Geometry SMART Packet

Triangle Proofs (SSS, SAS, ASA, AAS)

Student: Key Date: ____________ Period: _______

Standards

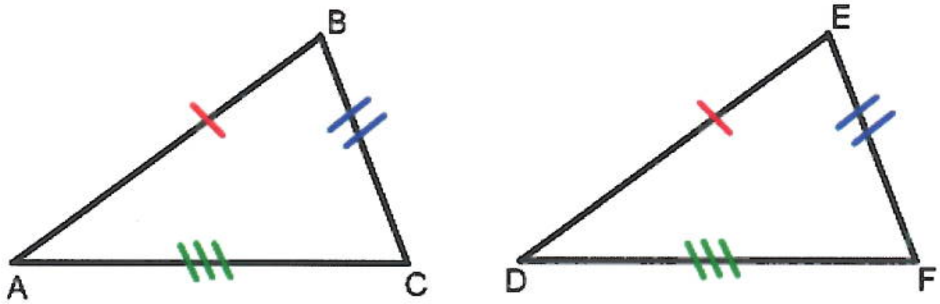
G.G.27 Write a proof arguing from a given hypothesis to a given conclusion.

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.

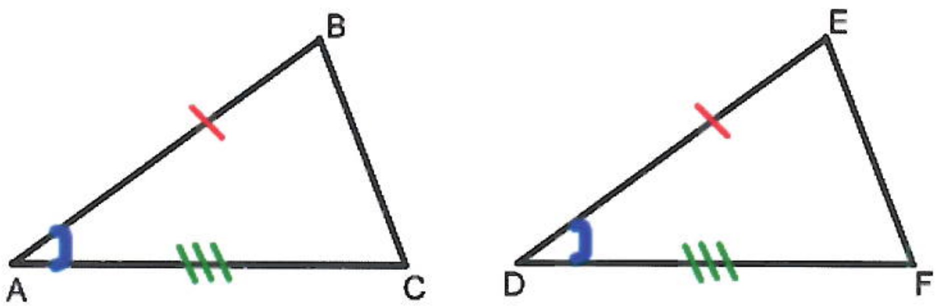
Check answers on burgessmath.weebly.com
Work through as much of this as needed!

8th grade page

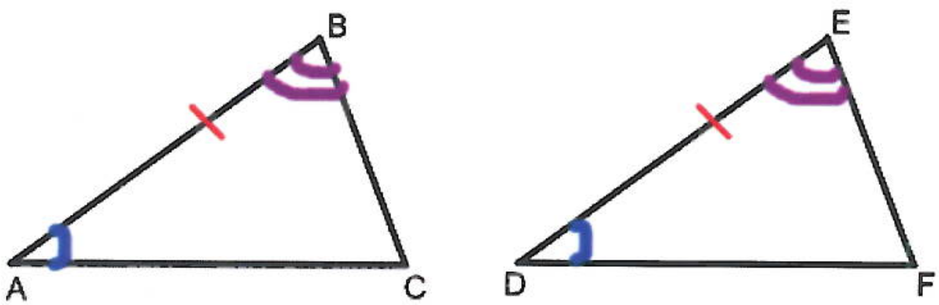
SSS (Side, Side, Side)



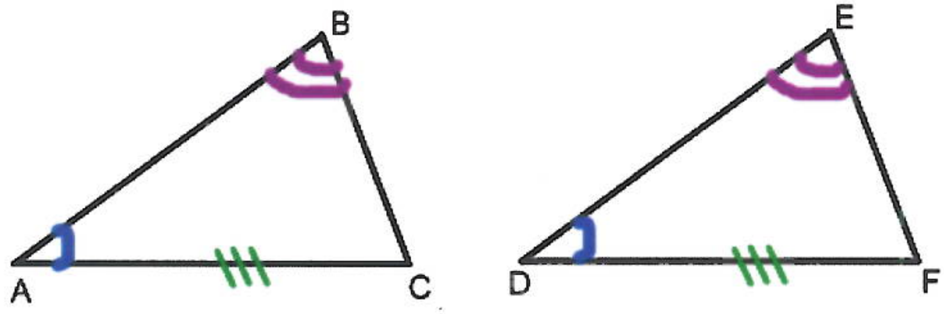
SAS (Side, Angle, Side)



ASA (Angle, Side, Angle)

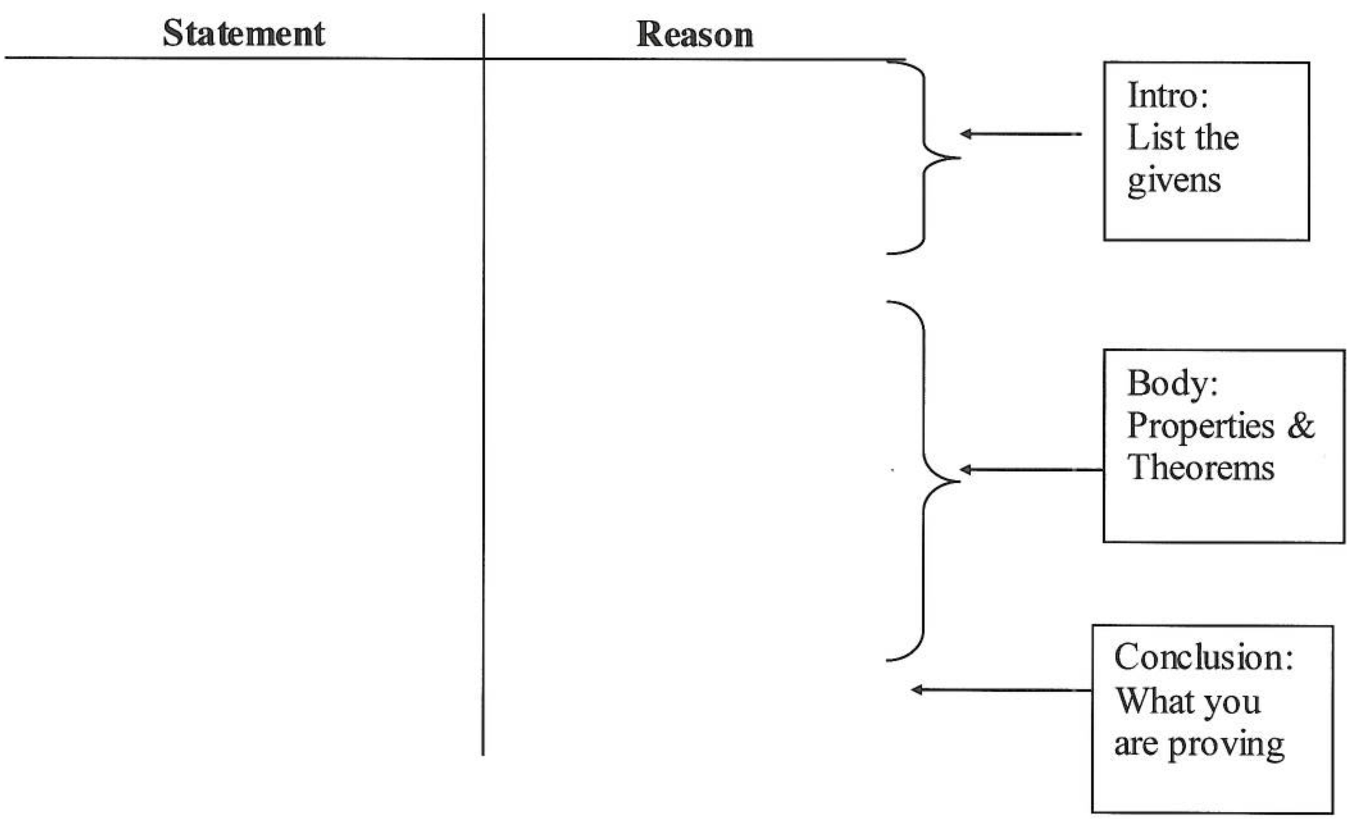


AAS (Angle, Angle, Side)



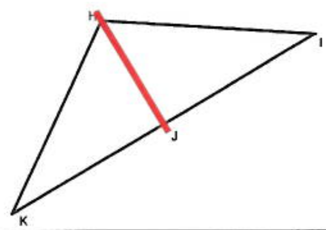
Note: **We can <u>NOT</u> prove triangles with AAA or SSA!!**

How to set up a proof:

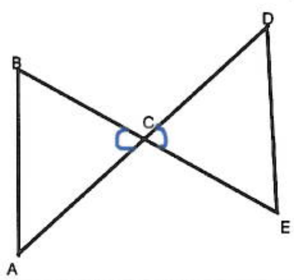


9 Most Common Properties, Definitions & Theorems for Triangles

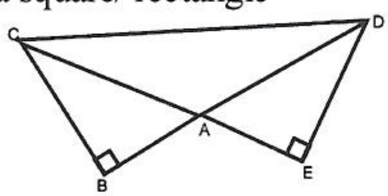
1. **Reflexive Property: $AB = BA$**
When the triangles have an angle or side in common



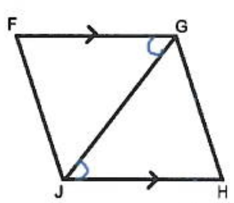
2. **Vertical Angles are Congruent**
When two lines are intersecting



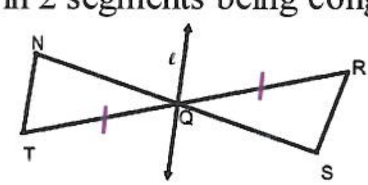
3. **Right Angles are Congruent**
When you are given right triangles and/or a square/ rectangle



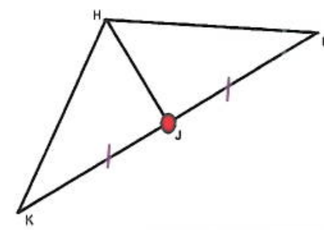
4. **Alternate Interior Angles of Parallel Lines are congruent**
When the givens inform you that two lines are parallel



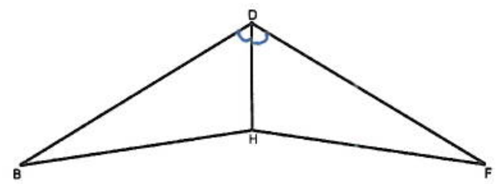
5. **Definition of a segment bisector**
Results in 2 segments being congruent



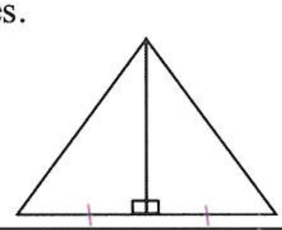
6. **Definition of a Midpoint**
Results in two segments being congruent



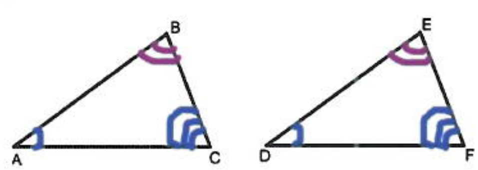
7. **Definition of an angle bisector**
Results in two angles being congruent



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



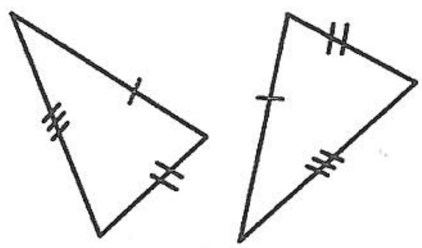
9. **3rd angle theorem**
If 2 angles of a triangle are $\cong$ to 2 angles of another triangle, then the 3rd angles are $\cong$



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

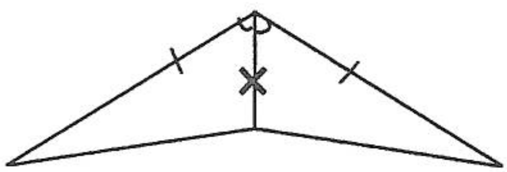
Directions: Check which congruence postulate you would use to prove that the two triangles are congruent.

1.



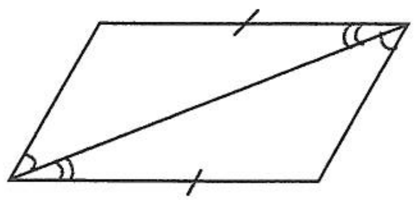
- [x] SSS
- [ ] SAS
- [ ] ASA
- [ ] AAS

2.



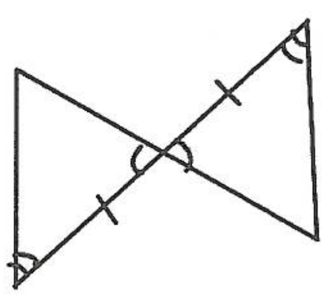
- [ ] SSS
- [x] SAS
- [ ] ASA
- [ ] AAS

3.



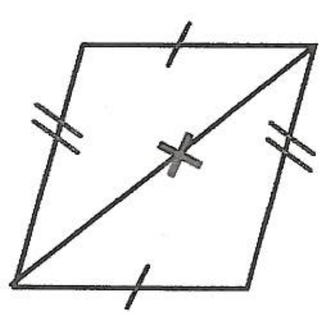
- [ ] SSS
- [ ] SAS
- [ ] ASA
- [x] AAS

4.



- [ ] SSS
- [ ] SAS
- [x] ASA
- [ ] AAS

5.

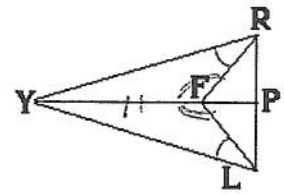


- [x] SSS
- [ ] SAS
- [ ] ASA
- [ ] AAS

Practice. *Fill in the missing reasons*

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

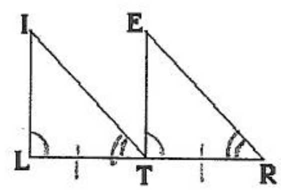
Prove: $\triangle FRY \cong \triangle FLY$



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

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

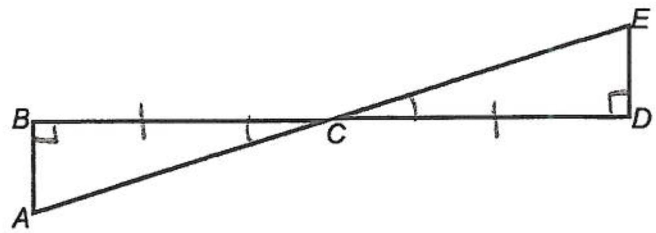
Prove: $\triangle LIT \cong \triangle TER$



Statement	Reason
1. $\overline{LT} \cong \overline{TR}$	GIVEN
2. $\angle ILT \cong \angle ETR$	GIVEN
3. $IT \parallel ER$	GIVEN
4. $\angle LTI \cong \angle ERT$	CORRESPONDING ANGLES (PARALLEL LINES CUT BY TRANSVERSAL)
5. $\triangle LIT \cong \triangle TER$	ASA

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

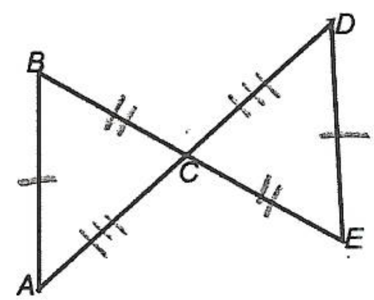
Prove: $\triangle ABC \cong \triangle EDC$



Statement	Reason
1. C is midpoint of $\overline{BD}$	GIVEN
2. $\overline{AB} \perp \overline{BD}$ and $\overline{BD} \perp \overline{DE}$	GIVEN
3. $\overline{BC} \cong \overline{CD}$	DEFINITION OF MIDPOINT
4. $\angle BCA \cong \angle ECD$	VERTICAL ANGLES
5. $\angle ABC$ and $\angle EDC$ are right angles	DEFINITION OF PERPENDICULAR LINES
6. $\angle ABC \cong \angle EDC$	ALL RIGHT ANGLES ARE CONGRUENT
7. $\Delta ABC \cong \Delta EDC$	ASA

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

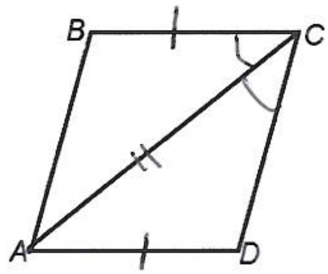
Prove: $\triangle ABC \cong \triangle DEC$



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

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

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

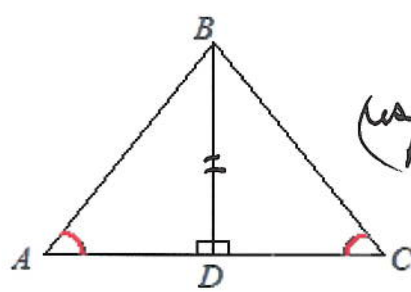


Statement	Reason
1. $\overline{BC} \cong \overline{DA}$	Given
2. $\overline{AC}$ bisects $\angle BCD$	Given
3. $\angle BCA \cong \angle DCA$	Def. of angle bisector
4. $\overline{AC} \cong \overline{AC}$	Reflexive
5. $\Delta ABC \cong \Delta CDA$	uh oh - not enough to prove this!

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: $\Delta ADB = \Delta CDB$



(use AAS)

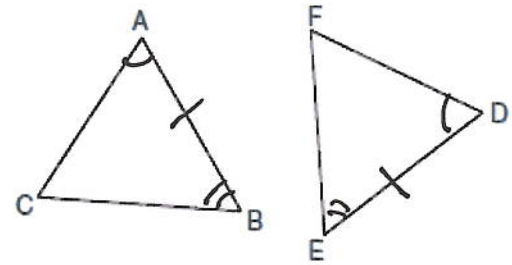
Given
$\angle ADB$ and $\angle CDB$ are rt Δ's
and $\angle A \cong \angle C$

- $\overline{BD} \cong \overline{BD}$ by reflexive
- $\Delta ADB \cong \Delta CDB$ by AAS

Regents Practice

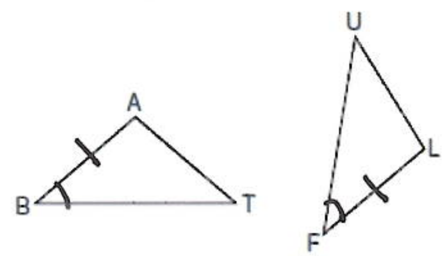
14. Which condition does *not* prove that two triangles are congruent?
(1) SSS ≅ SSS   (2) SSA ≅ SSA   (3) SAS ≅ SAS   (4) ASA ≅ ASA

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



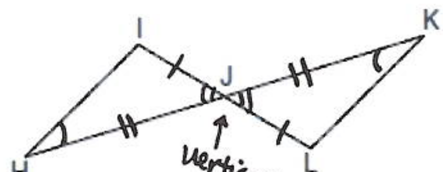
Which method can be used to prove $\triangle ABC \cong \triangle DEF$?
(1) SSS   (2) SAS   (3) ASA   (4) HL

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 $\angle H \cong \angle K$.

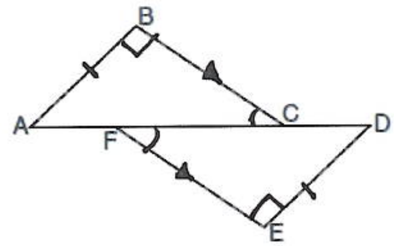


vertical ∠'s

What is the most direct method of proof that could be used to prove $\triangle HIJ \cong \triangle KLJ$?
~~(1)~~ HL ≅ HL not a right Δ
(2) SAS ≅ SAS
(3) AAS ≅ AAS
(4) ASA ≅ ASA

any of these would work

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 by def. of $\perp$ lines
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 AIA
7 $\overline{AB} \cong \overline{DE}$	7 Given
8 $\triangle ABC \cong \triangle DEF$	8 AAS