1. $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$ and $\overline{AC} \cong \overline{DF}$

2. $\overline{ST} \cong \overline{VW}$, $\overline{TU} \cong \overline{WX}$ and $\overline{SU} \cong \overline{VX}$

3. $\Delta CDE \cong \Delta HGF$

4. $\Delta XYZ \cong \Delta LMN$

5. $\angle A \cong \angle D$, $\angle B \cong \angle E$ and $\angle C \cong \angle F$

6. $\angle R \cong \angle X$, $\angle S \cong \angle Y$ and $\angle T \cong \angle Z$

7. SSS

8. SAS

9. ASA

10. SSS

11. Not necessarily congruent.

12. SAS or SSS

13. SAS

14. HL

5. Vertical angles are congruent, so we have AAS.

If you have AAS, then you know that all three angles are congruent.

If all 3 angles are congruent, then we have ASA.

16. Not necessarily congruent.

17. ASA

18. Not necessarily congruent.

19. All the angles are congruent but the sides may not be congruent, thus these triangles are not congruent.

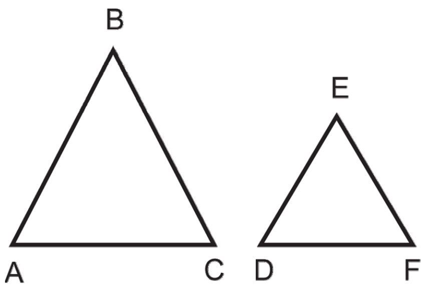
There is no AAA property for showing congruence.

Note: These triangles are similar because all the angles are equal.

20. SAS

21. Prove Theorem 2.2.2: The ratio of the lengths of corresponding sides of two triangles are equal if and only of the triangles are similar.

Two proofs are needed to prove the "if and only if" statement.
Part 1: Show If the two triangles are similar, then the ratio of the lengths of corresponding sides of two triangles are equal.



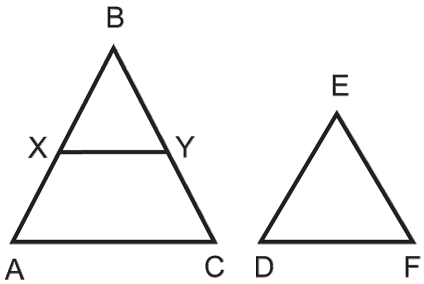
Given: $\Delta ABC \sim \Delta DEF$

Prove: $\dfrac{DE}{AB} = \dfrac{EF}{BC} = \dfrac{DF}{AC}$

Statement	Reason
1. $\Delta ABC \sim \Delta DEF$	1. Given.
2. $\dfrac{DE}{AB} = \dfrac{EF}{BC} = \dfrac{DF}{AC}$	2. Definition of similar triangle.

Part 2: Show if the ratio of the lengths of corresponding sides of two triangles are equal, then the triangles are similar.

21. Continued:



Given: $\frac{DE}{AB} = \frac{EF}{BC} = \frac{DF}{AC}$

Prove: $\Delta ABC \sim \Delta DEF$

Statement	Reason
1. $\frac{DE}{AB} = \frac{EF}{BC} = \frac{DF}{AC}$	1. Given.
2. Locate x on $\overline{AB}$ so that $\overline{XB} \cong \overline{DE}$.	2. Definition of congruent line segments.
3. Draw $\overline{XY}$ so that $\overline{XY} \parallel \overline{AC}$.	3. Postulate 1.6.2: Given a line and a point not on the line, there is exactly one line through the point that is parallel to the given line.
4. $\angle BXY \cong \angle A$ & $\angle BYX \cong \angle C$	4. Postulate 1.6.1: If two parallel lines are cut by a transversal, then the corresponding angles are congruent.
5. $\Delta ABC \sim \Delta XBY$	5. AA similarity.
6. $\frac{XB}{AB} = \frac{BY}{BC} = \frac{XY}{AC}$	6. Definition of similar triangles.
7. $XB = DE$	7. From line 2.
8. $\frac{XB}{AB} = \frac{EF}{BC} = \frac{DF}{AC}$	8. Substitution from lines 1 and 7.
9. $\frac{EF}{BC} = \frac{BY}{BC}$ & $\frac{DF}{AC} = \frac{XY}{AC}$	9. Substitution from lines 6 and 8.
10. $EF = BY$ & $DF = XY$	10. Multiplication.
11. $\overline{EF} \cong \overline{BY}$ & $\overline{DF} \cong \overline{XY}$	11. Definition of congruent line segments.

21. Continued:

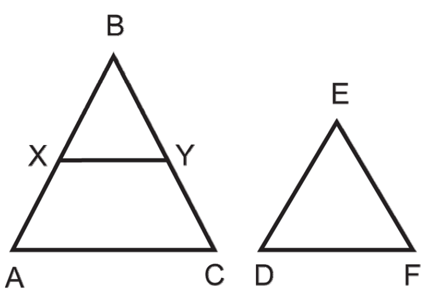
12. $\overline{XB} \cong \overline{DE}$	12. From line 2.
13. $\Delta XBY \cong \Delta DEF$	13. SSS
14. $\angle B \cong \angle E$ & $\angle BXY \cong \angle D$	14. CPCTC
15. $\angle BXY \cong \angle A$ & $\angle BXY \cong \angle D$	15. Lines 4 and 14.
16. $\angle A \cong \angle D$	15. Substitution from line 15.
17. $\Delta ABC \sim \Delta DEF$	16. AA similarity.

22. Prove Theorem 2.2.3: If two ratios of the lengths of corresponding sides of two triangles are equal and the included angles are congruent, then the triangles are similar.

Given: $\dfrac{DE}{AB} = \dfrac{EF}{BC}$

$\angle B \cong \angle E$

Prove: $\Delta ABC \sim \Delta DEF$



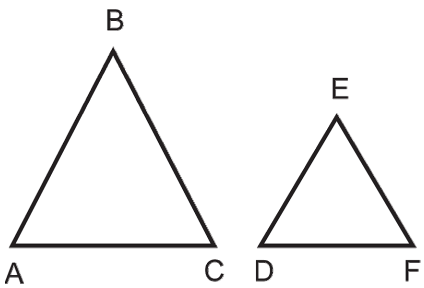
22. Continued:

Statement	Reason
1. $\frac{DE}{AB} = \frac{EF}{BC}$	1. Given.
2. Locate X on $\overline{AB}$ so that $\overline{XB} \cong \overline{DE}$	2. Definition of congruent line segments.
3. Draw $\overline{XY}$ so that $\overline{XY} \parallel \overline{AC}$	3. Postulate 1.6.2: Given a line and a point not on the line, there is exactly one line through the point that is parallel to the given line.
4. $\angle BXY \cong \angle A$ & $\angle BYX \cong \angle C$	4. Postulate 1.6.1: If two parallel lines are cut by a transversal, then the corresponding angles are congruent.
5. $\Delta ABC \sim \Delta XBY$	5. AA similarity.
6. $\frac{XB}{AB} = \frac{BY}{BC} = \frac{XY}{AC}$	6. Definition of similar triangles.
7. XB = DE	7. From line 2.
8. $\frac{XB}{AB} = \frac{EF}{BC}$	8. Substitution from lines 1 and 7.
9. $\frac{EF}{BC} = \frac{BY}{BC}$	9. Substitution from lines 6 and 8.

10. EF = BY	10. Multiplication.
11. $\overline{EF} \cong \overline{BY}$	11. Definition of congruent line segments.
12. $\overline{XB} \cong \overline{DE}$	12. From line 2.
13. $\angle B \cong \angle E$	13. Given.
14. $\Delta XBY \cong \Delta DEF$	14. SAS
15. $\angle BXY \cong \angle D$	15. CPCTC
16. $\angle A \cong \angle D$	16. Transitive from lines 4 and 15.
17. $\Delta ABC \sim \Delta DEF$	17. AA similarity.

23. Prove Theorem 2.2.1: Two triangles are similar if and only if their corresponding angles are congruent.

Two proofs are needed to prove the “if and only if” statement.
Part 1: Show if two triangles are similar, then their corresponding angles are congruent.



Given: $\Delta ABC \sim \Delta DEF$

Prove; $\angle A \cong \angle D$, $\angle B \cong \angle E$ and $\angle C \cong \angle F$

Statement	Reason
1. $\Delta ABC \sim \Delta DEF$	1. Given.
2. $\angle A \cong \angle D$, $\angle B \cong \angle E$ and $\angle C \cong \angle F$	2. Definition of similar triangles.

Part 2: Show if two triangles have corresponding congruent angles, then the triangles are similar.

Given: $\angle A \cong \angle D$, $\angle B \cong \angle E$ and $\angle C \cong \angle F$

Prove: $\Delta ABC \sim \Delta DEF$

Statement	Reason
1. $\angle A \cong \angle D$, $\angle B \cong \angle E$ and $\angle C \cong \angle F$	1. Given.
2. $\Delta ABC \sim \Delta DEF$	2. Postulate 2.2.1: If two angles of a triangle are congruent to two angles of another triangle, then the triangles are similar.

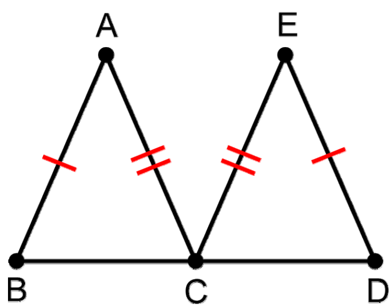
24.

Given: $\overline{AB} \cong \overline{ED}$

$\overline{AC} \cong \overline{EC}$

C is the midpoint of $\overline{BD}$

Prove: $\Delta ABC \cong \Delta EDC$



Statement	Reason
1. $\overline{AB} \cong \overline{ED}$ $\overline{AC} \cong \overline{EC}$	1. Given.
2. C is the midpoint of $\overline{BD}$	2. Given.
3. $\overline{BC} \cong \overline{DC}$	3. Definition of midpoint.
4. $\Delta ABC \cong \Delta EDC$	4. SSS

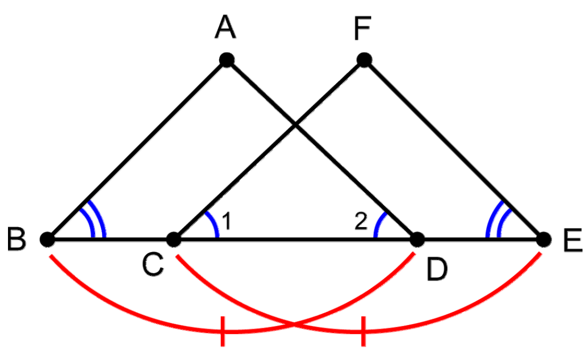
25.

Given: $\angle B \cong \angle E$

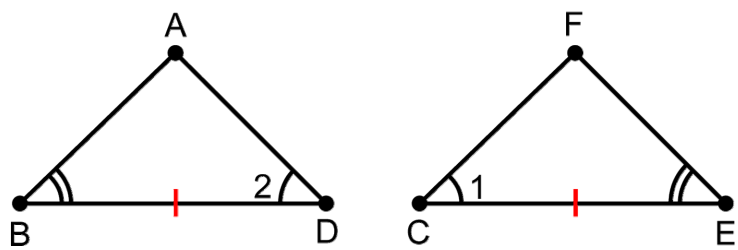
$\angle 1 \cong \angle 2$

$\overline{BD} \cong \overline{CE}$

Prove: $\Delta ABD \cong \Delta FEC$



Separate the Triangles



Statement	Reason
1. $\angle B \cong \angle E$ $\angle 1 \cong \angle 2$	1. Given. (A) & (A)
2. $\overline{BD} \cong \overline{CE}$	2. Given. (S)
3. $\Delta ABD \cong \Delta FEC$	3. ASA

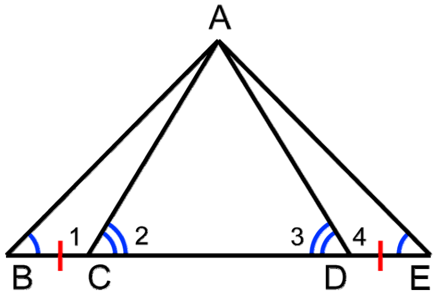
26.

Given: $\angle B \cong \angle E$

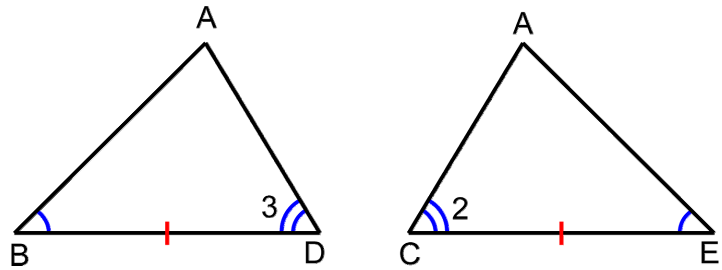
$\angle 2 \cong \angle 3$

$\overline{BC} \cong \overline{DE}$

Prove: $\Delta ABD \cong \Delta AEC$



Separate the triangles.

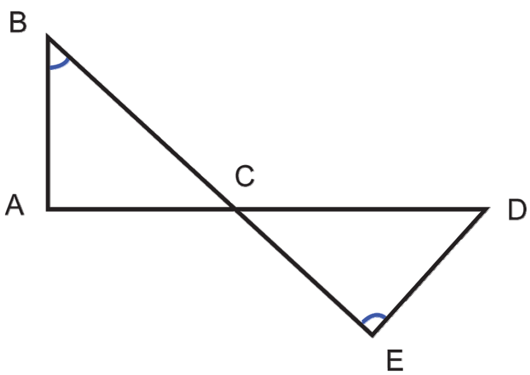


Statements	Reasons
1. $\angle B \cong \angle E$ $\angle 2 \cong \angle 3$	1. Given
2. $\overline{BC} \cong \overline{DE}$	2. Given
3. $\overline{CD} \cong \overline{CD}$	3. Reflexive
4. $\overline{BC} + \overline{CD} \cong \overline{DE} + \overline{CD}$	4. Additive Property
5. $\overline{BC} + \overline{CD} = \overline{BD}$ $\overline{DE} + \overline{CD} = \overline{EC}$	5. Definition of segment addition
6. $\overline{BD} \cong \overline{EC}$	6. Substitution from lines 4 and 5.
7. $\Delta ABD \cong \Delta AEC$	7. ASA

27.

Given: C is the midpoint of $\overline{BE}$
$\angle B \cong \angle E$

Prove: $\Delta BCA \cong \Delta ECD$



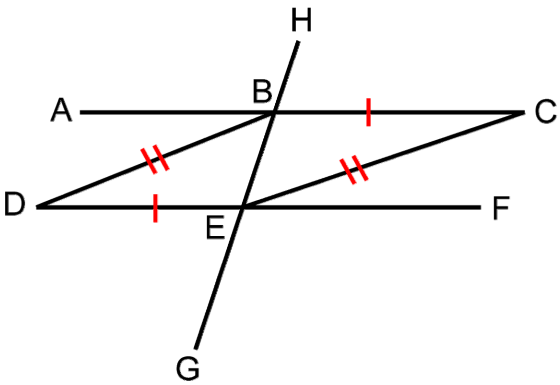
Statement	Reason
1. C is the midpoint of $\overline{BE}$.	1. Given.
2. $\overline{BC} \cong \overline{CE}$	2. Definition of midpoint. (S)
3. $\angle ACB$ & $\angle ECD$ are vertical angles.	3. Definition of vertical angles.
4. $\angle ACB \cong \angle ECD$	4. Theorem 1.2.1: If two angles are vertical angles, then they are congruent. (A)
5. $\angle B \cong \angle E$	5. Given. (A)
6. $\Delta BCA \cong \Delta ECD$	6. ASA

28.

Given: $\overline{DE} \cong \overline{BC}$

$\overline{DB} \cong \overline{CE}$

Prove: $\overline{AC} \parallel \overline{DF}$

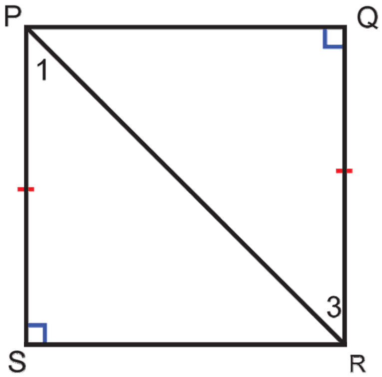


Statement	Reason
1. $\overline{DE} \cong \overline{BC}$ $\overline{DB} \cong \overline{CE}$	1. Given.
2. $\overline{BE} \cong \overline{BE}$	2. Reflexive.
3. $\Delta BED \cong \Delta EBC$	3. SSS
4. $\angle BED \cong \angle EBC$	4. CPCTC
5. $\overline{AC} \parallel \overline{DF}$	5. Theorem 1.6.4: If two lines are cut by a transversal and a pair of alternate interior angles are congruent, then the two lines are parallel.

29.

Given: $\angle Q$ and $\angle S$ are right angles
$\overline{RQ} \cong \overline{SP}$

Prove: $\overline{PQ} \parallel \overline{SR}$



Statement	Reason
1. $\angle Q$ and $\angle S$ are right angles	1. Given. (right triangle)
2. $\overline{RQ} \cong \overline{SP}$	2. Given. (L)
3. $\overline{PR} \cong \overline{PR}$	3. Reflexive. (H)
4. $\Delta SPR \cong \Delta QRP$	4. HL
5. $\angle 1 \cong \angle 3$	5. CPCTC
6. $\overline{PQ} \parallel \overline{SR}$	6. Theorem 1.6.4: If two lines are cut by a transversal and a pair of alternate interior angles are congruent, then the two lines are parallel.