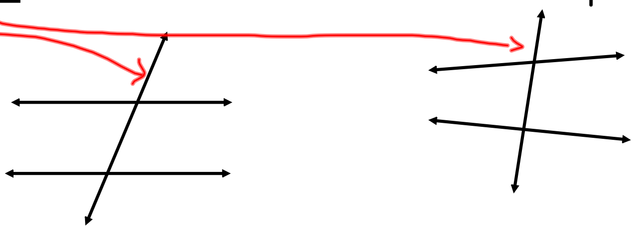
Notes 9 - 1 Proving lines parallel

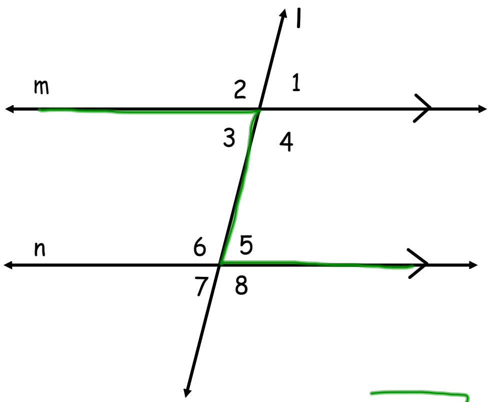
Parallel Lines - lines in the same plane that have no points in common or have all points in common(coincide)

Coplanar - when all the points or lines in a set lie in a plane

Transversal - a line that intersects 2 other coplanar lines

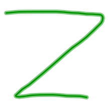


Postulate 9.1 - Two distinct coplanar lines are either parallel or intersecting



Interior angles are angles that are between the given lines. $\angle 3$, $\angle 4$, $\angle 5$, $\angle 6$

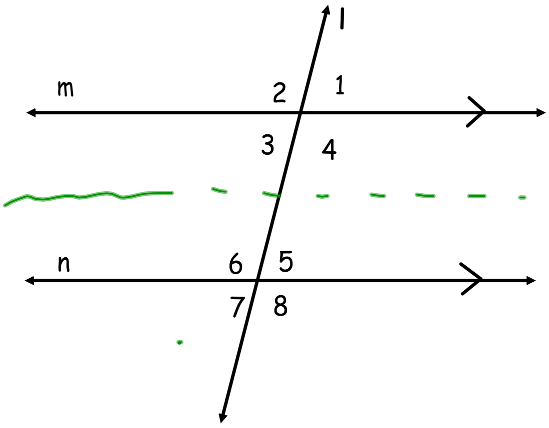
Exterior angles are angles that are outside the given lines. $\angle 1$, $\angle 2$, $\angle 7$, $\angle 8$



Alternate Interior angles are interior angles on opposite sides of the transversal and they do not have a common vertex.

$\angle 4$ & $\angle 6$, $\angle 3$, $\angle 5$

Alternate Exterior angles are exterior angles on opposite sides of the transversal and they do not have a common vertex. $\angle 2$ & $\angle 8$
$\angle 1$ & $\angle 7$



Consecutive
<u>Interior angles on the same side of the transversal</u> do not have a common vertex.

<u>Corresponding Angles</u> share the same position with regard to the given lines. (Imagine sliding the top line down on top of the bottom. The angles that fall on top of each other are corresponding angles.)

Theorems for proving lines parallel:

If two coplanar lines are cut by a transversal so that the

- alternate interior angles are congruent
- alternate exterior angles are congruent
- corresponding angles are congruent
- consecutive interior angles on the same side of the transversal are supplementary

then the two lines are parallel.

The converse of this theorem can be used to show angles congruent.

If 2 coplanar lines are parallel and cut by a transversal, then

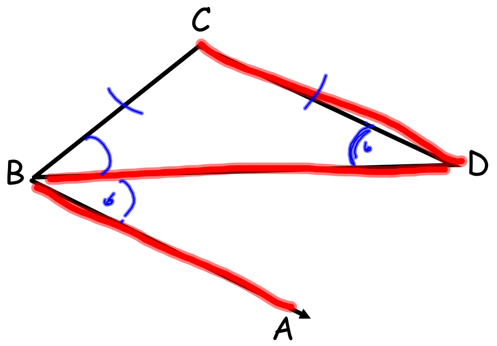
- alternate interior ∠'s ≅
- alternate exterior ∠'s ≅
- corresponding angles ≅
- consecutive interior ∠'s are supplementary.

Ex. 1

Given: $\overrightarrow{BD}$ bisects $\measuredangle ABC$

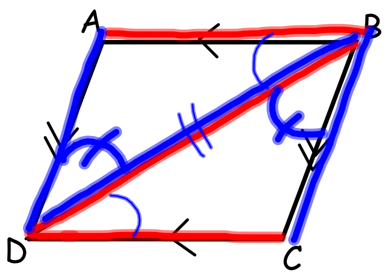
$\overline{BC} \cong \overline{CD}$

Prove: $\overline{CD} \parallel \overline{BA}$



statements	reasons
1. $\overrightarrow{BD}$ bisects $\measuredangle ABC$	1. given
2. $\measuredangle CBD \cong \measuredangle DBA$	2. Def of bisector of an angle
3. $\overline{BC} \cong \overline{CD}$	3. given
4. $\measuredangle CBD \cong \measuredangle D$	4. Isosceles $\triangle$ Thm
5. $\measuredangle DBA \cong \measuredangle CDB$	5. Substitution
6. $\overline{CD} \parallel \overline{BA}$	6. If 2 coplanar lines are cut by a transversal so that alternate interior angles are congruent, then the lines are $\parallel$.

Ex. 2



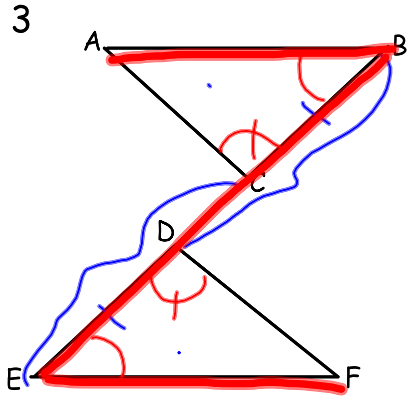
Given: $\overline{AB} \parallel \overline{DC}$

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

Prove: $\measuredangle DAB \cong \measuredangle BCD$

statements	reasons
1. $\overline{AB} \parallel \overline{DC}$	1. given.
2. $\measuredangle ABD \cong \measuredangle CDB$	2. If 2 coplanar lines are parallel & cut by a transversal the alternate interior angles are $\cong$
3. $\overline{AD} \parallel \overline{BC}$	3. given
4. $\measuredangle ADB \cong \measuredangle CBD$	4. Same as #2
5. $\overline{BD} \cong \overline{BD}$	5. Reflexive
6. $\triangle DAB \cong \triangle BCD$	6. ASA $\cong$ ASA
7. $\measuredangle DAB \cong \measuredangle BCD$	7. cpctc

Ex. 3



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

$\overline{AB} \parallel \overline{EF}$

$\overline{AC} \perp \overline{BE}$

$\overline{FD} \perp \overline{EB}$

Prove: $\measuredangle A \cong \measuredangle F$