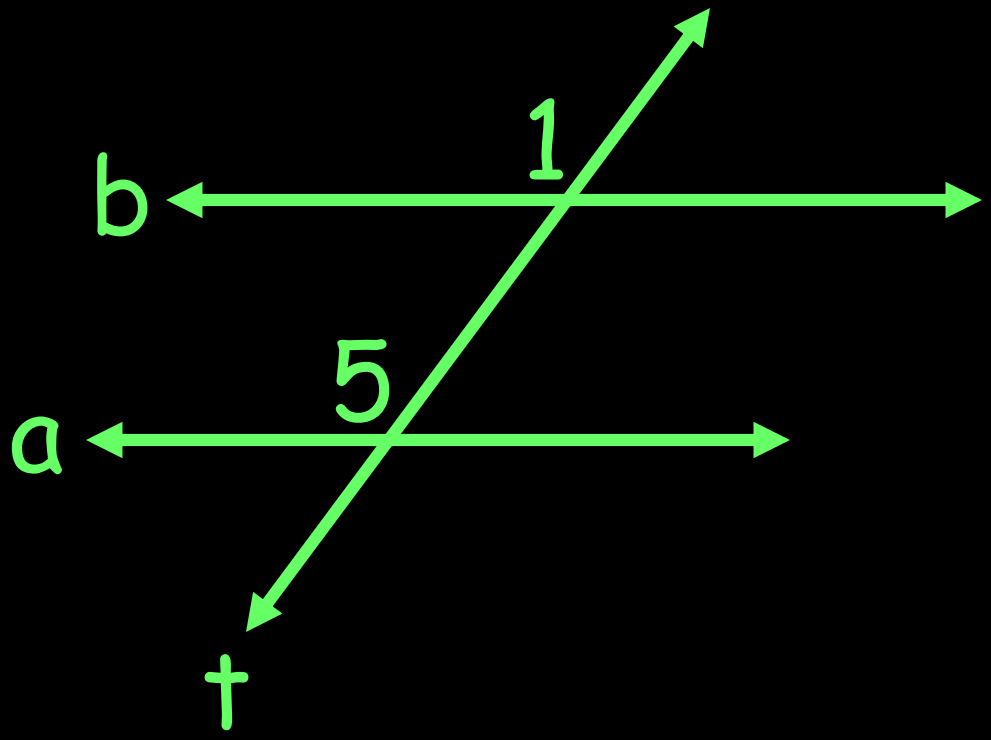
Section 3.2 Properties of Parallel Lines

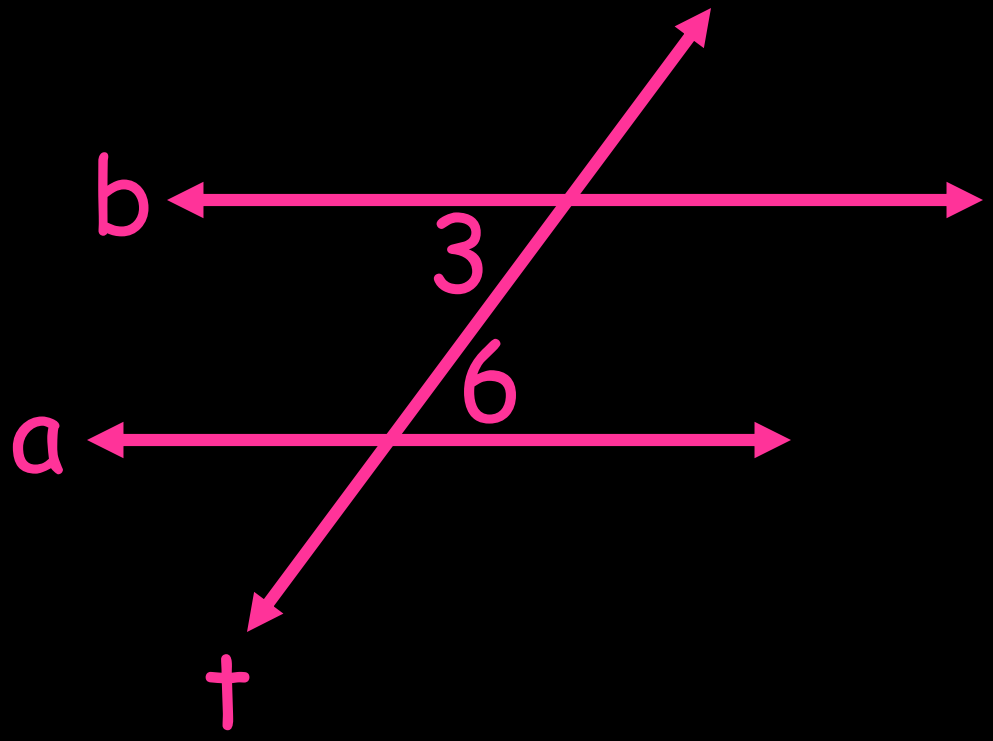
Corresponding Angles



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

Postulate 10

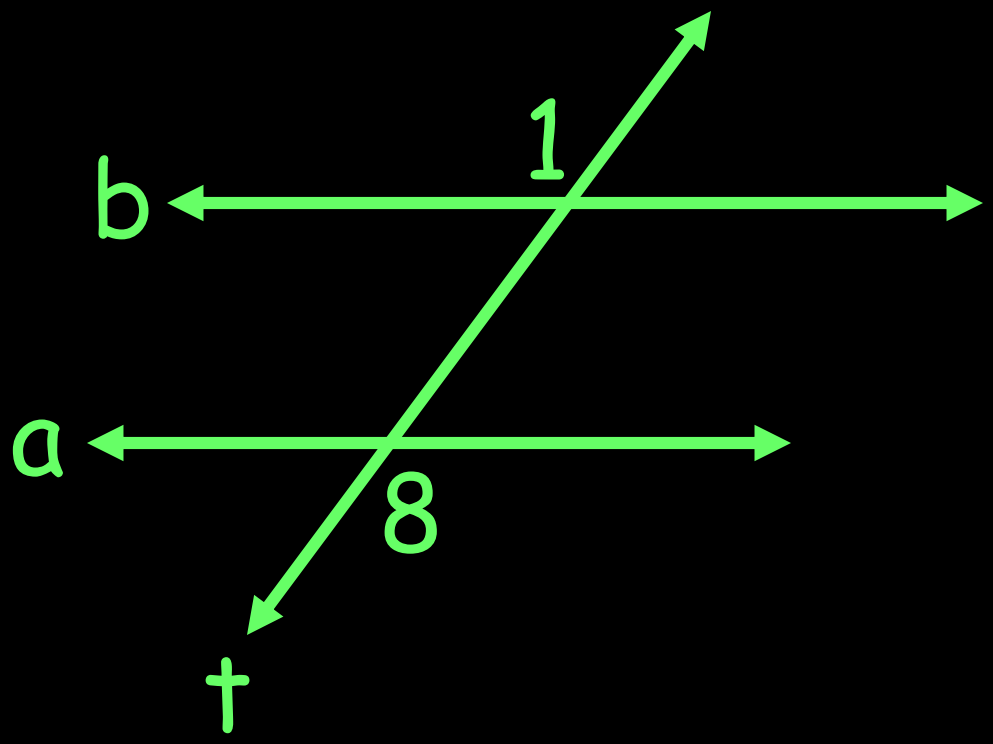
Alternate Interior Angles



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

Theorem 3-2

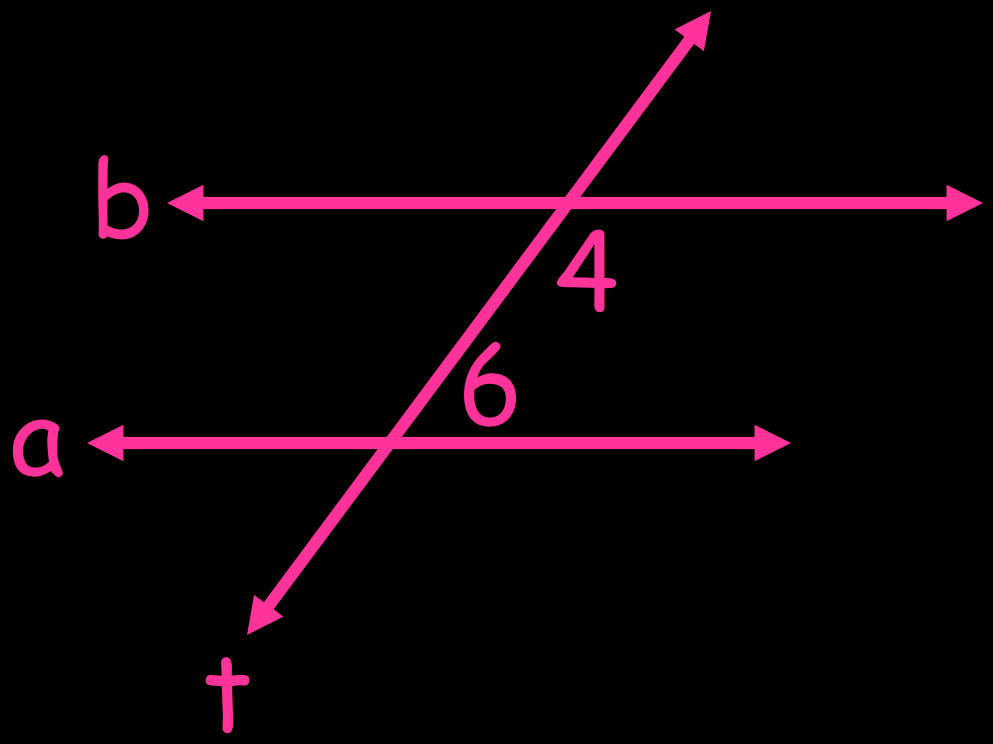
Alternate Exterior Angles



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

Theorem 3-2a

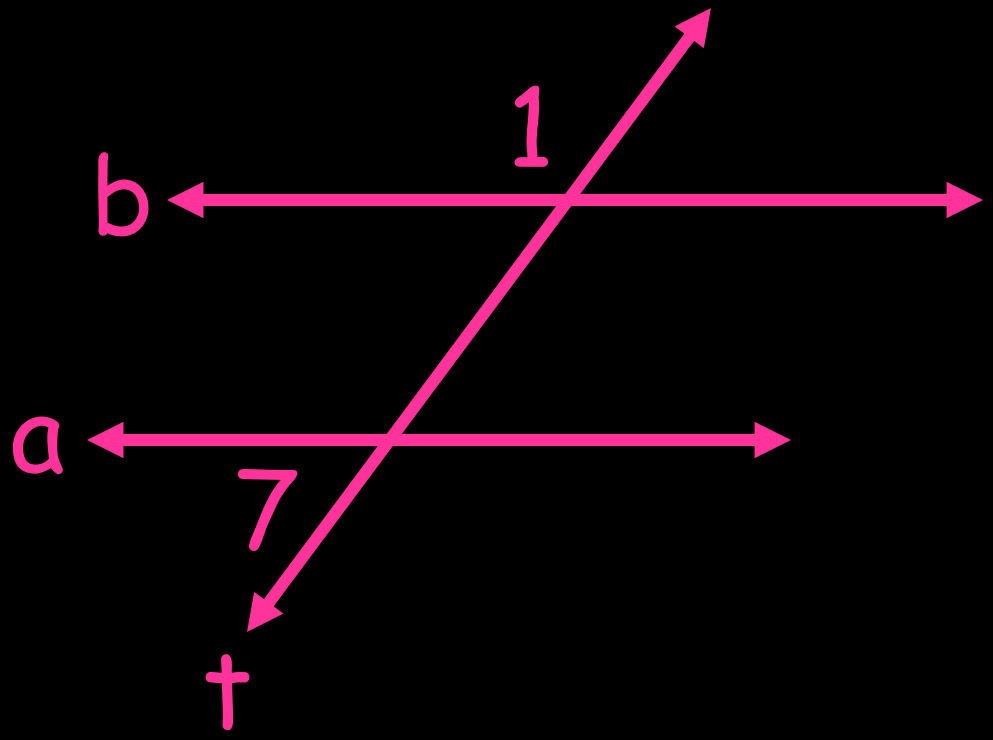
Same-Side Interior Angles



If two parallel lines are cut by a transversal, then same side interior angles are supplementary.

Theorem 3-3

Same-Side Exterior Angles

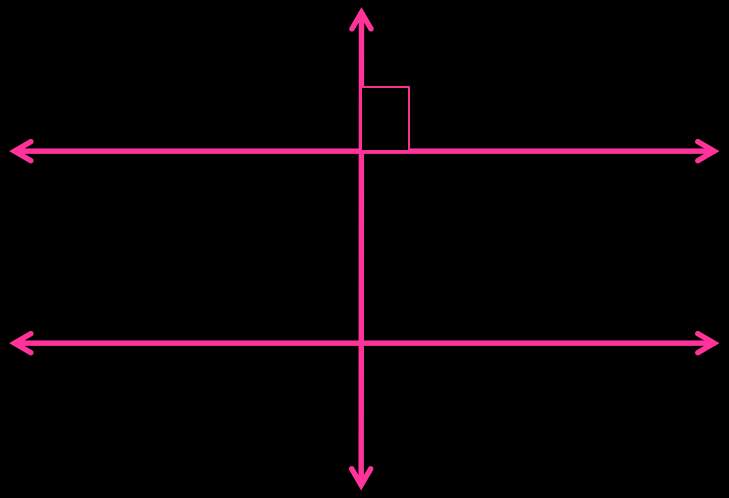


If two parallel lines are cut by a transversal, then same side exterior angles are supplementary.

Theorem 3-3a

Theorem 3-4

If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other parallel line.

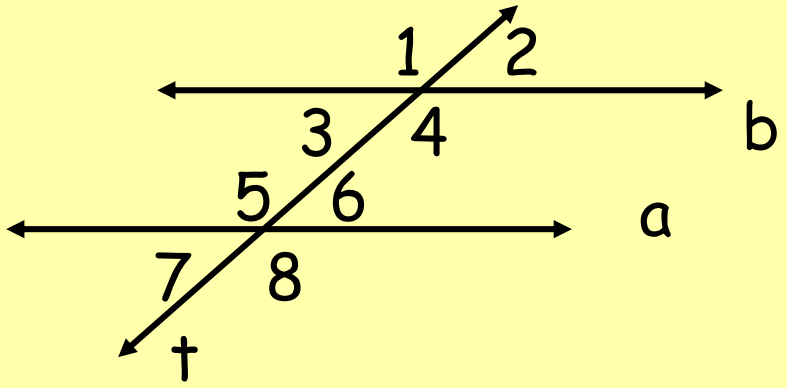


We can use the postulate that states "If two parallel lines are cut by a transversal, then corresponding angles are congruent," to prove the three theorems.

Theorem 3-2: If two parallel lines are cut by a transversal, then alternate interior angles are congruent.

Given: a ll b

Prove: $\angle 3 \cong \angle 6$

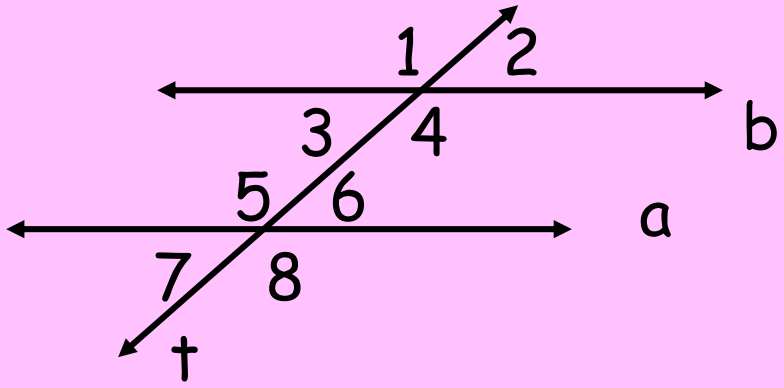


Statements	Reasons
1. a ll b	1. Given
2. $\angle 2 \cong \angle 6$	2. If two parallel lines are cut by a transversal then corresponding angles are congruent.
3. $\angle 2 \cong \angle 3$	3. Vertical Angles Thm.
4. $\angle 3 \cong \angle 6$	4. Substitution.

Theorem: If two parallel lines are cut by a transversal, then alternate exterior angles are congruent.

Given: a ll b

Prove: $\angle 1 \cong \angle 8$

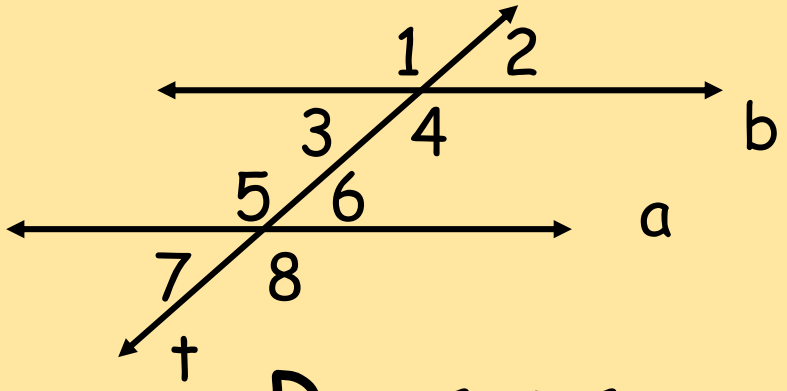


Statements	Reasons
1. a ll b	1. Given
2. $\angle 4 \cong \angle 8$	2. If two parallel lines are cut by a transversal then corresponding angles are congruent.
3. $\angle 4 \cong \angle 1$	3. Vertical Angles Thm.
4. $\angle 1 \cong \angle 8$	4. Substitution.

Theorem 3-3: If two parallel lines are cut by a transversal, then same side interior angles are supplementary.

Given: a ll b

Prove: $\angle 4$, $\angle 6$ are supplementary

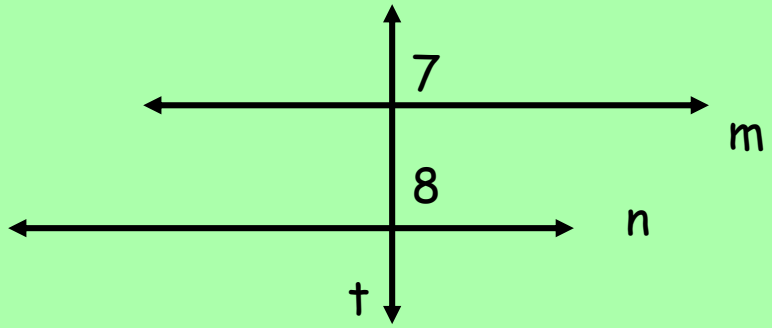


Statements	Reasons
1. a ll b	1. Given
2. $m\angle 6 + m\angle 8 = 180$.	2. Angle Addition Postulate
3. $m\angle 4 = m\angle 8$	3. If two parallel lines are cut by a transversal then corresponding angles are congruent.
4. $m\angle 6 + m\angle 4 = 180$	4. Substitution
5. $\angle 4$, $\angle 6$ are supplementary	5. Definition of Supplementary Angles

Theorem 3-4: If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other parallel line.

Given: $t \perp m$; $m \parallel n$;

Prove: $t \perp n$



Statements	Reasons
1. $t \perp m$	1. Given
2. $\angle 7$ is a right angle.	2. Definition of perpendicular lines
3. $m\angle 7 = 90$	3. Definition of a right angle.
4. $m \parallel n$	4. Given
5. $m\angle 7 = m\angle 8$	5. If two parallel lines are cut by a transversal, then corresponding angles are congruent.
6. $m\angle 8 = 90$	6. Substitution
7. $\angle 8$ is a right angle	7. Definition of a right angle.
8. $t \perp n$	8. Definition of perpendicular lines