Review of Proofs

Date	Classwork	Assignment
Thursday, May 2	**Unit 13 Test**	
Friday, May 3	Proofs Review – Triangle Congruence and CPCTC	Proofs Review #1
Monday, May 6	Proofs Review – Parallel Lines and +/-	Proofs Review #2
Tuesday, May 7	Proofs Review – Quadrilaterals & Coordinate Proofs	Proofs Review #3
Wednesday, May 8	Proofs Review – Similarity	Proofs Review #4
Thursday, May 9	Proofs Review – Circle Proofs	Proofs Review #5
Friday, May 10	Proofs Review – Circle Proofs	Regents Review #1 (White)

PROOF REVIEW

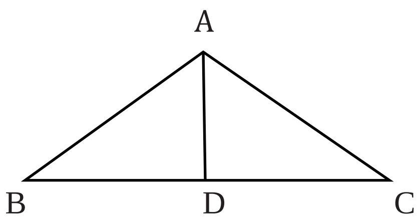
A midpoint divides a segment into two congruent segments.

An angle bisector divides an angle into two congruent angles.

If two sides of a triangle are congruent, then their opposite angles are congruent.

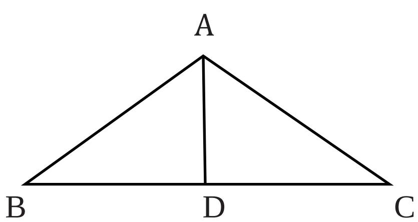
If two angles of a triangle are congruent, then their opposite sides are congruent.

1. Given: $\overline{AD}$ bisects $\measuredangle BAC$



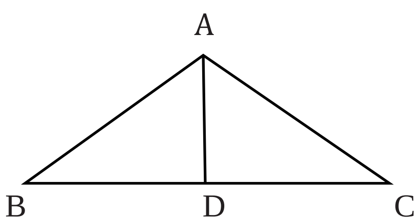
Statement	Reason
1. $\overline{AD}$ bisects $\measuredangle BAC$	1. Given

2. Given: D is the midpoint of $\overline{BC}$



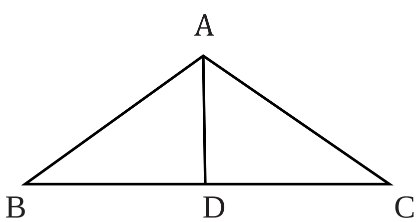
Statement	Reason
1. D is the midpoint of $\overline{BC}$	1. Given

3. Given: $\overline{AB} \cong \overline{AC}$



Statement	Reason
1. $\overline{AB} \cong \overline{AC}$	1. Given

4. Given: $\measuredangle B \cong \measuredangle C$

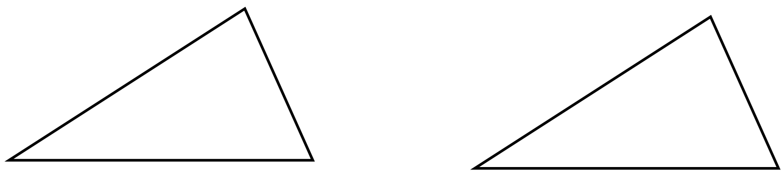


Statement	Reason
1. $\measuredangle B \cong \measuredangle C$	1. Given

There are 5 Methods for Proving Triangles Congruent:

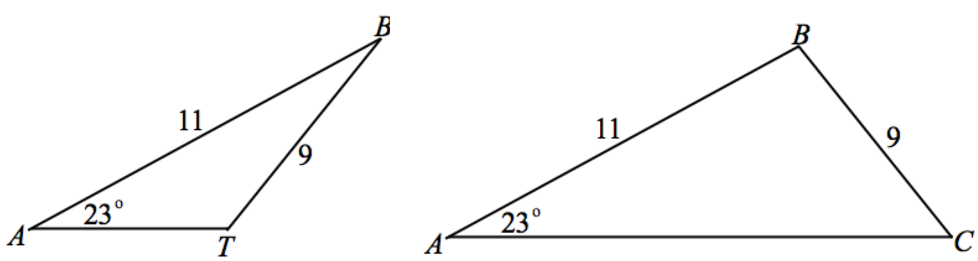
SSS Triangle Congruence:

If three sides of one triangle are congruent to three sides of a second triangle, the triangles are congruent.



SAS Triangle Congruence:

If two sides and the <u>included angle</u> of one triangle are congruent to two sides and the <u>included angle</u> of a second triangle, the triangles are congruent.

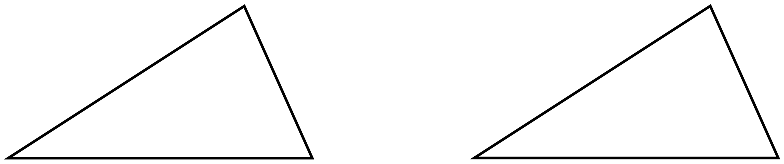


HL Triangle Congruence:

If two triangles are <u>right triangles</u>, and if their hypotenuses are congruent and a pair of legs are congruent, then the triangles are congruent by HL.

ASA Triangle Congruence:

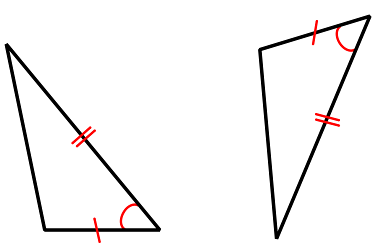
If two angles and the <u>included side</u> of one triangle are congruent to two angles and the <u>included side</u> of a second triangle, the triangles are congruent.



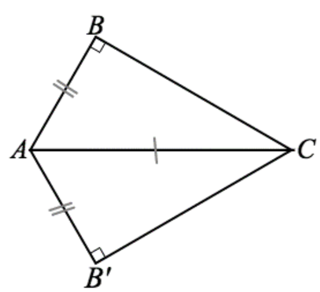
AAS Triangle Congruence:
If two angles and the <u>non-included side</u> of one triangle are congruent to two angles and the <u>non-included side</u> of a second triangle, the triangles are congruent.

Reflexive Property: Any segment or angle is congruent to itself.

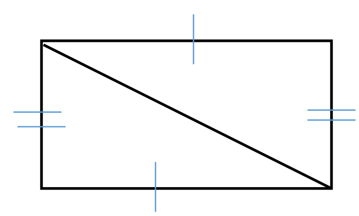
(1) __________



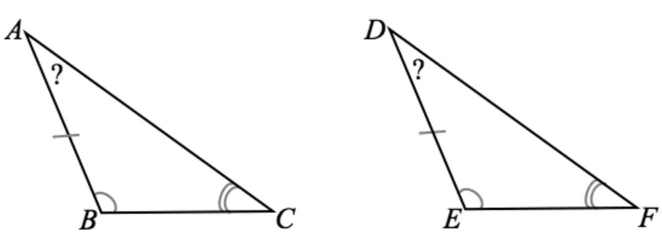
(2) __________



(3) __________

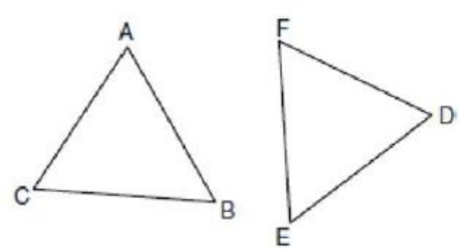


(4) __________



(5) __________

In the diagram of ΔABC and ΔDEF below, $\overline{AB} \cong \overline{DE}$, $\angle A \cong \angle D$, and $\angle B \cong \angle E$.



Perpendicular Segments

Perpendicular segments always form right angles, but depending on whether the proof is HL or SAS, AAS, or ASA, the next step will be different.

$\overline{AD} \perp \overline{BC}$

If the proof is SAS, AAS or ASA:

Perpendicular lines intersect forming right angles.

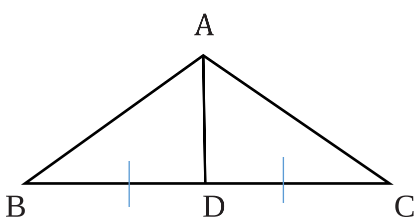
All right angles are congruent.

If the proof is HL:

Perpendicular lines intersect forming right angles.

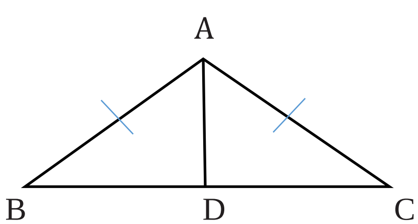
A triangle with a right angle is a right triangle.

5. Given: $\overline{AD} \perp \overline{BC}$



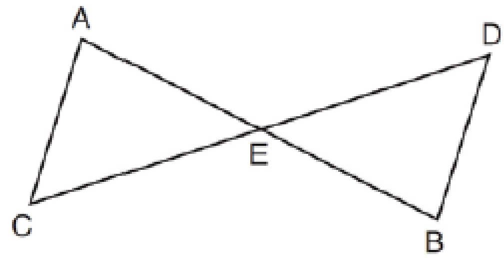
Statement	Reason
1. $\overline{AD} \perp \overline{BC}$	1. Given

6. Given: $\overline{AD} \perp \overline{BC}$

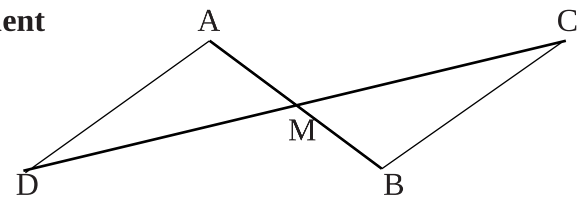


Statement	Reason
1. $\overline{AD} \perp \overline{BC}$	1. Given

Vertical angles are congruent.



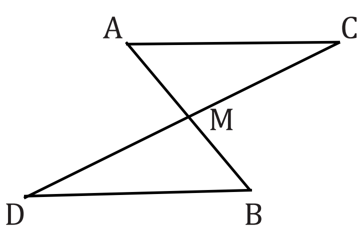
A segment bisector divides a segment into two congruent segments at its midpoint.



$\overline{AB}$ bisects $\overline{DC}$

7. Given: $\overline{AB}$ bisects $\overline{DC}$
$\measuredangle A \cong \measuredangle B$

Prove: $\Delta ACM \cong \Delta BDM$

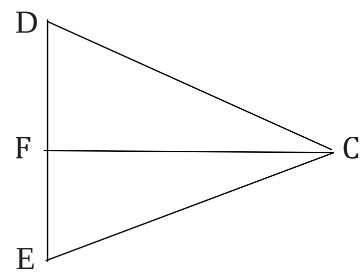


Statements	Reasons
1. $\overline{AB}$ bisects $\overline{DC}$	1. Given

Given: $\overline{CF}$ bisects $\measuredangle DCE$

$\overline{CF} \perp \overline{DE}$

Prove: $\Delta DCF \cong \Delta ECF$



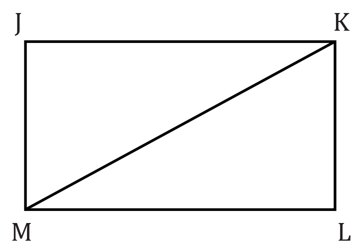
Statements	Reasons

Given: $\overline{MJ} \perp \overline{JK}$

$\overline{ML} \perp \overline{KL}$

$\overline{JK} \cong \overline{ML}$

Prove: $\Delta JMK \cong \Delta LKM$



Statements	Reasons

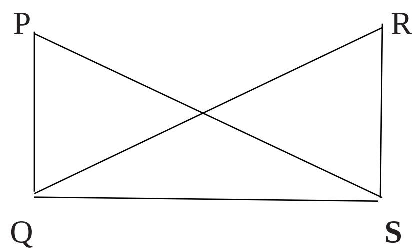
Corresponding sides of congruent triangles are congruent
Corresponding angles of congruent triangles are congruent.

Given: $\overline{PQ} \cong \overline{RS}$

$\overline{PQ} \perp \overline{QS}$

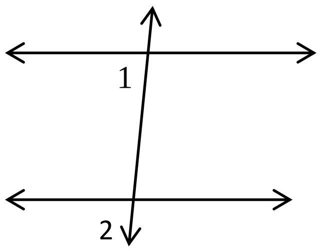
$\overline{RS} \perp \overline{QS}$

Prove: $\overline{PS} \cong \overline{RQ}$



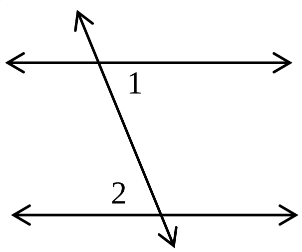
	Statements	Reasons
1.	$\overline{PQ} \cong \overline{RS}$, $\overline{PQ} \perp \overline{QS}$, $\overline{RS} \perp \overline{QS}$	1. Given

Angles formed by Parallel Lines



If 2 parallel lines are cut by a transversal, corresponding angles are congruent.

If corresponding angles are congruent, then lines are parallel.



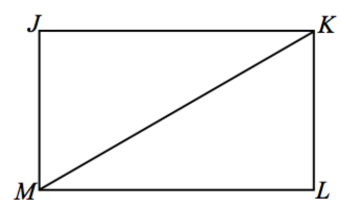
If 2 parallel lines are cut by a transversal, alternate interior angles are congruent.

If alternate interior angles are congruent, then lines are parallel.

Given: $\overline{JK} \parallel \overline{ML}$

$\overline{JM} \parallel \overline{KL}$

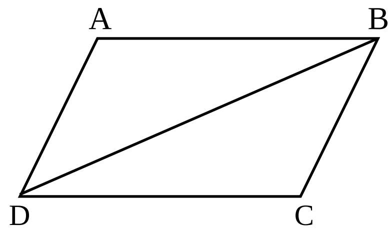
Prove: $\measuredangle J \cong \measuredangle L$



Statements	Reasons
1. $\overline{JK} \parallel \overline{ML}$ $\overline{JM} \parallel \overline{KL}$	1. Given

Given: $\overline{AB} \cong \overline{DC}$
$\overline{AB} \parallel \overline{DC}$

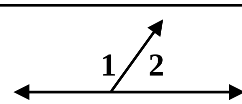
Prove: $\overline{AD} \parallel \overline{BC}$



Statements	Reasons
1. $\overline{AB} \cong \overline{DC}$ $\overline{AB} \parallel \overline{DC}$	1. Given

Supplementary Angles

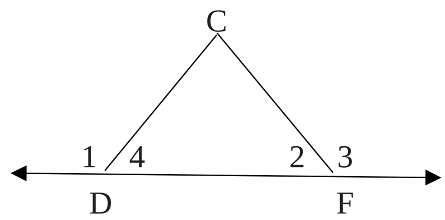
Angles on a line are supplementary



Supplements of congruent angles are congruent.

Given: $\measuredangle 1 \cong \measuredangle 3$

Prove: ΔCDF is isosceles



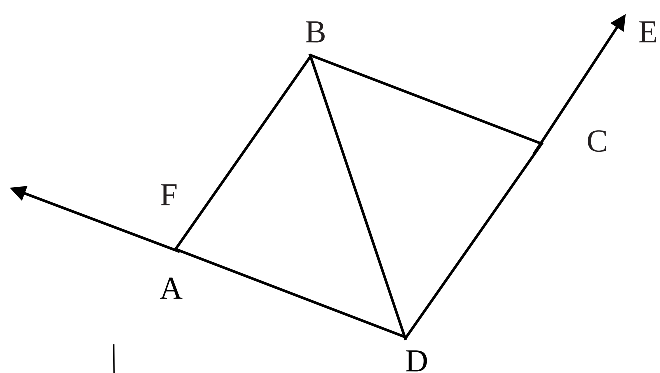
Statements	Reasons

Given: $\overline{BD}$ bisects $\measuredangle ADC$

$\overline{AD} \cong \overline{CD}$

$\measuredangle BCE \cong \measuredangle BAF$

Prove: $\Delta BAD \cong \Delta BCD$



1. $\overline{BD}$ bisects $\measuredangle ADC$ $\overline{AD} \cong \overline{CD}$ $\measuredangle BCE \cong \measuredangle BAF$	1. Given

ADDITION AND SUBTRACTION OF SEGMENTS & ANGLES

If a pair of congruent segments/angles are added to another pair of congruent segments/angles, then the resulting segments/angles are congruent. Similarly, if a pair of congruent segments/angles are subtracted from a pair of congruent segments/angles, then the resulting segments/angles are congruent.

Given: $\overline{ABCD}$ with $\overline{AB} \cong \overline{CD}$

Prove: $\overline{AC} \cong \overline{BD}$

Statements	Reasons
1. $\overline{AB} \cong \overline{CD}$	1. Given
2. $\overline{BC} \cong \overline{BC}$	2. Reflexive Property
3. $AB + BC = CD + BC$	3. Addition Property
4. $AC = AB + BC$ $BD = CD + BC$	4. A whole ='s the sum of its parts
5. $\overline{AC} \cong \overline{BD}$	5. Substitution

Given: $\overline{ABCD}$ with $\overline{AC} \cong \overline{BD}$

Prove: $\overline{AB} \cong \overline{CD}$

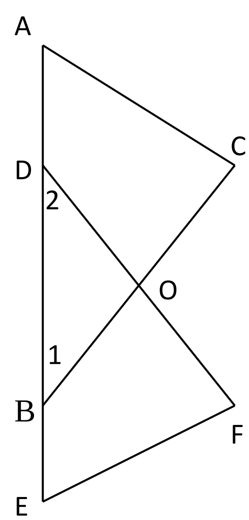
Statements	Reasons
1. $\overline{AC} \cong \overline{BD}$	1. Given
2. $\overline{BC} \cong \overline{BC}$	2. Reflexive Property
3. $AC = AB + BC$ $BD = CD + BC$	3. A whole ='s the sum of its parts
4. $AB + BC = CD + BC$	4. Substitution
5. $\overline{AC} \cong \overline{BD}$	5. Subtraction Property

1. Given: $\overline{AD} \cong \overline{BE}$

$\overline{DF} \cong \overline{BC}$

$\measuredangle 1 \cong \measuredangle 2$

Prove: $\Delta ACB \cong \Delta EFD$



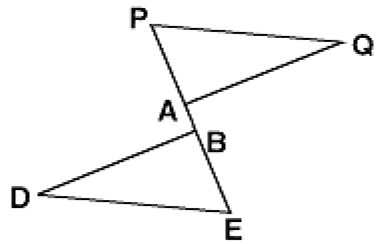
Statements	Reasons

2. Given: $\overline{PQ} \parallel \overline{DE}$

$PB = AE$

$\angle D \cong \angle Q$

Prove: $\Delta DEB \cong \Delta QPA$



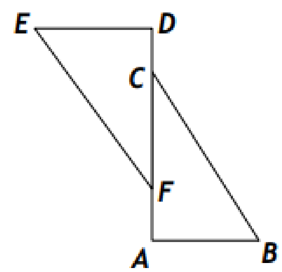
Statements	Reasons

3. Given: $\angle FED \cong \angle CBA$

$\overline{DC} \cong \overline{AF}$

$\overline{FD} \perp \overline{DE}$, $\overline{CA} \perp \overline{AB}$

Prove: $\overline{EF} \cong \overline{BC}$



Statements	Reasons

Quadrilateral Proofs

Trapezoid

At least one pair parallel sides (bases)

Parallelogram

Both pairs of opposite sides are parallel
Both pairs of opposite sides are congruent
Both pairs of opposite angles are congruent
Diagonals bisect each other
Consecutive angles are supplementary

*diagonals of a parallelogram are NOT congruent!
*diagonals of a parallelogram do NOT bisect the angles!
*diagonals of a parallelogram are NOT perpendicular!

Isosceles Trapezoid

Legs are congruent
Base angles are congruent
Diagonals are congruent

*diagonals of an isos. trap are NOT perpendicular!
*diagonals of an isos. trap. do NOT bisect the angles!

Rhombus

All of the above properties plus:

Four congruent sides
Diagonals bisect the angles
Diagonals are perpendicular

*diagonals of a rhombus are NOT congruent!

Rectangle

All of the above properties plus:

Four right angles
Diagonals are congruent

*diagonals of a rectangle are NOT perpendicular!
*diagonals of a rectangle do NOT bisect the angles!

Square

All of the above

Summary of Methods for Proving a Quadrilateral is a Parallelogram

1. If both pairs of opposite sides of a quadrilateral are parallel, it is a parallelogram.
2. If both pairs of opposite sides of a quadrilateral are congruent, it is a parallelogram.
3. If the diagonals of a quadrilateral bisect each other it is a parallelogram.
4. If both pairs of opposite angles of a quadrilateral are congruent, it is a parallelogram.
5. If one pair of opposite sides of quadrilateral are both congruent and parallel,
   it is a parallelogram.

Summary of Proving a Quadrilateral is a Rectangle

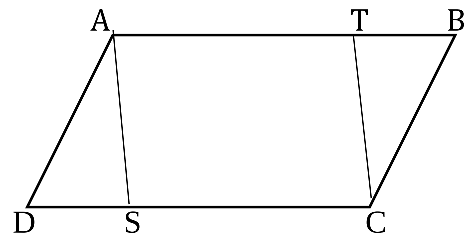
1. If a quadrilateral has four right angles, it is a rectangle.
2. If a parallelogram has a right angle, it is a rectangle.
3. If the diagonals of a parallelogram are congruent, it is a rectangle.

Summary of Proving a Quadrilateral is a Rhombus

1. If a quadrilateral has four congruent sides, it is a rhombus.
2. If the diagonals of a parallelogram are perpendicular, it is a rhombus.
3. If two consecutive sides of a parallelogram are congruent, it is a rhombus.
4. If the diagonals of a parallelogram bisect the angles, it is a rhombus.

Given: ABCD is a parallelogram

$\overline{DS} \cong \overline{BT}$

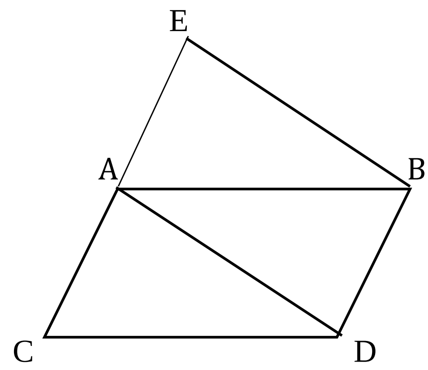


Prove: $\measuredangle ASC \cong \measuredangle CTA$

Given: A is the midpoint of $\overline{CE}$

$\measuredangle CAD \cong \measuredangle E$, $\overline{AD} \cong \overline{EB}$

Prove: ABCD is a parallelogram

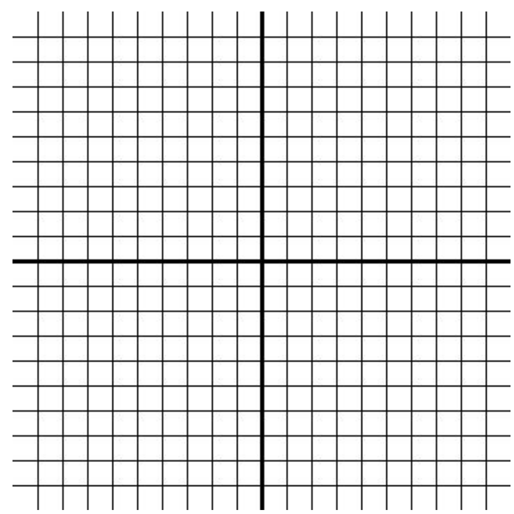


Coordinate Proofs

Theorem	Formula
If the slopes of two lines are equal, then the lines are parallel.	
If the slopes of two lines are negative reciprocals of each other, then the lines are perpendicular.	
If two segments share the same midpoint, then they bisect each other.	
If two segments are equal in length, then the segments are congruent.	

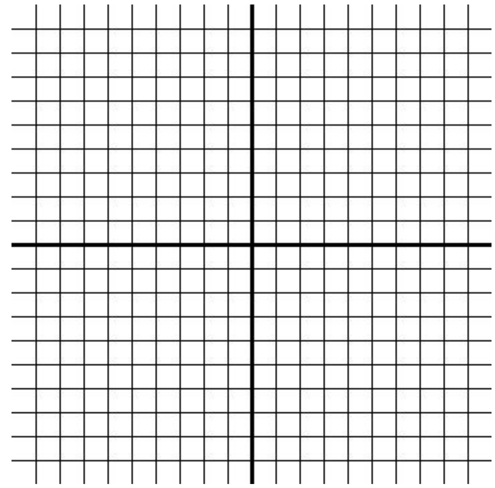
1. Prove that quadrilateral ABCD is a rhombus:

   A(-1, -1), B(4, 0), C(5, 5), D(0, 4)



2. Prove that quadrilateral *LMNP* is a rectangle:

L(-2, 0), M(2, -2), N(5, 4), P(1, 6)



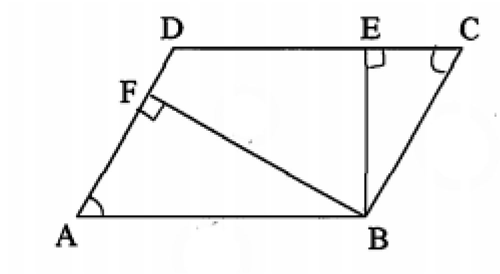
Angle-Angle (AA) Similarity: If two angles of one triangle are congruent to two angles of another triangle, the triangles are similar.

1. Given: parallelogram *ABCD*

$\overline{BE} \perp \overline{DC}$

$\overline{BF} \perp \overline{AD}$

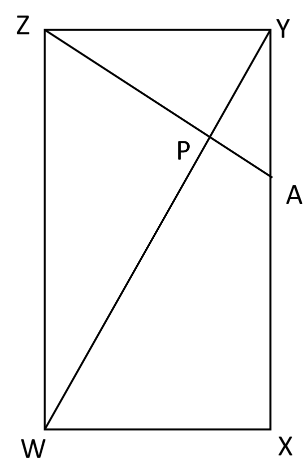
Prove: $\Delta BAF \sim \Delta BCE$



2. Given: rectangle WXYZ

$\overline{WY} \perp \overline{ZA}$

Prove: $\Delta WPZ \sim \Delta YPA$

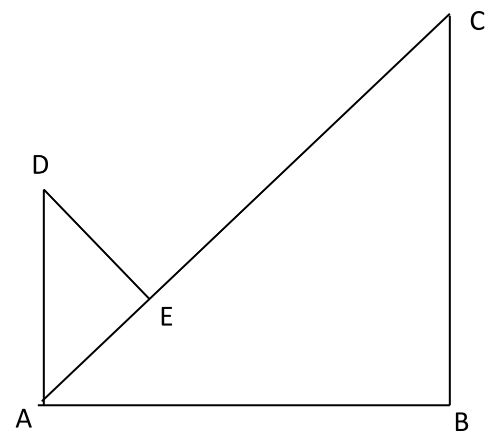


3. Given: $\overline{DA} \perp \overline{AB}$

$\overline{CB} \perp \overline{AB}$

$\overline{DE} \perp \overline{AC}$

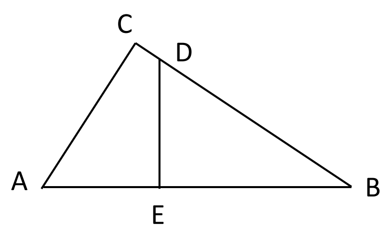
Prove: $\dfrac{AD}{AC} = \dfrac{AE}{BC}$



4. Given: $\overline{DE} \perp \overline{AB}$

$\measuredangle C$ is a right angle

Prove: $\dfrac{BA}{BC} = \dfrac{BD}{BE}$



Proof Reasons

1. Corresponding parts (sides/angles) of congruent triangles are congruent. (CPCTC)

2. An angle bisector divides an angle into two congruent angles.

3. A segment bisector divides a segment into two congruent segments, *at its midpoint*.

4. A midpoint divides a segment into two congruent segments.

5. Vertical angles are congruent.

6. Angles on a Line Add to 180.

7. Supplements of congruent angles are congruent.

8. Supplements of the same angle are congruent.

9. a) If two parallel lines are cut by a transversal….

   …alternate interior angles are congruent.

   …alternate exterior angles are congruent.

   …corresponding angles are congruent.

   …consecutive interior angles are supplementary.

   b) If….

   …alt. int. angles are ≅ then the lines are parallel

   … alt. ext. angles are ≅ then the lines are parallel

   … corresponding angles are ≅ then the lines are //

   … consec. int. angles are suppl. then the lines are //

10. Corresponding angles of similar triangles are congruent.

11. Corresponding sides of similar triangles are proportional.

12. The product of the means is equal to the product of the extremes.

13. If two sides of a triangle are congruent, then their opposite angles are congruent. (ITT)

14. If two angles of a triangle are congruent, then their opposite sides are congruent. (CITT)

15. A triangle with two congruent sides is isosceles.

16. A triangle with three congruent sides is equilateral.

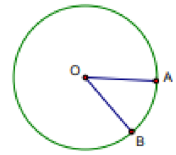
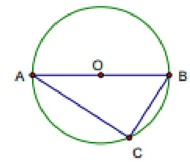
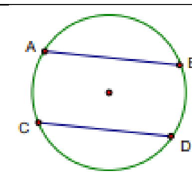
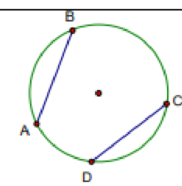
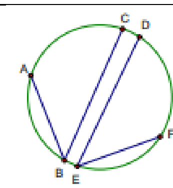
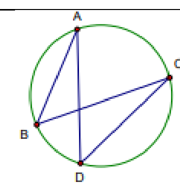
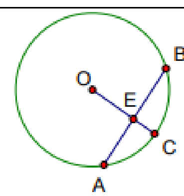
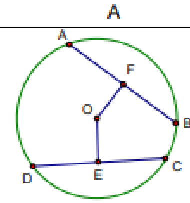
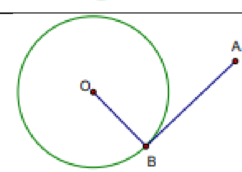
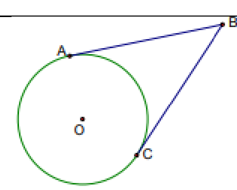
17. Perpendicular lines intersect forming right angles.

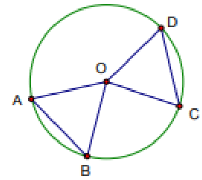
18. All right angles are congruent.

19. A triangle with a right angle is a right triangle.

20. Halves of congruent segments/angles are congruent.

CIRCLE PROOFS

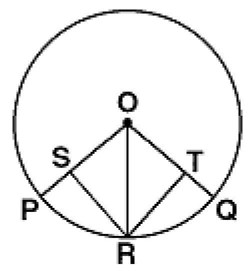
All radii of the same circle are congruent.	 $\overline{OA} \cong \overline{OB}$
If an inscribed angle intercepts a semicircle, then it is a right angle.	 $\angle ACB$ is a right angle
If chords in a circle are parallel, then they intercept congruent arcs.*	 If $\overline{AB} \parallel \overline{CD}$ Then $\overset{\frown}{AC} \cong \overset{\frown}{BD}$
If arcs of a circle are congruent, then their corresponding chords are congruent.*	 If $\overset{\frown}{AB} \cong \overset{\frown}{CD}$ Then $\overline{AB} \cong \overline{CD}$
If inscribed angles of a circle are congruent, then the arcs they intercept are congruent.*	 If $\angle ABC \cong \angle DEF$ Then $\overset{\frown}{AC} \cong \overset{\frown}{DF}$
Inscribed angles of a circle that share the same intercepted arc are congruent.	 $\angle ABC \cong \angle ADC$
If a radius (or diameter) is perpendicular to a chord, then it bisects the chord and the intercepted arc.*	 If $\overline{OC} \perp \overline{AB}$ then $\overline{AE} \cong \overline{EB}$ and $\overset{\frown}{AC} \cong \overset{\frown}{CB}$
If chords in a circle are congruent, then they are equidistant from the center of the circle.*	 If $\overline{AB} \cong \overline{DC}$ then $\overline{OF} \cong \overline{OE}$
The radius (or diameter) of a circle is perpendicular to a tangent at the point of tangency.	 If $\overline{AB}$ is a tangent then $\overline{OB} \perp \overline{AB}$
If tangents segments are drawn to a circle from an external point, then the segments are congruent.	 If $\overline{AB}$ and $\overline{CB}$ are tangents then $\overline{AB} \cong \overline{CB}$

If central angles of a circle are congruent, then their corresponding chords are congruent.*	 If $\angle AOB \cong \angle DOC$ Then $\overline{AB} \cong \overline{DC}$

The converse is also true.

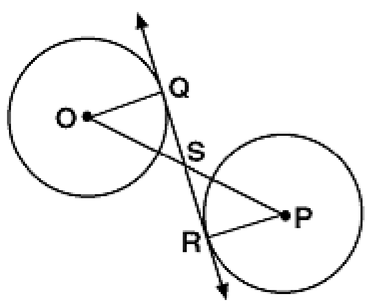
1. Given : R is the midpoint of $\widehat{PQ}$
   $\overline{RS} \perp \overline{OP}$
   $\overline{RT} \perp \overline{OQ}$

   Prove: $\overline{RS} \cong \overline{RT}$

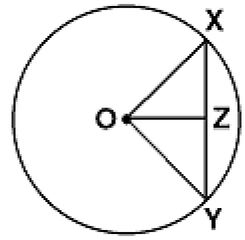


2. Given: circle $O \cong$ circle P
   $\overleftrightarrow{QR}$ is a common tangent

   Prove: $\overline{OS} \cong \overline{SP}$

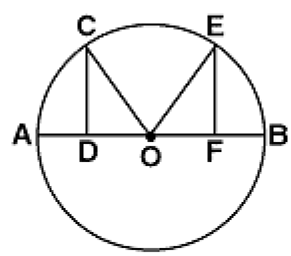


3. Given: In circle O, $\overline{OZ} \perp \overline{XY}$
Prove: $\overline{OZ}$ bisects $\angle XOY$



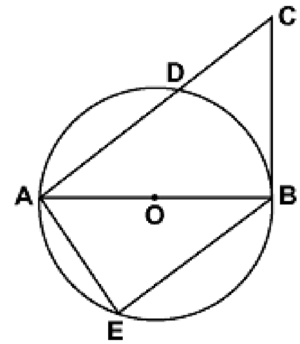
4. Given: diameter $\overline{AB}$
$\overline{AD} \cong \overline{FB}$
$\overline{CD} \perp \overline{AB}$
$\overline{EF} \perp \overline{AB}$

Prove: $\overparen{AC} \cong \overparen{EB}$



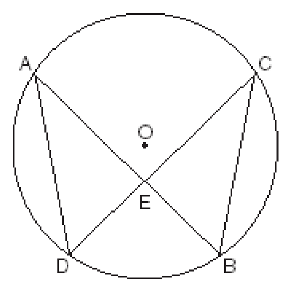
5. Given: In circle O, tangent $\overline{CB}$ is drawn to the circle at B, E is a point on the circle, and $\overline{BE} \parallel \overline{ADC}$

Prove: $\Delta ABE \sim \Delta CAB$



6. Given: chords $\overline{AB}$ and $\overline{CD}$ of circle O intersect at E chords $\overline{AD}$ and $\overline{CB}$ are drawn.

Prove: $(AE)(EB) = (CE)(ED)$



7. Given: $\widehat{AB} \cong \widehat{BC}$

Prove: $DB \cdot EB = (CB)^2$