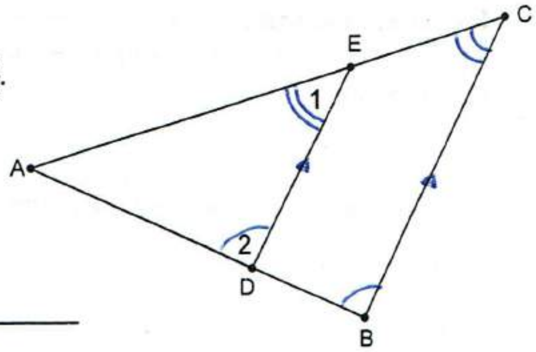
Parallel Lines and Angle Relationships



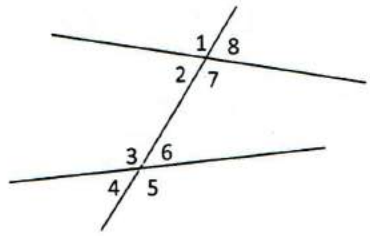
ΔADE is a dilation of ΔABC using center point A and a magnitude of $\frac{2}{3}$.

Since $\overline{BC}$ does not pass through the center of dilation, A,

what do we know about $\overline{BC}$ and $\overline{DE}$? They are $\parallel$

Since ΔADE is the image of ΔABC under a dilation, ΔADE and ΔABC are similar and their corresponding angles are congruent. Therefore $\angle B \cong \angle 2$ and $\angle C \cong \angle 1$.

Special Angle Pairs:



Look at the angles in the diagram to the right. There are angle pairs with special Relationships that have special names.

- corresponding angles (corr. $\angle$s) – angles that have the same relative position on the transversal

  ex: $\angle 1$ and $\angle$ 3 ; $\angle 2$ and $\angle$ 4 ; $\angle 7$ and $\angle$ 5 ; $\angle 8$ and $\angle$ 6

  If traced, they form the letter F.

- alternate interior angles (alt. int. $\angle$s) – angles on the opposite side of the transversal that are between the lines that are not adjacent to each other

  ex: $\angle$ 2 and $\angle$ 6 ; $\angle$ 7 and $\angle$ 3

  If traced, they form the letter Z.

- alternate exterior angles (alt. ext. $\angle$s) – angles on the opposite side of the transversal that are not between the lines that are not adjacent to each other

  ex: $\angle$ 1 and $\angle$ 5 ; $\angle$ 8 and $\angle$ 4

- Remember, when 2 lines intersect, they form special angle pairs also.

  ex: A pair of vertical $\angle$s are $\angle$ 5 and $\angle$ 3.

  ex: A linear pair is formed by $\angle$ 1 and $\angle$ 8.

Explore with corresponding angles using parallel lines. (Use dynamic software and/or a sheet of lined notebook paper.)

If $\parallel$, corr. $\angle$s are $\cong$.

Postulate:

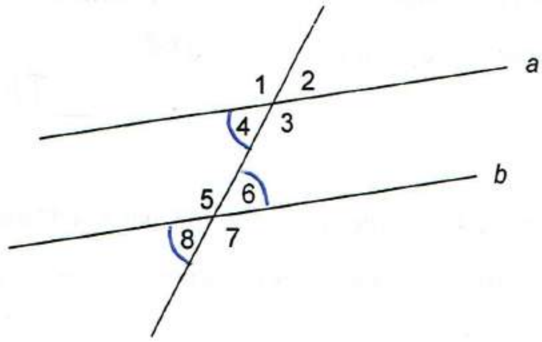
If parallel lines are cut by a transversal, then corresponding $\angle$s are $\cong$.

We can use the postulate from the previous page to prove rules (theorems) involving parallel lines and alternate interior angles and alternate exterior angles. These proofs will formalize your findings from the software investigation.

1. Fill in the missing steps and reasons to the following proof.

Given: $a \parallel b$

Prove: $\angle 4 \cong \angle 6$



given

$a \parallel b$

If ∥, corr ∠s are ≅

$\angle 4 \cong \angle 8$

Vert. ∠s are ≅

$\angle 8 \cong \angle 6$

trans. prop. of ≅

$\angle 4 \cong \angle 6$

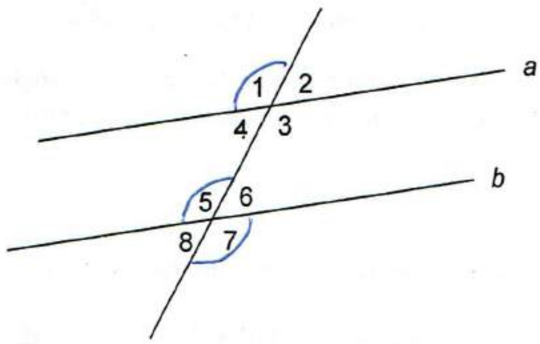
Theorem: **If parallel lines are cut by a transversal, then** alt. int. ∠s are ≅.

If ∥, alt. int. ∠s are ≅.

2. Fill in the missing steps and reasons to the following proof.

Given: $a \parallel b$

Prove: $\angle 1 \cong \angle 7$



given

$a \parallel b$

If ∥, corr. ∠s are ≅.

$\angle 1 \cong \angle 5$

Vert. ∠s are ≅.

$\angle 5 \cong \angle 7$

trans. prop. of ≅

$\angle 1 \cong \angle 7$

Theorem: **If parallel lines are cut by a transversal, then** alt. ext. ∠s are ≅.

If ∥, alt. ext. ∠s are ≅.