Geometry SMART Packet

Triangle Proofs (SSS, SAS, ASA, AAS)

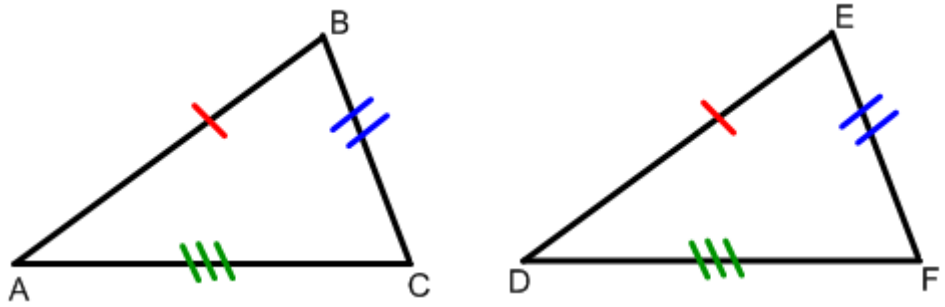
Student: _____ Date: _____ Period: _____

Standards

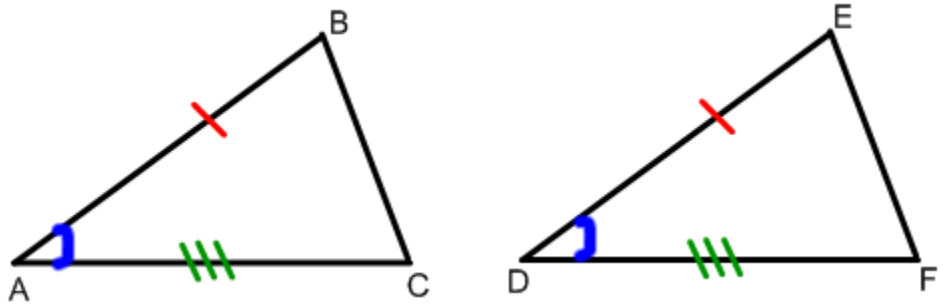
G.G.27 Write a proof arguing from a given hypothesis to a given conclusion.

G.G.28 Determine the congruence of two triangles by using one of the five congruence techniques (SSS, SAS, ASA, AAS, HL), given sufficient information about the sides and/or angles of two congruent triangles.

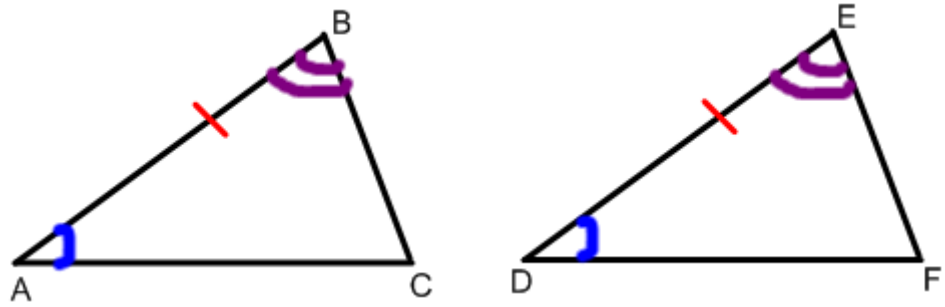
SSS (Side, Side, Side)



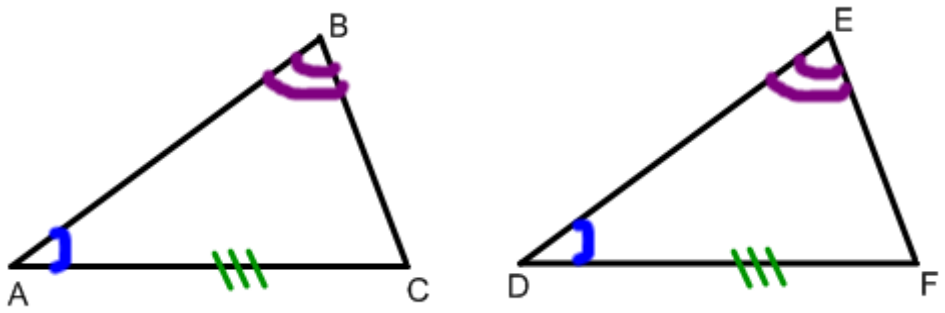
SAS (Side, Angle, Side)



ASA (Angle, Side, Angle)



AAS (Angle, Angle, Side)



Note: **We can NOT prove triangles with AAA or SSA!!**

How to set up a proof:

Statement	Reason

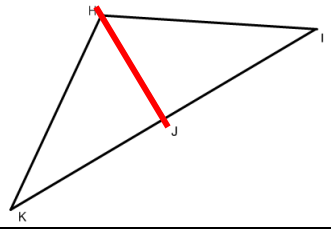
Intro: List the givens

Body: Properties & Theorems

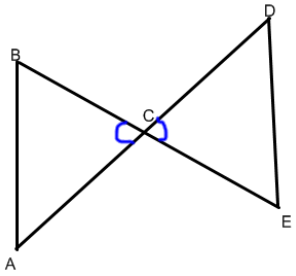
Conclusion: What you are proving

9 Most Common Properties, Definitions & Theorems for Triangles

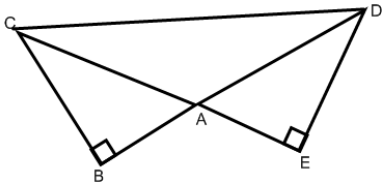
1. **Reflexive Property: *AB = BA***
When the triangles have an angle or side in common



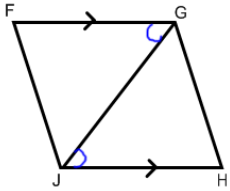
2. **Vertical Angles are Congruent**
When two lines are intersecting



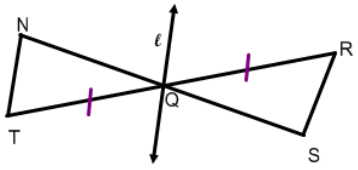
3. **Right Angles are Congruent**
When you are given right triangles and/or a square/ rectangle



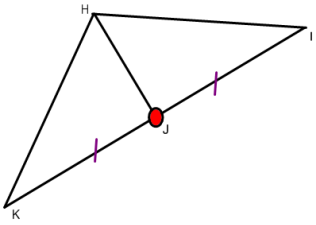
4. **Alternate Interior Angles of Parallel Lines are congruent**
When the givens inform you that two lines are parallel



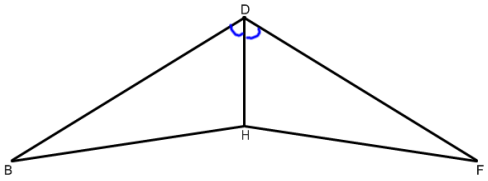
5. **Definition of a segment bisector**
Results in 2 segments being congruent



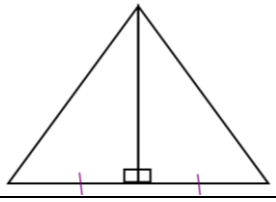
6. **Definition of a Midpoint**
Results in two segments being congruent



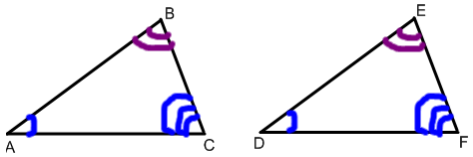
7. **Definition of an angle bisector**
Results in two angles being congruent



8. **Definition of a perpendicular bisector**
Results in 2 congruent segments and right angles.

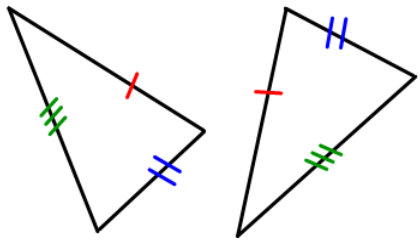
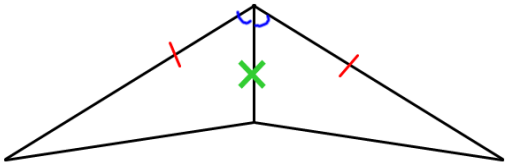
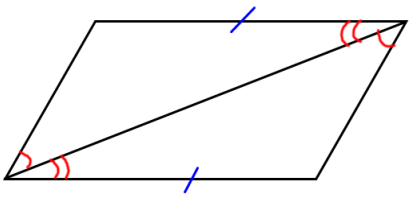
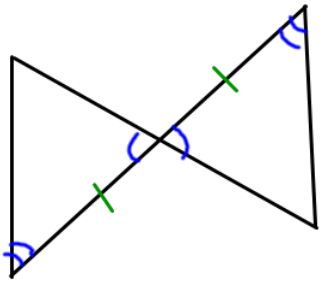
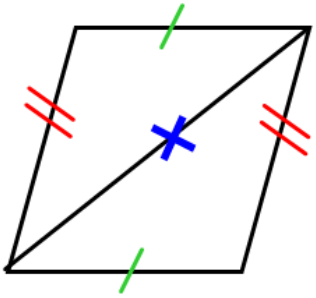


9. **3rd angle theorem**
If 2 angles of a triangle are ≅ to 2 angles of another triangle, then the 3rd angles are ≅



Note: DO NOT ASSUME ANYTHING IF IT IS NOT IN THE GIVEN

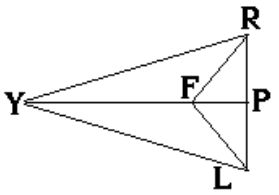
Directions: Check which congruence postulate you would use to prove that the two triangles are congruent.

1. 	SSS ☐ SAS ☐ ASA ☐ AAS ☐
2. 	SSS ☐ SAS ☐ ASA ☐ AAS ☐
3. 	SSS ☐ SAS ☐ ASA ☐ AAS ☐
4. 	SSS ☐ SAS ☐ ASA ☐ AAS ☐
5. 	SSS ☐ SAS ☐ ASA ☐ AAS ☐

Practice. *Fill in the missing reasons*

6. **Given:** $\angle YLF \cong \angle FRY, \quad \angle RFY \cong \angle LFY$

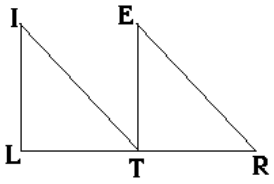
Prove: $\triangle FRY \cong \triangle FLY$



Statement	Reason
1. $\angle YLF \cong \angle FRY$	
2. $\angle RFY \cong \angle LFY$	
3. $\overline{FY} \cong \overline{FY}$	
4. $\triangle FRY \cong \triangle FLY$	

7. **Given:** $\overline{LT} \cong \overline{TR}, \ \angle ILT \cong \angle ETR, \ IT \parallel ER$

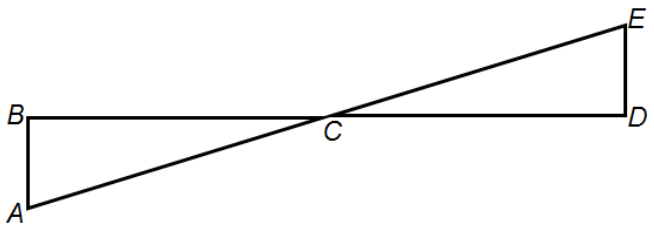
Prove: $\triangle LIT \cong \triangle TER$



Statement	Reason
1. $\overline{LT} \cong \overline{TR}$	
2. $\angle ILT \cong \angle ETR$	
3. $IT \parallel ER$	
4. $\angle LTI \cong \angle ERT$	
5. $\triangle LIT \cong \triangle TER$	

8. **Given:** C is midpoint of $\overline{BD}$
$\overline{AB} \perp \overline{BD}$
$\overline{BD} \perp \overline{DE}$

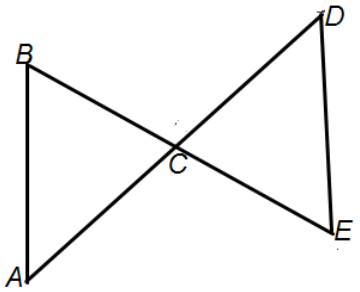
Prove: $\triangle ABC \cong \triangle EDC$



Statement	Reason
1. C is midpoint of $\overline{BD}$	
2. $\overline{AB} \perp \overline{BD}$ and $\overline{BD} \perp \overline{DE}$	
3. $\overline{BC} \cong \overline{CD}$	
4. $\angle BCA \cong \angle ECD$	
5. $\angle ABC$ and $\angle EDC$ are right angles	
6. $\angle ABC \cong \angle EDC$	
7. $\Delta ABC \cong \Delta EDC$	

9. **Given:** $\overline{BA} \cong \overline{ED}$
C is the midpoint of $\overline{BE}$ and $\overline{AD}$

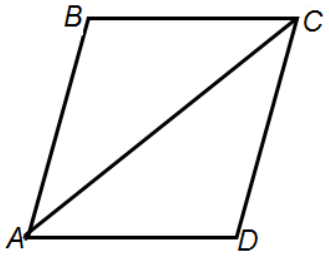
Prove: $\triangle ABC \cong \triangle DEC$



Statement	Reason
1. $\overline{BA} \cong \overline{ED}$	
2. C is the midpoint of $\overline{BE}$ and $\overline{AD}$	
3. $\overline{BC} \cong \overline{EC}$	
4. $\overline{AC} \cong \overline{DC}$	
5. $\Delta ABC \cong \Delta DEC$	

10. **Given:** $\overline{BC} \cong \overline{DA}$
$\overline{AC}$ bisects $\angle BCD$

Prove: $\triangle ABC \cong \triangle CDA$



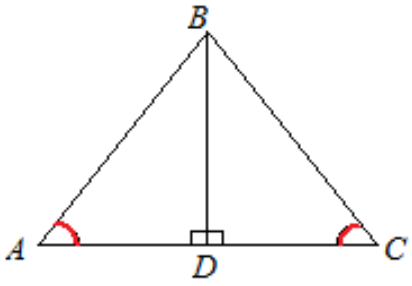
Statement	Reason
1. $\overline{BC} \cong \overline{DA}$	
2. $\overline{AC}$ bisects $\angle BCD$	
3. $\angle BCA \cong \angle DCA$	
4. $\overline{AC} \cong \overline{AC}$	
5. $\Delta ABC \cong \Delta CDA$	

Practice. *Write a 2-column proof for the following problems.*

11.

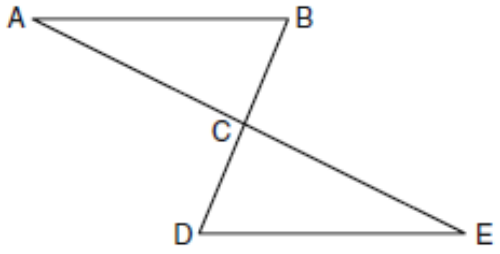
Given: $\angle ADB$ and $\angle CDB$ are right angles
$\angle A \cong \angle C$

Prove: $\Delta ADB = \Delta CDB$



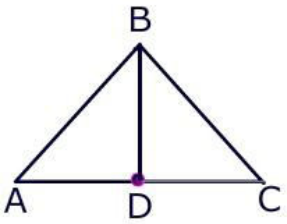
12. **Given**: C is the midpoint of BD and AE

Prove: $\triangle ABC \cong \triangle EDC$



13. **Given:** $\overline{AB} \cong \overline{CB}$, $\overline{BD}$ is a median of $\overline{AC}$

Prove: $\Delta ABD \cong \Delta CBD$

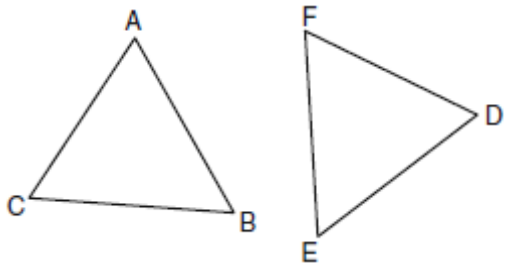


Regents Practice

14. Which condition does *not* prove that two triangles are congruent?

(1) SSS ≅ SSS (2) SSA ≅ SSA (3) SAS ≅ SAS (4) ASA ≅ ASA

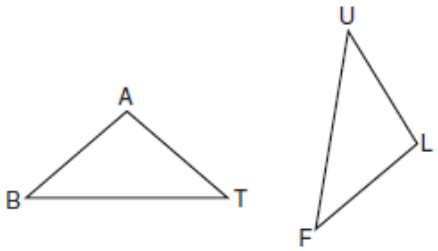
15. In the diagram of $\triangle ABC$ and $\triangle DEF$ below, $\overline{AB} \cong \overline{DE}$, $\angle A \cong \angle D$, and $\angle B \cong \angle E$.



Which method can be used to prove $\triangle ABC \cong \triangle DEF$?

(1) SSS (2) SAS (3) ASA (4) HL

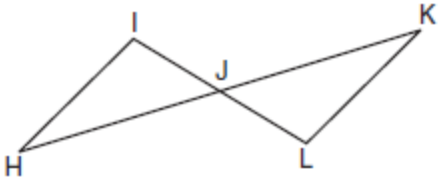
16. In the accompanying diagram of triangles *BAT* and *FLU*, $\angle B \cong \angle F$ and $\overline{BA} \cong \overline{FL}$.



Which statement is needed to prove $\triangle BAT \cong \triangle FLU$?

(1) $\angle A \cong \angle L$ (2) $\overline{AT} \cong \overline{LU}$ (3) $\angle A \cong \angle U$ (4) $\overline{BA} \parallel \overline{FL}$

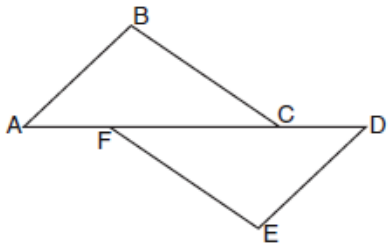
17. In the accompanying diagram, $\overline{HK}$ bisects $\overline{IL}$ and $\angle H \cong \angle K$.



What is the most direct method of proof that could be used to prove $\triangle HIJ \cong \triangle KLJ$?

(1) HL ≅ HL
(2) SAS ≅ SAS
(3) AAS ≅ AAS
(4) ASA ≅ ASA

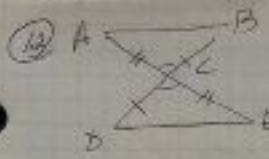
18. Complete the partial proof below for the accompanying diagram by providing reasons for steps 3, 6, 8, and 9.



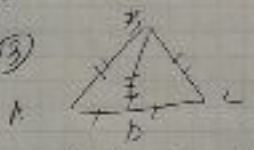
Given: $\overline{AFCD}$, $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$, $\overline{BC} \parallel \overline{FE}$, $\overline{AB} \cong \overline{DE}$

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

Statements	Reasons
1 $\overline{AFCD}$	1 Given
2 $\overline{AB} \perp \overline{BC}$, $\overline{DE} \perp \overline{EF}$	2 Given
3 $\angle B$ and $\angle E$ are right angles.	3
4 $\angle B \cong \angle E$	4 All right angles are congruent.
5 $\overline{BC} \parallel \overline{FE}$	5 Given
6 $\angle BCA \cong \angle EFD$	6
7 $\overline{AB} \cong \overline{DE}$	7 Given
8 $\triangle ABC \cong \triangle DEF$	8

(12) 

1. C is midpt $\overline{BD}$ + $\overline{AE}$ 1 given
2. $\overline{AC} \cong \overline{EC}$ 2. Defn of midpt
3. $\overline{DC} \cong \overline{BC}$ 3. Defn of midpt
4. $\angle ACB \cong \angle ECD$ 4. VA $\cong$
5. $\triangle ABC \cong \triangle EDC$ 5. SAS

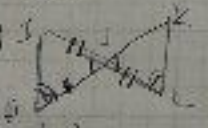
(13) 

1. $\overline{AD} \cong \overline{CB}$ 1. Given
2. $\overline{BD}$ is a median of $\overline{AC}$ 2. Given
3. $\overline{AD} \cong \overline{CD}$ 3. Def of median
4. $\overline{BD} \cong \overline{BD}$ 4. Reflexive
5. $\triangle ABD \cong \triangle CBD$ 5. SSS

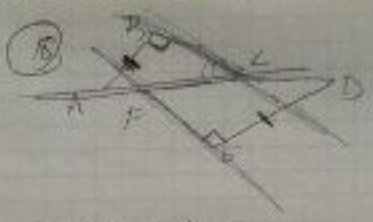
(14) (2)

(15) (3)

(16) (1)

(17) 

(3)

(18) 

3. Defn of $\perp$
6. If lines $\parallel$ then $\angle A \cong$
8. AAS

#5 + #8 you are not responsible for

(1) SSS
(2) SAS
(3) AAS
(4) ASA
(5) SSS

(6) Reasons
1. given
2. given
3. Reflexive prop.
4. ASA

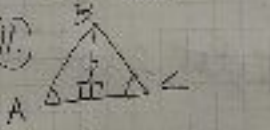
(7) Reasons
1. given
2. given
3. given
4. Thm 4.1, CA ≅
5. ASA

(8) Reasons
1. given
2. given
3. ~~given~~ Def of midpt.
4. Def of perpendicular ∠s ≅
5. Def of ⊥
6. All rt. ∠s ≅
7. AAS

(9) Reasons
1. given
2. given
3. Def of midpt
4. def of midpt
5. SSS

(10) Reasons
1. given
2. given
3. Def of ∠ bisector
4. Reflexive prop
5. SAS

(11)



1. $\angle ADB$ & $\angle CDB$ are rt.	1. given
2. $\angle ADB \cong \angle CDB$	2. All rt ∠s ≅
3. $\angle A \cong \angle C$	3. given
4. $\overline{BD} \cong \overline{BD}$	4. Reflexive
5. $\triangle ADB \cong \triangle CDB$	5. AAS
6. $\triangle ADB = \triangle CDB$	6. def. ≅