Midpoint Formula

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

1.5 Angle Pair Relationships

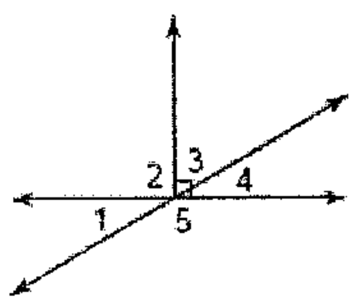
☆ Complementary angles — 2 angles that add up to 90 degrees

☆ Supplementary angles — 2 angles that add up to 180 degrees

☆ Adjacent angles — angles that share a side

☆ Linear Pair — 2 adjacent and supplementary angles

☆ Vertical Angles — opposite angles that share both lines (are equall)



<u>2.2 Notes Day 1</u> Analyzing Conditional Statements

<u>Conditional statement</u>- *a logical statement that has two parts*

1) hypothesis 2) conclusion

Written as an "if-then" statement:

Ex: If it is raining, then there are clouds in the sky.

Symbolic Notation:

<u>Converse</u>- when the hypothesis and conclusion are exchanged in a conditional statement.

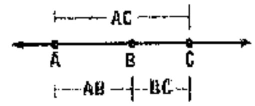
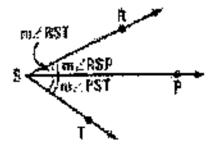
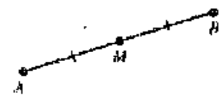
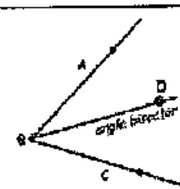
<u>Inverse</u>- when the hypothesis and conclusion are both *negated.*

<u>Contrapositive</u>- when the hypothesis and conclusion are exchanged in a conditional statement and then both *negated.*

Example:

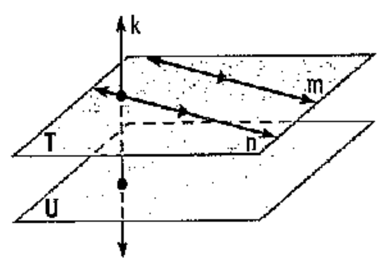
Conditional statement	If $m\angle A = 99°$, then $\angle A$ is obtuse.	both true
Converse	If $\angle A$ is obtuse, then $m\angle A = 99°$.	both false
Inverse	If $m\angle A \neq 99°$, then $\angle A$ is not obtuse.	both false
Contrapositive	If $\angle A$ is not obtuse, then $m\angle A \neq 99°$.	both true

<u>Equivalent Statements</u> - A conditional statement and its contrapositive are either both true or both false. Similarly, the converse and the inverse of a conditional statement are either both true or both false. When two statements are both true or both false, they are called equivalent statements.

Postulate	Definition
Segment Addition Postulate	$AB + BC = AC$ 
Angle Addition Postulate	$m\angle RST = m\angle RSP + m\angle PST$. 
Definition of Midpoint	If M is a midpoint, AM = MB 
Definition of Bisector	$\angle ABD \cong \angle DBC$ 

3.1 Identify Pairs of Lines and Angles

Parallel lines: Lines that never intersect and *are* coplanar.



Skew lines: Two lines that never intersect and *are not* coplanar.

Parallel planes: Two planes that do not intersect.

Perpendicular lines: Two lines that intersect at 90°.

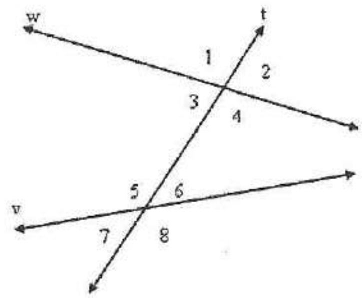
Transveral — A line that intersects 2 or more coplanar lines at different points.

Corresponding Angles — Angles with corresponding positions.

Alternate Interior Angles — Angles that lie between the two lines and on opposite sides of the transversal.

Alternate Exterior Angles — Angles that lie on the outside and on opposite sides of the transversal.

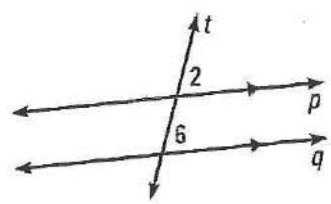
Consecutive Interior Angles (Same-Side Interior Angles) — Angles that lie between the two lines and are on the same side of the transversal.



POSTULATE *For Your Notebook*

POSTULATE 15 Corresponding Angles Postulate

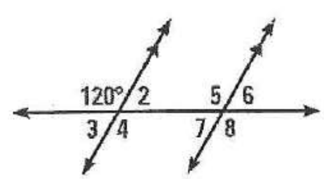
If two parallel lines are cut by a transversal, then the pairs of corresponding angles are congruent.



$\angle 2 \cong \angle 6$

EXAMPLE 1 **Identify congruent angles**

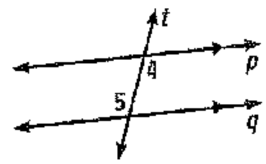
The measure of three of the numbered angles is 120°. Identify the angles. Explain your reasoning.



THEOREMS *For Your Notebook*

THEOREM 3.1 Alternate Interior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of alternate interior angles are congruent.

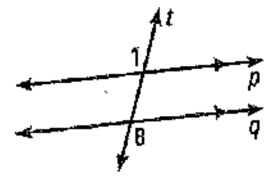


$\angle 4 \cong \angle 5$

Proof: Example 3, p. 156

THEOREM 3.2 Alternate Exterior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of alternate exterior angles are congruent.

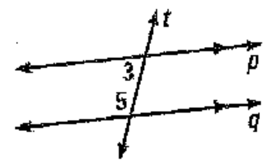


$\angle 1 \cong \angle 8$

Proof: Ex. 37, p. 159

THEOREM 3.3 Consecutive Interior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of consecutive interior angles are supplementary.



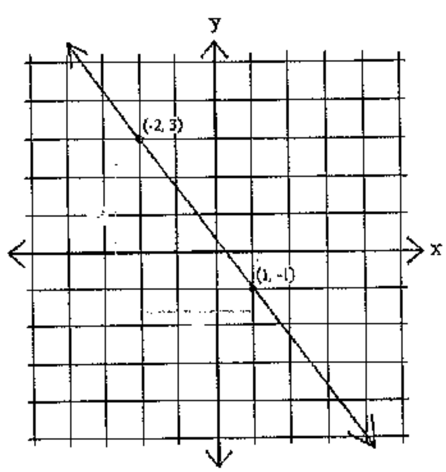
$\angle 3$ and $\angle 5$ are supplementary.

Proof: Ex. 41, p. 159

3.4-3.5 Equations and Graphs of Lines

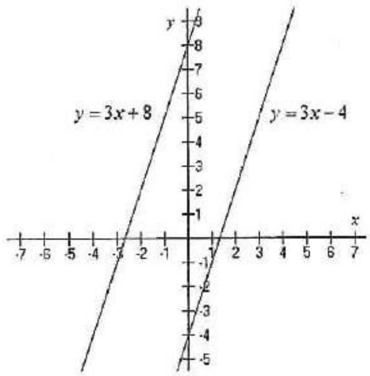
Slope: Ratio of vertical change (*rise*) to horizontal change (*run*).

$$m = \frac{rise}{run} = \frac{change\ in\ y}{change\ in\ x} = \frac{y_2 - y_1}{x_2 - x_1}$$

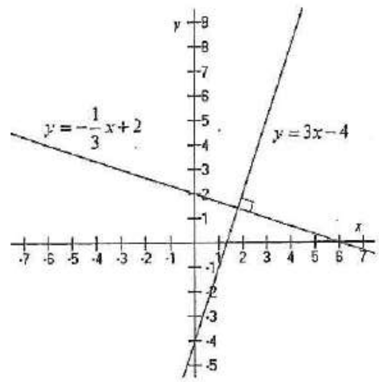


Parallel and Perpendicular Lines

Parallel lines have the same slope.



Perpendicular lines have m2=-1/m1 and m1*m2=-1

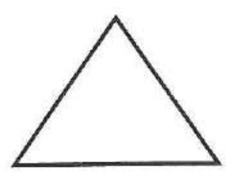


Classifying Triangles by Sides

Scalene No congruent sides

Isosceles At least 2 congruent sides

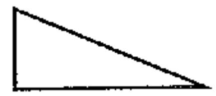
Equilateral 3 congruent sides



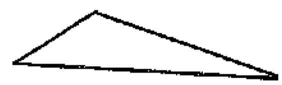
Classifying Triangles by Angles

Acute — 3 acute angles

Right — 1 right angle

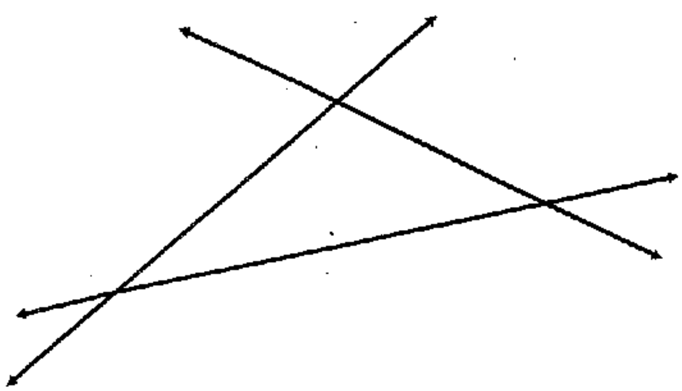


Obtuse — 1 obtuse angle



Equiangular — 3 congruent angles

Interior Angles and Exterior Angles



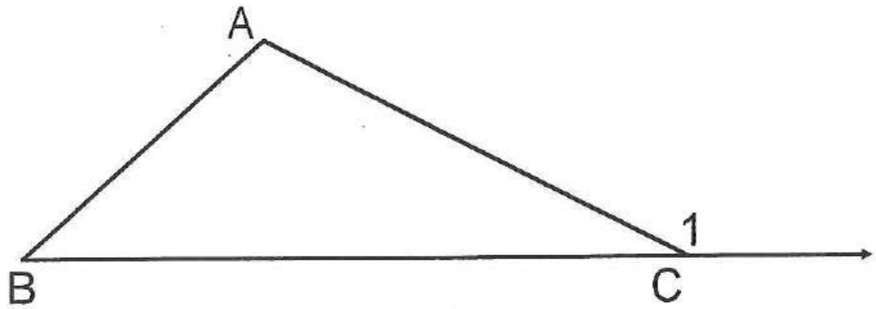
Triangle Sum Theorem:

The sum of the measures of the interior angles of a triangle is 180°

Proof: tear off the angles

Exterior Angle Theorem:

The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.

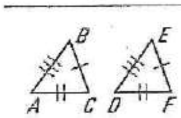
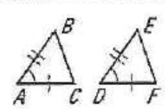
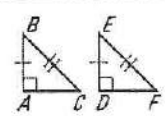
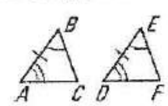
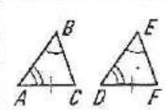


$$m\angle 1 = m\angle A + m\angle B$$

CONCEPT SUMMARY ***For Your Notebook***

Triangle Congruence Postulates and Theorems

You have learned five methods for proving that triangles are congruent.

SSS	SAS	HL (right △ only)	ASA	AAS
				
All three sides are congruent.	Two sides and the included angle are congruent.	The hypotenuse and one of the legs are congruent.	Two angles and the included side are congruent.	Two angles and a (non-included) side are congruent.

You **<u>may not use</u>** the following to prove 2 triangles are congruent!!

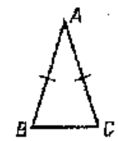
1. "Angle,Angle, Angle or A.A.A": No calling triple A for help!
2. "Angle, Side, Side or A.S.S": No Swearing!

THEOREMS *For Your Notebook*

THEOREM 4.7 Base Angles Theorem

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

If $\overline{AB} \cong \overline{AC}$, then $\angle B \cong \angle C$.

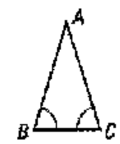


Proof: p. 265

THEOREM 4.8 Converse of Base Angles Theorem

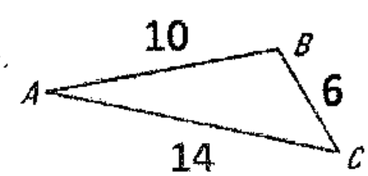
If two angles of a triangle are congruent, then the sides opposite them are congruent.

If $\angle B \cong \angle C$, then $\overline{AB} \cong \overline{AC}$.



Proof: Ex. 45, p. 269

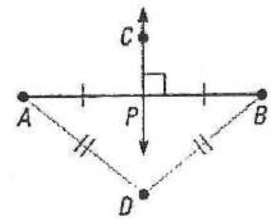
Triangle Inequality Theorem



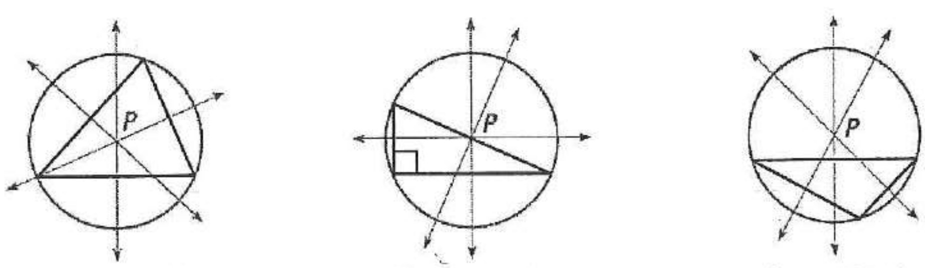
The 2 small sides added together, must be more than the long side.

Perpendicular Bisector

Perpendicular line that is equidistant from the endpoints of a segment.



CIRCUMCENTER The point of concurrency of the three perpendicular bisectors of a triangle is called the **circumcenter** of the triangle. The circumcenter P is equidistant from the three vertices, so P is the center of a circle that passes through all three vertices.

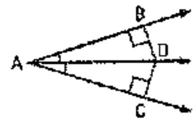


Acute triangle *P* is inside triangle.	Right triangle *P* is on triangle.	Obtuse triangle *P* is outside triangle.

As shown above, the location of P depends on the type of triangle. The circle with the center P is said to be *circumscribed* about the triangle.

Angle Bisector

Line that cuts an angle into 2 equal angles

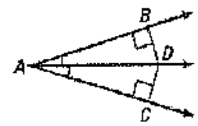


THEOREMS *For Your Notebook*

THEOREM 5.5 Angle Bisector Theorem

If a point is on the bisector of an angle, then it is equidistant from the two sides of the angle.

If $\overrightarrow{AD}$ bisects $\angle BAC$ and $\overline{DB} \perp \overrightarrow{AB}$ and $\overline{DC} \perp \overrightarrow{AC}$, then $DB = DC$.

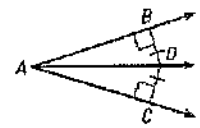


Proof: Ex. 34, p. 315

THEOREM 5.6 Converse of the Angle Bisector Theorem

If a point is in the interior of an angle and is equidistant from the sides of the angle, then it lies on the bisector of the angle.

If $\overline{DB} \perp \overrightarrow{AB}$ and $\overline{DC} \perp \overrightarrow{AC}$ and $DB = DC$, then $\overrightarrow{AD}$ bisects $\angle BAC$.



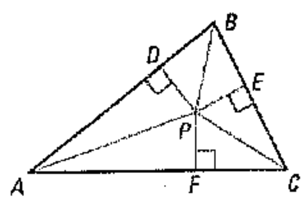
Proof: Ex. 35, p. 315

THEOREM *For Your Notebook*

THEOREM 5.7 Concurrency of Angle Bisectors of a Triangle

The angle bisectors of a triangle intersect at a point that is equidistant from the sides of the triangle.

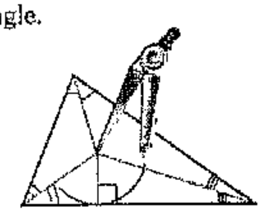
If $\overline{AP}$, $\overline{BP}$, and $\overline{CP}$ are angle bisectors of $\triangle ABC$, then $PD = PE = PF$.

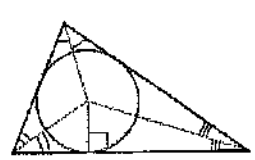


Proof: Ex. 36, p. 316

The point of concurrency of the three angle bisectors of a triangle is called the **incenter** of the triangle. The incenter always lies inside the triangle.

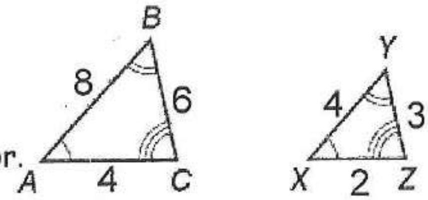
Because the incenter P is equidistant from the three sides of the triangle, a circle drawn using P as the center and the distance to one side as the radius will just touch the other two sides. The circle is said to be *inscribed* within the triangle.





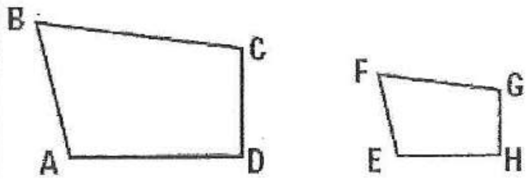
<u>Similar Polygons</u>:

Matching angles are equal.
Matching sides have the same scale factor.



$\triangle ABC \sim \triangle XYZ$

Example:



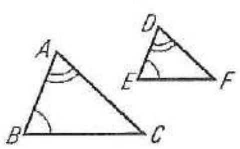
ABCD ~ EFGH

Corresponding angles
$\angle A \cong \angle E$, $\angle B \cong \angle F$, $\angle C \cong \angle G$, and $\angle D \cong \angle H$

Ratios of corresponding sides
$\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE}$

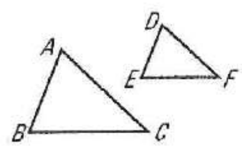
Triangle Similarity Postulate and Theorems

AA Similarity Postulate



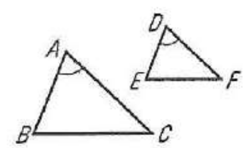
If $\angle A \cong \angle D$ and $\angle B \cong \angle E$, then $\triangle ABC \sim \triangle DEF$.

SSS Similarity Theorem



If $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$, then $\triangle ABC \sim \triangle DEF$.

SAS Similarity Theorem



If $\angle A \cong \angle D$ and $\frac{AB}{DE} = \frac{AC}{DF}$, then $\triangle ABC \sim \triangle DEF$.