<u>GEOMETRY POSTULATES AND THEOREMS</u>

Postulate 1: Through any two points, there is exactly one line.

Postulate 2: The measure of any line segment is a unique positive number. The measure (or length) of $\overline{AB}$ is a positive number, AB.

Postulate 3: If X is a point on $\overline{AB}$ and A-X-B (X is between A and B),

then AX + XB = AB

Postulate 4: If two lines intersect, then they intersect in exactly one point

Postulate 5: Through any three noncollinear points, there is exactly one plane.

Postulate 6: If two planes intersect, then their intersection is a line.+

Postulate 7: If two points lie in a plane, then the line joining them lies in that plane.

Theorem 1.1: The midpoint of a line segment is unique.

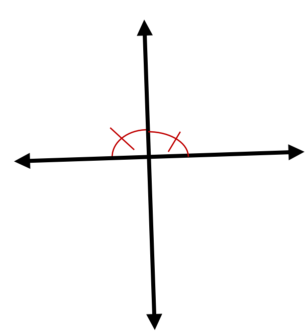
Postulate 8: The measure of an angle is a unique positive number.

Postulate 9: If a point D lies in the interior of angle $\angle ABC$,

then $m\angle ABD + m\angle DBC = m\angle ABC$

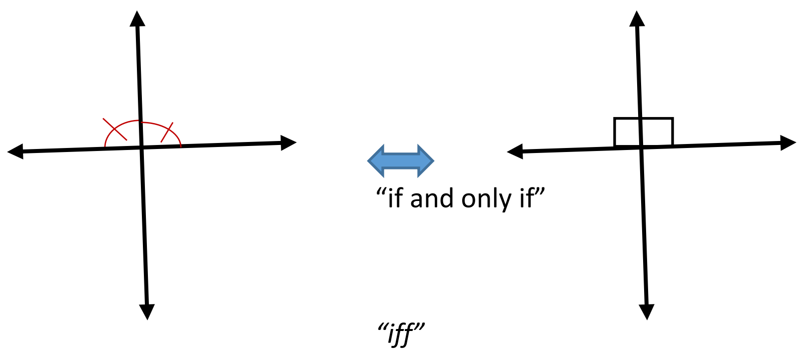
Theorem 1.4.1: There is one and only one angle bisector for any given angle.

Definition: “Officially”, Perpendicular lines are two lines that meet to form congruent adjacent angles.



Theorem 1.6.1:
If two lines are perpendicular, then they meet to form right angles.

Theorem 1.7.1:
If two lines meet to form a right angle, then these lines are perpendicular.

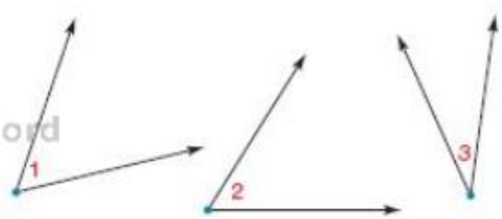


Theorem 1.7.2: If two angles are complementary to the same angle (or to congruent angles) then these angles are congruent

If two angles are complementary to the same angle, then these angles are congruent.

Given: $\angle 1$ is comp. to $\angle 3$
$\angle 2$ is comp. to $\angle 3$

Prove: $\angle 1 \cong \angle 2$



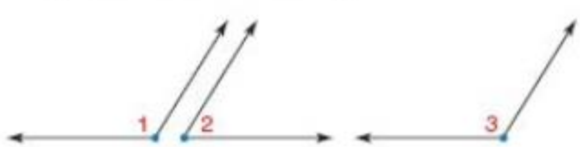
Theorem 1.7.3: If two angles are supplementary to the same angle (or to congruent angles, then the angles are congruent.

If two angles are supplementary to the same angle, then these angles are congruent.

Given: $\angle 1$ is supp. to $\angle 2$
$\angle 3$ is supp. to $\angle 2$

Prove: $\angle 1 \cong \angle 3$

(HINT: See Exercise 25 for help.)



Theorem 1.7.4: Any two right angles are congruent.

Given: ∠ABC is a right angle.
∠DEF is a right angle.
Prove: ∠ ABC ≅ ∠ DEF

Theorem 1.7.5: If the exterior sides of two adjacent angles form perpendicular rays, then theses angles are complementary.

If the exterior sides of two adjacent acute angles form perpendicular rays, then these angles are complementary.
Given: $\overrightarrow{BA} \perp \overrightarrow{BC}$
Prove: ∠1 is comp. to ∠2

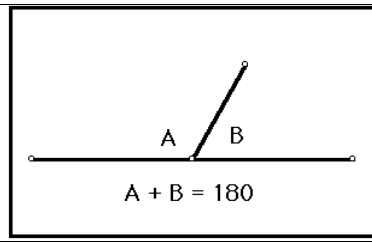
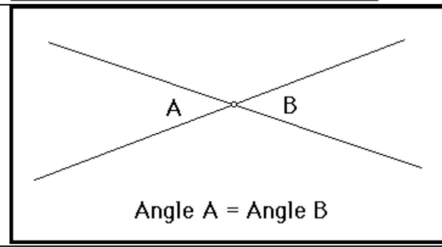
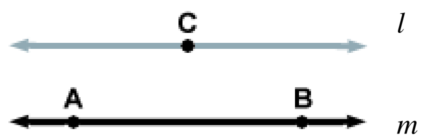
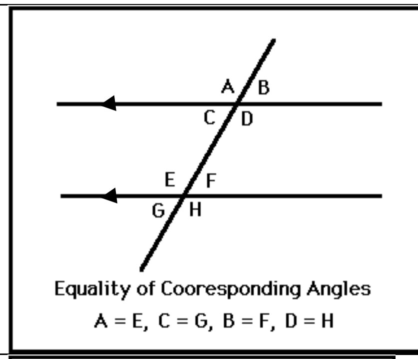
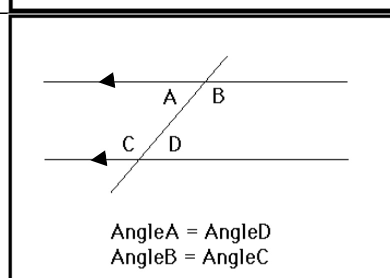
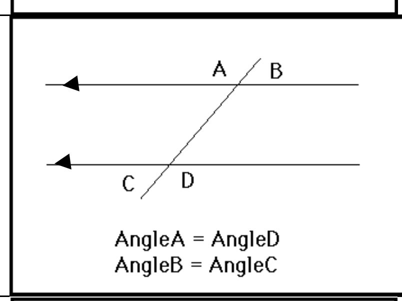
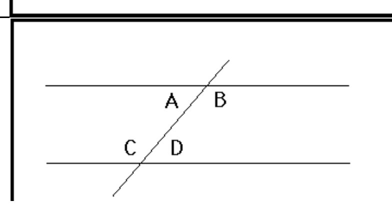
Theorem 2.1.1: From a point not on a given line, there is exactly one line perpendicular to the given point.

To construct this unique line with a compass, go to
http://www.mathopenref.com/constperpextpoint.html

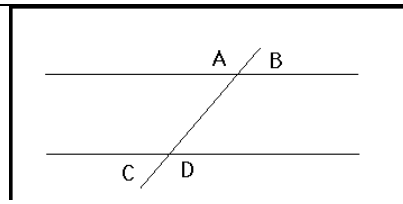
Postulate 10: (Parallel Postulate)
Through a point not on a line, exactly one line is parallel to the given line.

Postulate 11: (Corresponding Angles Postulate)
If two parallel lines are cut by a transversal, then the corresponding angles are congruent.

To construct this unique line with a compass, go to
http://www.mathopenref.com/constparallel.html

Linear Pair Postulate If two angles form a linear pair, then the measures of the angles add up to 180°.	
Vertical Angles Postulate If two angles are vertical angles, then they are congruent (have equal measures).	
Parallel Lines Postulate Through a point not on a line, exactly one line is parallel to that line. To construct this unique line with a compass, go to http://www.mathopenref.com/constparallel.html	 *Line l is the only line parallel to line m going through point C.*
Corresponding Angles Postulate, or CA Postulate If two parallel lines are cut by a transversal, then corresponding angles are congruent. (Lesson 2.6)	
Alternate Interior Angles Theorem, or AIA Theorem If two parallel lines are cut by a transversal, then alternate interior angles are congruent. (Lesson 2.6)	
Alternate Exterior Angles Theorem, or AEA Theorem If two parallel lines are cut by a transversal, then alternate exterior angles are congruent.	
Consecutive Interior Angles Theorem If two parallel lines are cut by a transversal, then alternate interior angles are supplementary.	 A + C = 180, B + D = 180

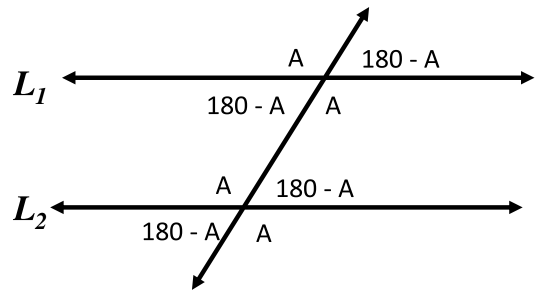
Consecutive Exterior Angles Theorem
If two parallel lines are cut by a transversal, then alternate exterior angles are supplementary.



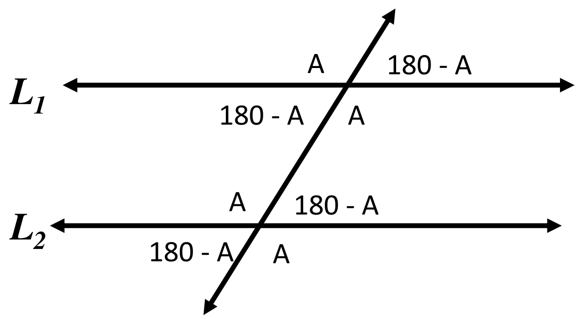
A+C = 180, B+D = 180

Parallel Lines Theorems If two parallel lines are cut by a transversal, then corresponding angles are congruent, alternate interior angles are congruent, and alternate exterior angles are congruent. (Lesson 2.6)

$L_1 \parallel L_2 \Rightarrow$



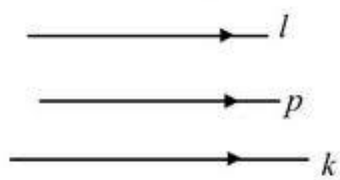
Converse of the Parallel Lines Theorems If two lines are cut by a transversal to form pairs of congruent corresponding angles, congruent alternate interior angles, or congruent alternate exterior angles, then the lines are parallel. (Lesson 2.6)



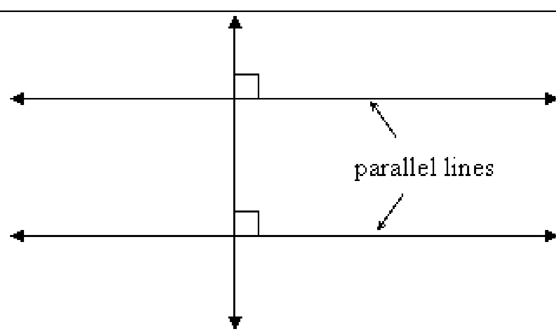
$\Rightarrow L_1 \parallel L_2$

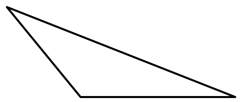
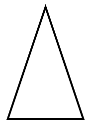
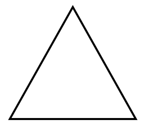
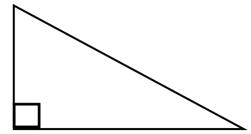
Three Parallel Lines Theorem
If two lines are parallel to a third line, then they are parallel to each other.

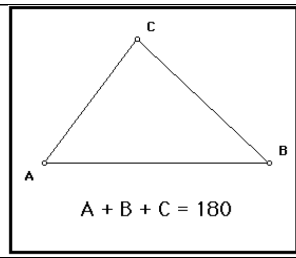
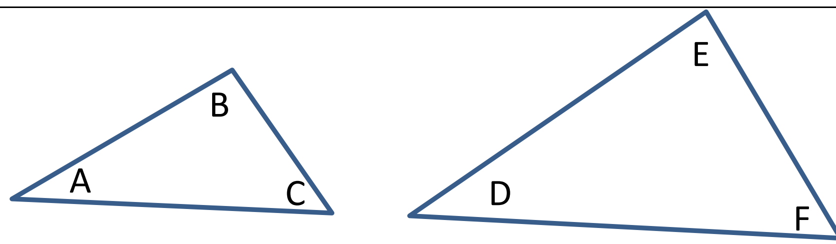
Given: $l \parallel p; l \parallel k$
Conclusion: $p \parallel k$



2 Lines ⊥ to a Third Line Theorem
If two coplanar lines are perpendicular to a third line, then they are parallel to each other



Triangles			
			
Scalene Triangle	**Isosceles Triangle**	**Equilateral Triangle**	**Right Triangle**
(no sides the same)	$\left(\begin{array}{l}2 \text{ sides} \cong \\ \text{and } 2\ \angle\text{'s} \cong\end{array}\right)$	$\left(\begin{array}{l}3 \text{ sides} \cong \\ \text{and } 3\ \angle\text{'s} \cong\end{array}\right)$	

Triangle Sum Theorem The sum of the measures of the angles in every triangle is 180°. (Lesson 4.1)	
Third Angle Theorem If two angles of one triangle are equal in measure to two angles of another triangle, then the third angle in each triangle is equal in measure to the third angle in the other triangle. (Lesson 4.1)	 If $\angle A \cong \angle D$, and $\angle B \cong \angle E$, then $\angle C \cong \angle F$
Triangle Exterior Angle Postulate The measure of an exterior angle of a triangle is equal to the sum of the measures of the remote interior angles. (Lesson 4.3)	$m\angle \text{D} = m\angle \text{B} + m\angle \text{A}$