s are ≅
⑤ $\Delta FHG \cong \Delta EDG$	⑤ ASA

5. Given $\overline{EG}$ is a median of ΔDEF, $DE = FE$

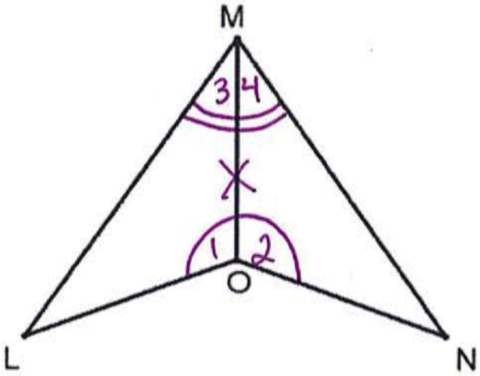
Prove $\Delta DEG \cong \Delta FEG$



S	R
① $\overline{EG}$ is median of Δ DEF DE = FE	① Given
② G is the mdpt of $\overline{DF}$	② A median creates a mdpt.
③ DG = FG	③ A mdpt creates 2 = segments
④ EG = EG	④ Reflexive
⑤ $\Delta DEG \cong \Delta FEG$	⑤ SSS

6. Given $\overline{OM}$ bisects $\angle LMN$, $\angle LOM \cong \angle NOM$

Prove $\Delta LMO \cong \Delta NMO$



S	R
① $\overline{OM}$ bisects $\angle LMN$ $\angle LOM \cong \angle NOM$ $\angle 1 \cong \angle 2$	① Given
② $\angle 3 \cong \angle 4$	② An $\angle$ bisector creates 2 $\cong$ $\angle$s
③ $\overline{MO} \cong \overline{MO}$	③ Reflexive
④ $\Delta LMO \cong \Delta NMO$	④ ASA

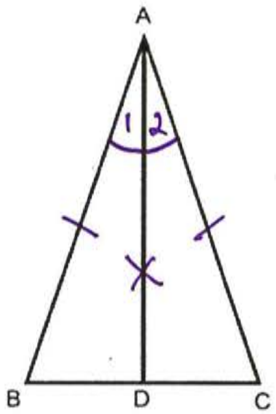
7. If $\overline{AD}$ is the perpendicular bisector of $\overline{BC}$,

then prove $\Delta ABD \cong \Delta ACD$

S	R
① $\overline{AD}$ is $\perp$ bisector of $\overline{BC}$	① Given
② $\angle 1$ & $\angle 2$ are rt $\angle$s	② $\perp$ lines form rt $\angle$s
③ $\angle 1 \cong \angle 2$	③ All rt $\angle$s are $\cong$
④ D is the mdpt of $\overline{BC}$	④ A segment bisector creates a mdpt
⑤ $\overline{BD} \cong \overline{CD}$	⑤ A mdpt creates 2 $\cong$ seg
⑥ $\overline{AD} \cong \overline{AD}$	⑥ Reflexive
⑦ $\Delta ABD \cong \Delta ACD$	⑦ SAS

8. Given $AB = AC, \overline{DA}$ bisects $\angle BAC$

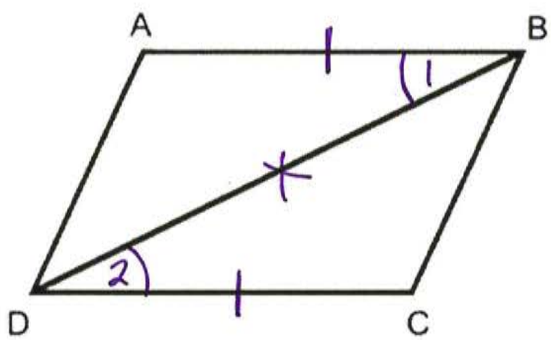
Prove $\Delta ABD \cong \Delta ACD$



S	R
① $AB = AC$ $\overline{DA}$ bisects $\angle BAC$	① Given
② $\angle 1 \cong \angle 2$	② An $\angle$ bisector creates 2 $\cong$ $\angle$s
③ $\overline{AD} \cong \overline{AD}$	③ Reflexive
④ $\Delta ABD \cong \Delta ACD$	④ SAS

9. Given: $\overline{AB} \parallel \overline{CD}$ and $AB = CD$

Prove $\Delta ABD \cong \Delta CBD$

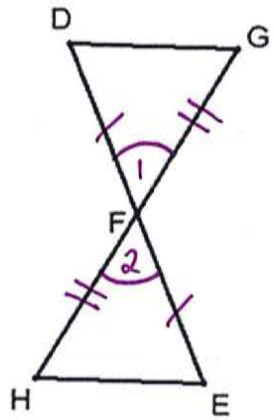


S	R
① $\overline{AB} \parallel \overline{CD}$ $AB = CD$	① Given
② $\angle 1 \cong \angle 2$	② If 2 $\parallel$ lines are cut by a transversal, alt int $\angle$s $\cong$
③ $\overline{DB} \cong \overline{BD}$	③ Reflexive
④ $\Delta ABD \cong \Delta CBD$	④ SAS

10. Given $\overline{DG}$ & $\overline{EH}$ bisect each other at F

Prove: $\Delta \cancel{DEF} \cong \Delta \cancel{GHF}$

$\Delta DGF \cong \Delta EHF$

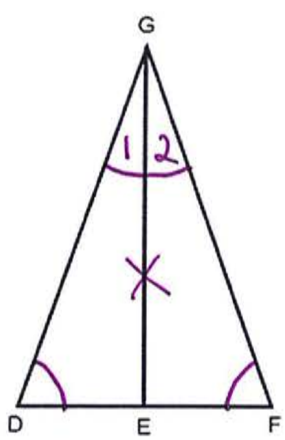


S	R
① $\overline{DG}$ & $\overline{EH}$ bisect at F	① Given
② F is mdpt of $\overline{DE}$ & $\overline{GH}$	② Segment bisector creates a mdpt.
③ $\overline{DF} \cong \overline{EF}$ $\overline{GF} \cong \overline{HF}$	③ A mdpt creates 2 ≅ segments
④ $\angle 1 \cong \angle 2$	④ Vertical ∠s are ≅
⑤ $\Delta DGF \cong EHF$	⑤ SAS

11. Given: $m\angle D = m\angle F$

$\overline{EH}$ bisects $\angle DGF$

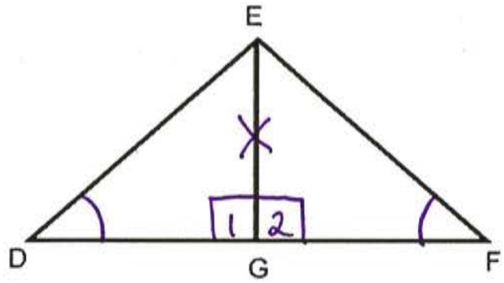
Prove: $\Delta DGE \cong \Delta FGE$



S	R
① $m\angle D = m\angle F$ $\overline{EH}$ bisects $\angle DGF$	① Given
② $\angle 1 \cong \angle 2$	② An ∠ bisector creates 2 ≅ ∠s
③ $\overline{GE} \cong \overline{GE}$	③ Reflexive
④ $\Delta DGE \cong FGE$	④ AAS

12. Given $\angle D \cong \angle F, \overline{EG} \perp \overline{DF}$

Prove $\Delta DEG \cong \Delta FEG$



S	R
① $\angle D \cong \angle F$, $\overline{EG} \perp \overline{DF}$	① Given
② $\angle 1$ & $\angle 2$ are rt $\angle$s	② $\perp$ lines form rt $\angle$s
③ $\angle 1 \cong \angle 2$	③ All rt $\angle$s are $\cong$
④ $\overline{EG} \cong \overline{EG}$	④ Reflexive
⑤ $\Delta DEG \cong \Delta FEG$	⑤ AAS