

# Geometry SMART Packet

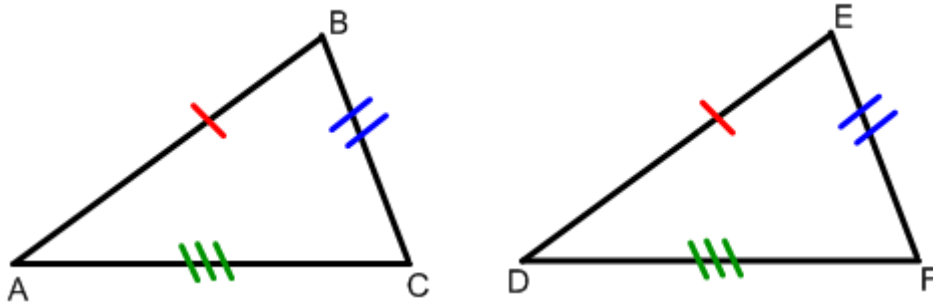
## *Triangle Proofs (SSS, SAS, ASA, AAS)*

Student: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

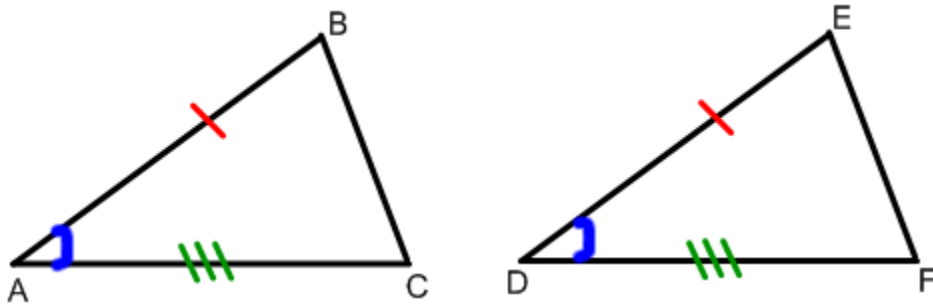
### Standards

- 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.

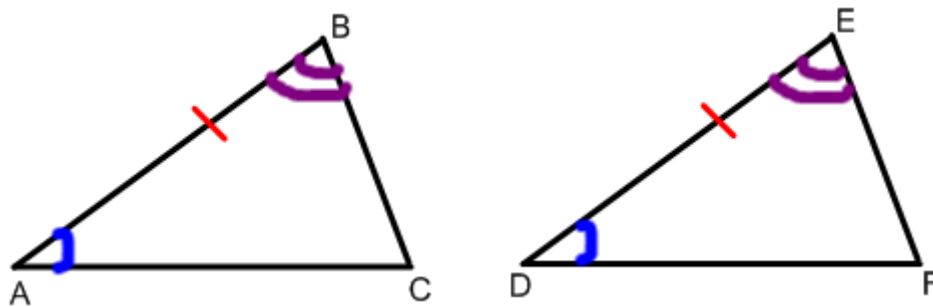
## SSS (Side, Side, Side)



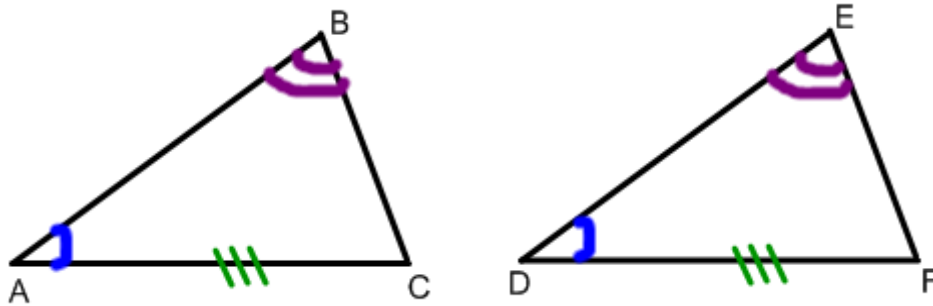
## SAS (Side, Angle, Side)



## ASA (Angle, Side, Angle)



## AAS (Angle, Angle, Side)



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

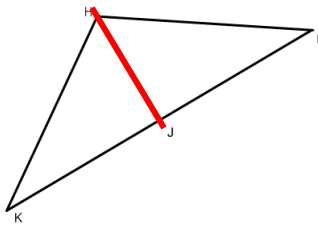
*How to set up a proof:*

Statement	Reason
	Intro: List the givens
	Body: Properties & Theorems
	Conclusion: What you are proving

# 9 Most Common Properties, Definitions & Theorems for Triangles

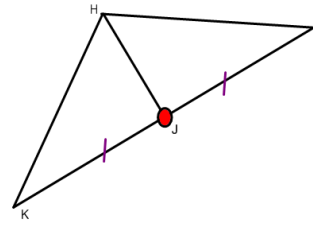
**1. Reflexive Property:  $AB = BA$**

When the triangles have an angle or side in common



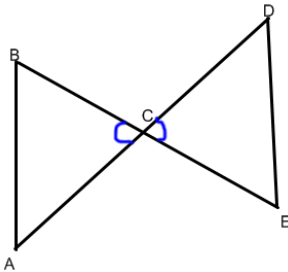
**6. Definition of a Midpoint**

Results in two segments being congruent



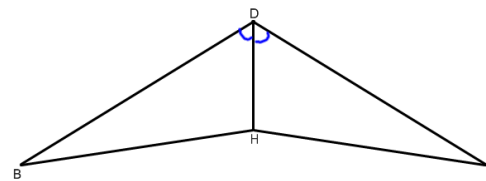
**2. Vertical Angles are Congruent**

When two lines are intersecting



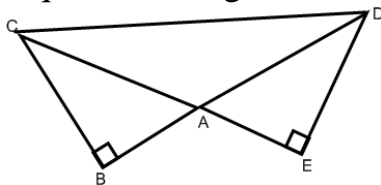
**7. Definition of an angle bisector**

Results in two angles being congruent



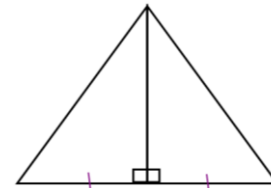
**3. Right Angles are Congruent**

When you are given right triangles and/or a square/ rectangle



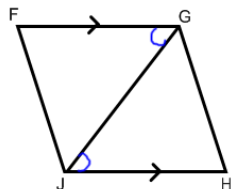
**8. Definition of a perpendicular bisector**

Results in 2 congruent segments and right angles.



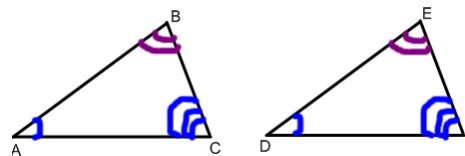
**4. Alternate Interior Angles of Parallel Lines are congruent**

When the givens inform you that two lines are parallel



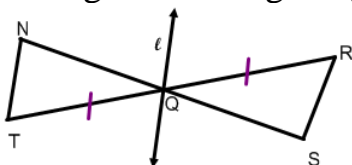
**9. 3<sup>rd</sup> angle theorem**

If 2 angles of a triangle are  $\cong$  to 2 angles of another triangle, then the 3<sup>rd</sup> angles are  $\cong$



**5. Definition of a segment bisector**

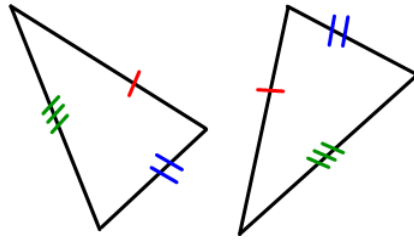
Results in 2 segments being congruent



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

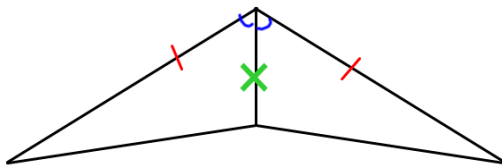
**Directions: Check which congruence postulate you would use to prove that the two triangles are congruent.**

1.



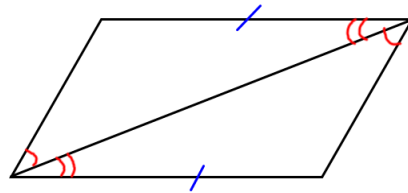
- SSS
- SAS
- ASA
- AAS

2.



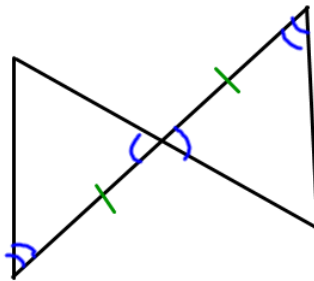
- SSS
- SAS
- ASA
- AAS

3.



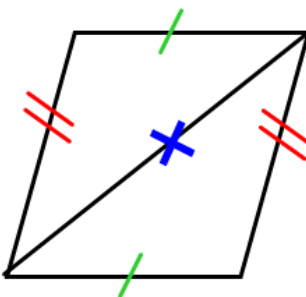
- SSS
- SAS
- ASA
- AAS

4.



- SSS
- SAS
- ASA
- AAS

5.

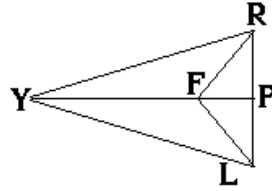


- SSS
- SAS
- ASA
- AAS

**Practice.** Fill in the missing reasons

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

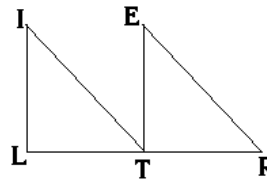
**Prove:**  $\triangle FRY \cong \triangle FLY$



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

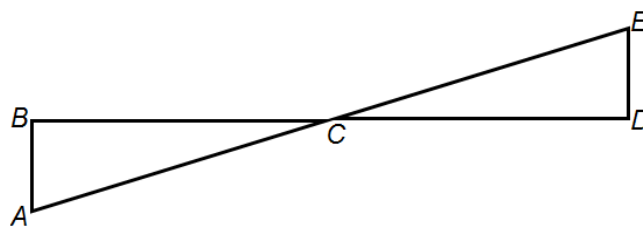
7. **Given:**  $\overline{LT} \cong \overline{TR}$ ,  $\angle ILT \cong \angle ETR$ ,  $IT \parallel ER$

**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. $\triangle LIT \cong \triangle TER$	

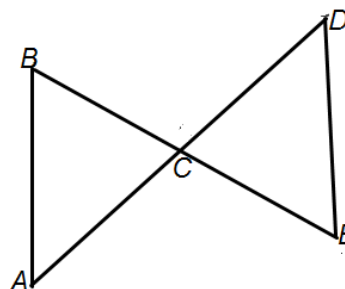
8. **Given:**  $C$  is midpoint of  $\overline{BD}$   
 $\overline{AB} \perp \overline{BD}$   
 $\overline{BD} \perp \overline{DE}$



**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. $\triangle ABC \cong \triangle EDC$	

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

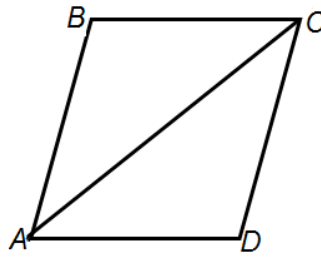


**Prove:**  $\triangle ABC \cong \triangle DEC$

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. $\triangle ABC \cong \triangle DEC$	

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. $\triangle ABC \cong \triangle CDA$	

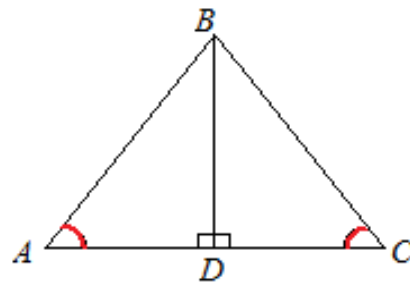
**Practice.** Write a 2-column proof for the following problems.

11.

**Given:**  $\angle ADB$  and  $\angle CDB$  are right angles

$$\angle A \cong \angle C$$

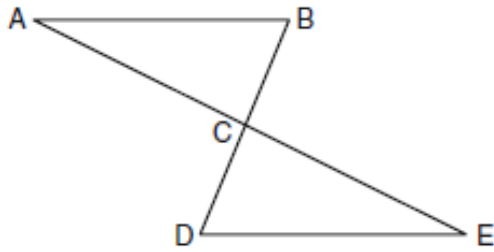
**Prove:**  $\triangle ADB \cong \triangle CDB$





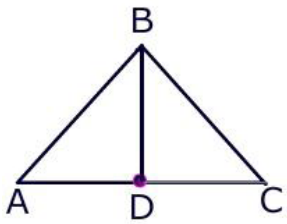
12. **Given:**  $C$  is the midpoint of  $BD$  and  $AE$

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



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

**Prove:**  $\triangle ABD \cong \triangle CBD$

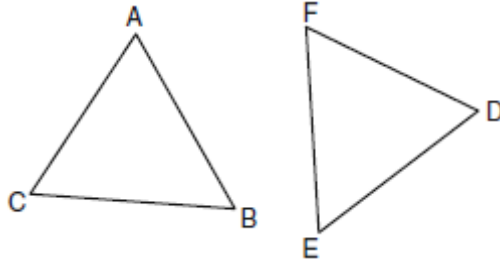


## Regents Practice

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

- (1)  $SSS \cong SSS$       (2)  $SSA \cong SSA$       (3)  $SAS \cong SAS$       (4)  $ASA \cong ASA$

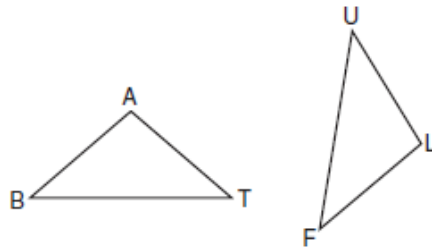
15. In the diagram of  $\triangle ABC$  and  $\triangle DEF$  below,  $\overline{AB} \cong \overline{DE}$ ,  $\angle A \cong \angle D$ , and  $\angle B \cong \angle E$ .



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

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

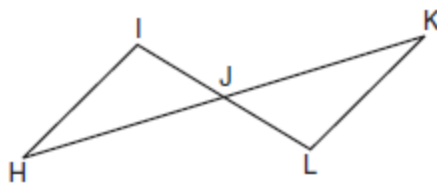
16. In the accompanying diagram of triangles  $BAT$  and  $FLU$ ,  $\angle B \cong \angle F$  and  $\overline{BA} \cong \overline{FL}$ .



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)  $\overline{BA} \parallel \overline{FL}$

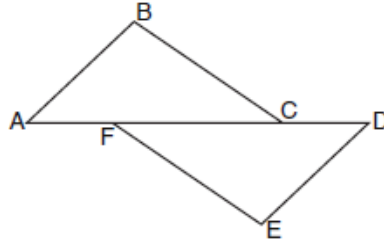
17. In the accompanying diagram,  $\overline{HK}$  bisects  $\overline{IL}$  and  $\angle H \cong \angle K$ .



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

- (1)  $HL \cong HL$   
 (2)  $SAS \cong SAS$   
 (3)  $AAS \cong AAS$   
 (4)  $ASA \cong ASA$

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