Proving Properties of Parallel Lines Cut by a Transversal

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Sauyo High School

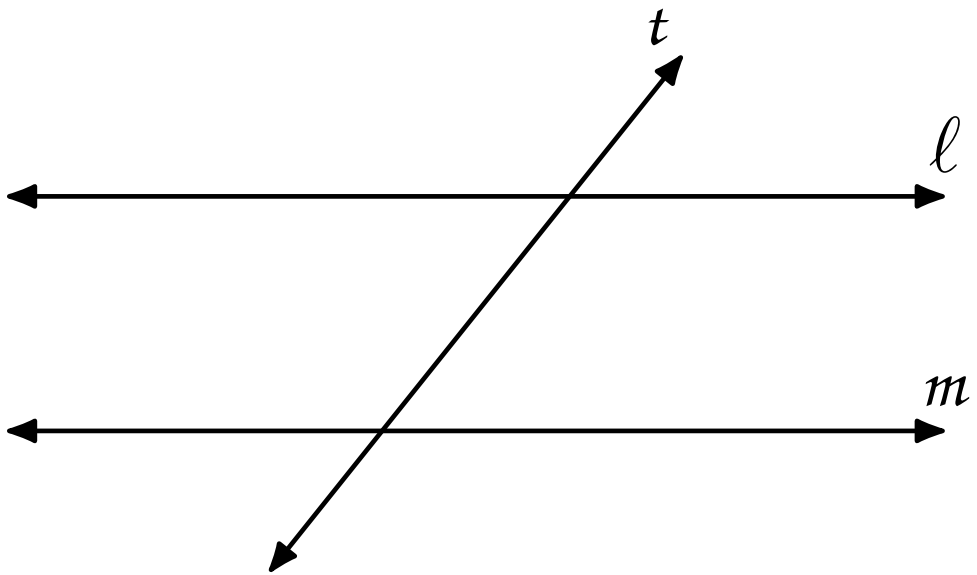
What are Parallel Lines?

Parallel lines are two lines that lie in the same plane and do not intersect.

$\ell \parallel m$

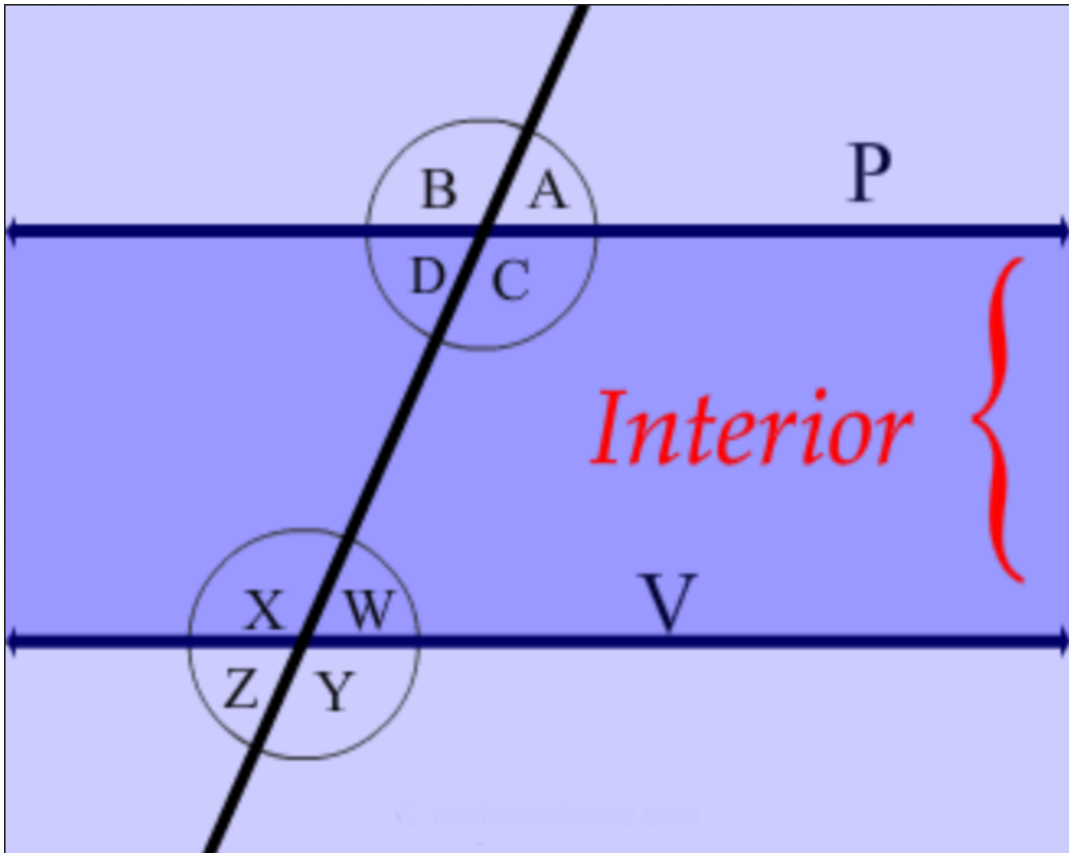
What is a Transversal?

A transversal is a line that passes through two lines in the same plane at two distinct points.



What are the Angles Formed by Parallel Lines Cut by a Transversal?

Interior Angles



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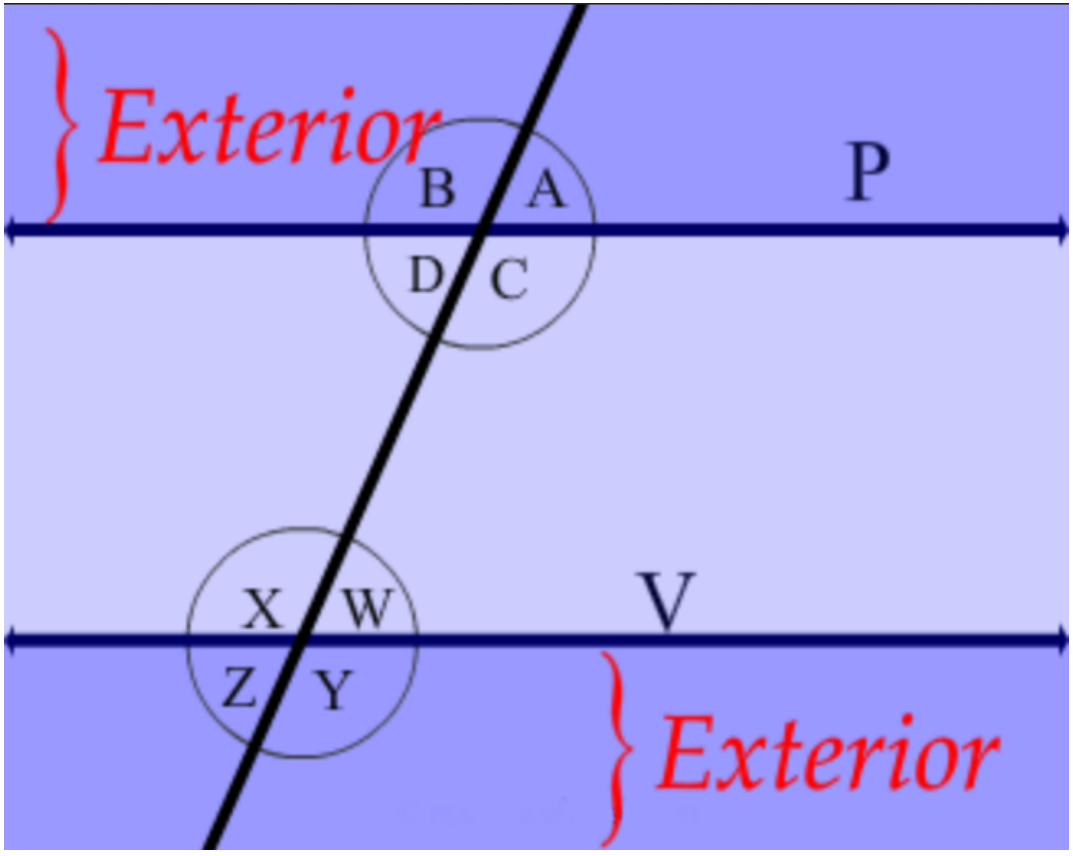
Exterior Angles



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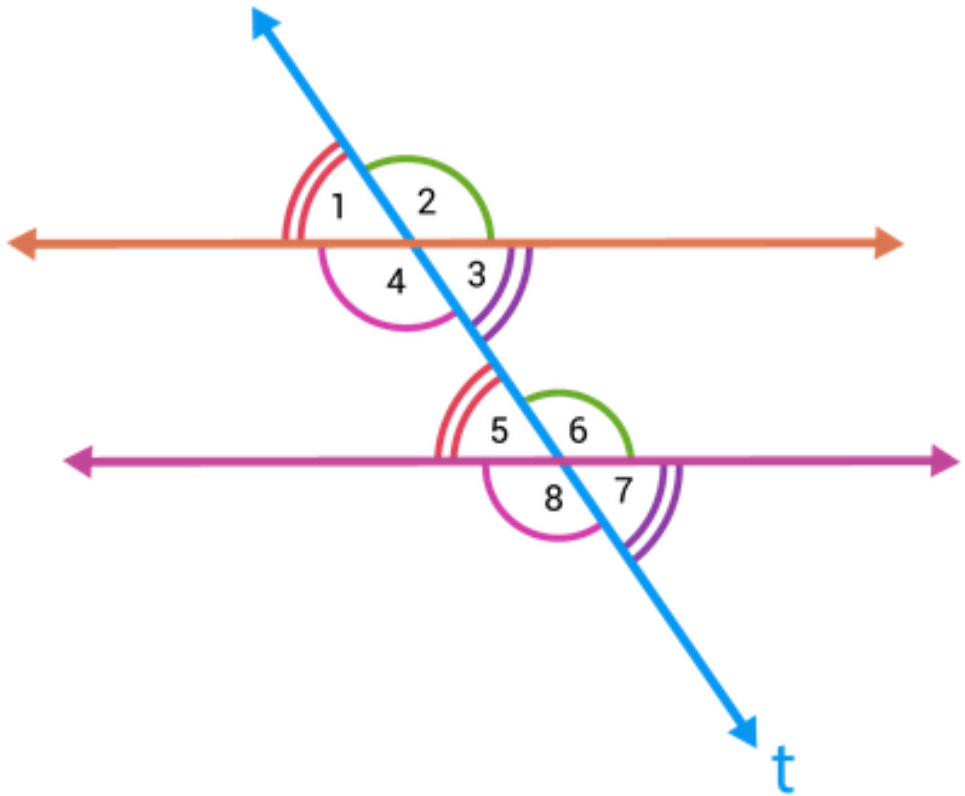
Corresponding Angles



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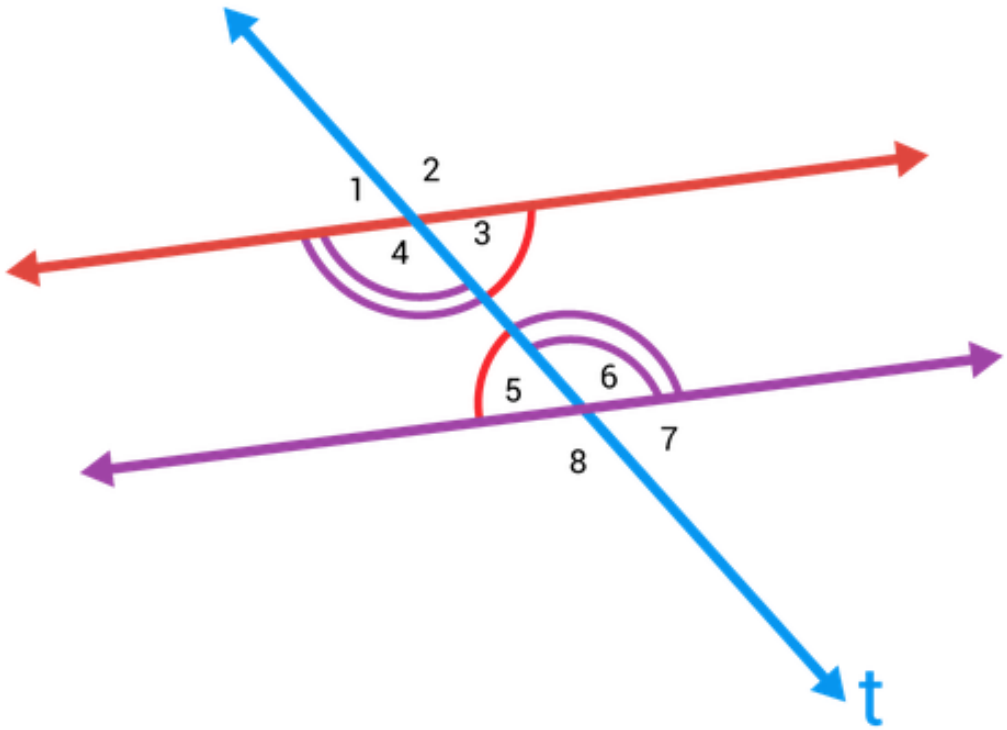
Alternate Interior Angles



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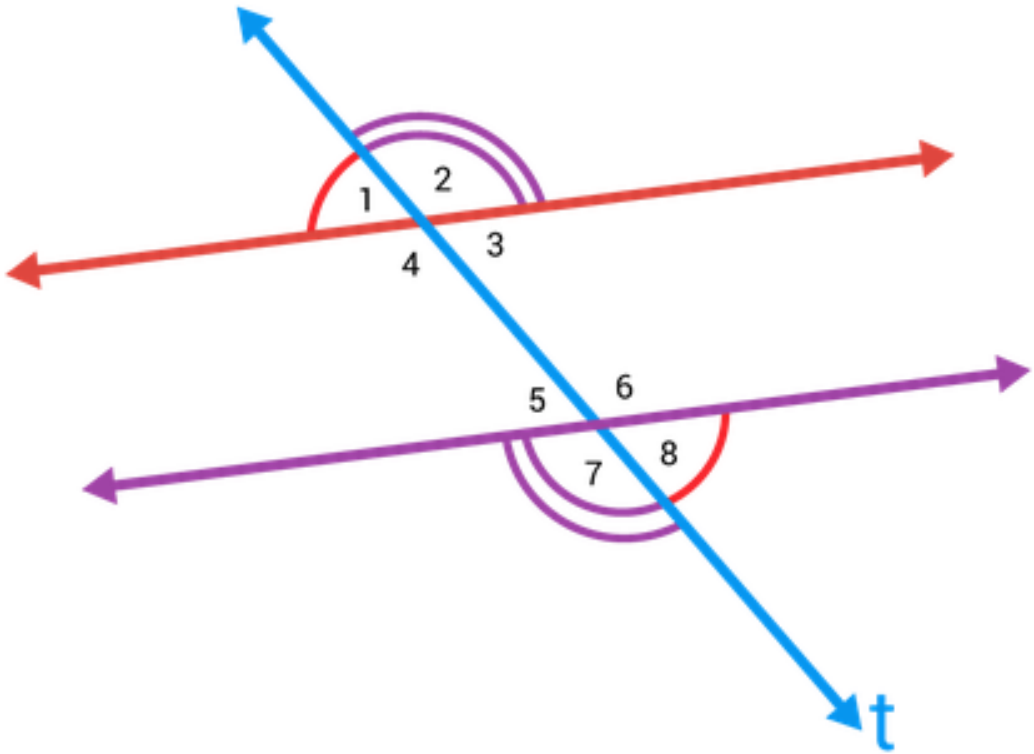
Alternate Exterior Angles



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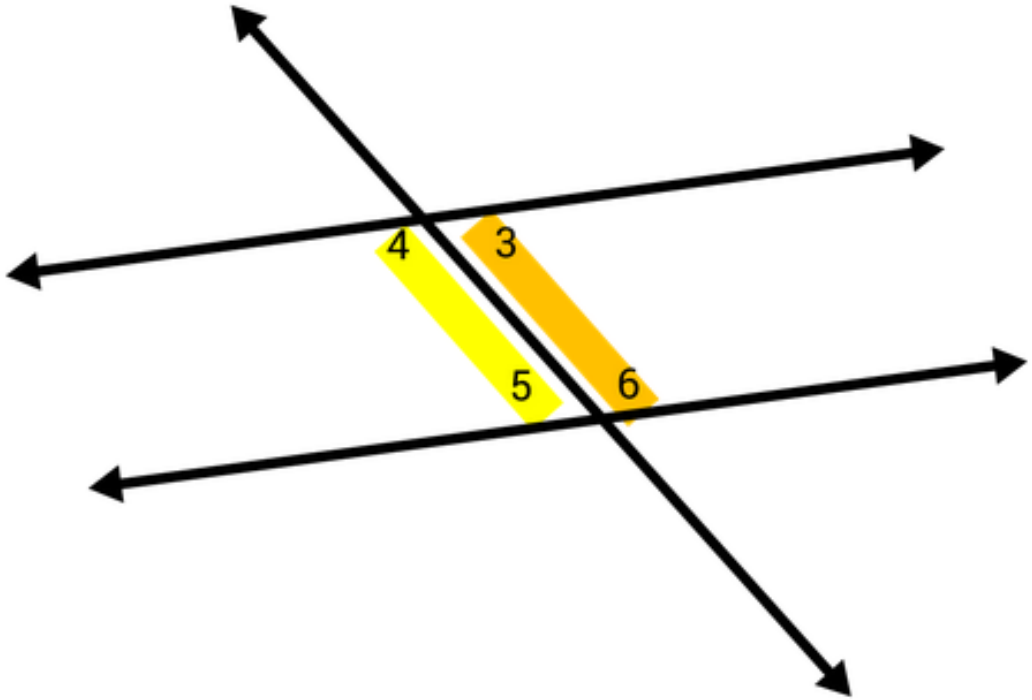
Same-Side or Consecutive Interior Angles



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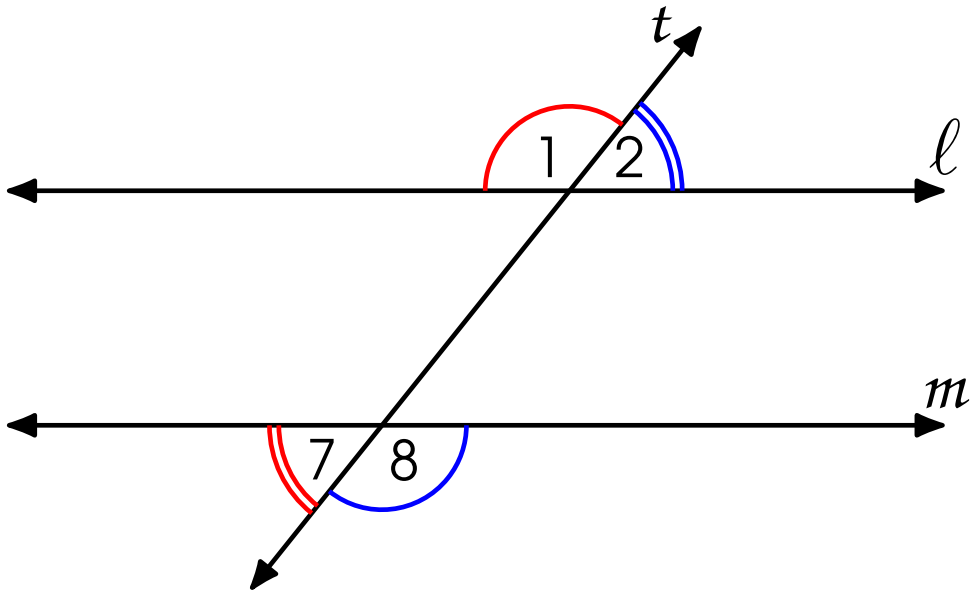
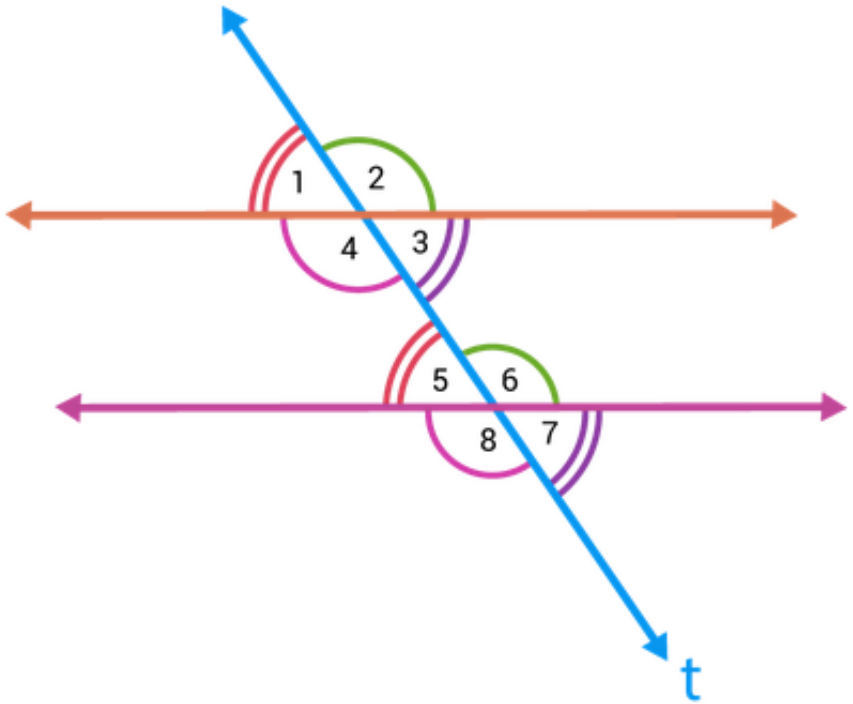


Properties of Angles Formed by Parallel Lines Cut by a Transversal

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



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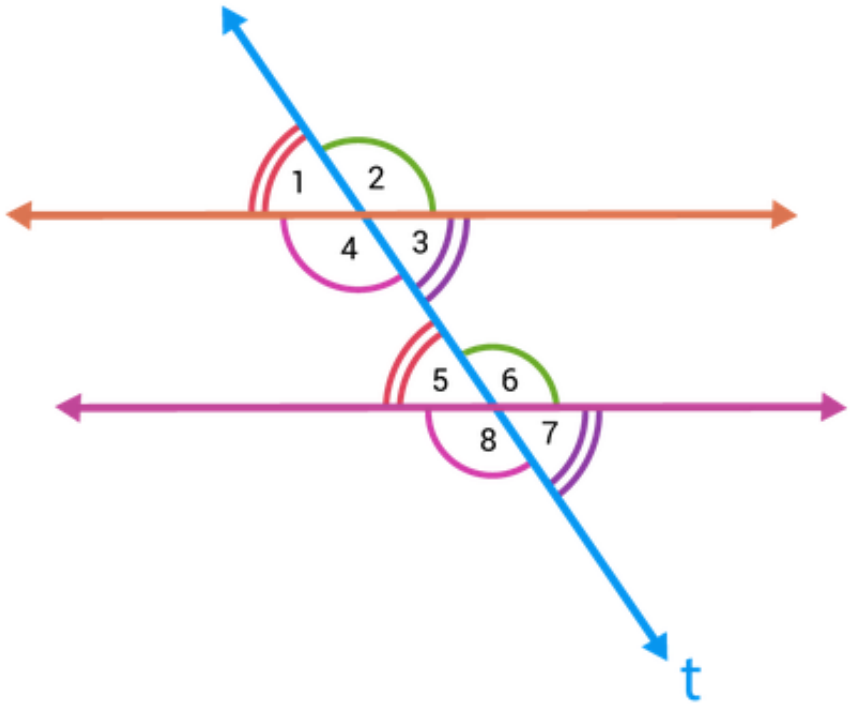

$\angle 1 \cong \angle 5$

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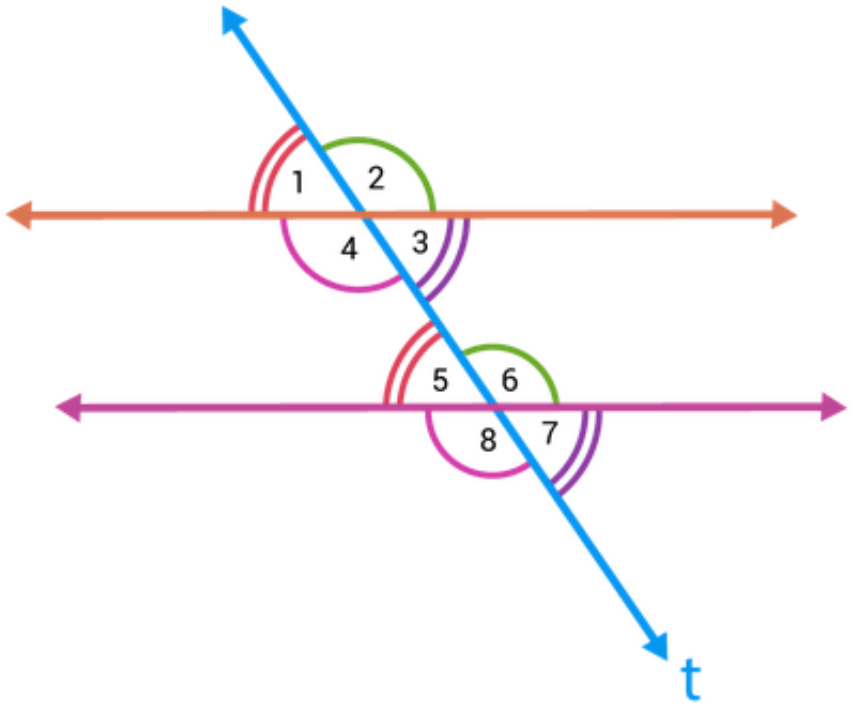

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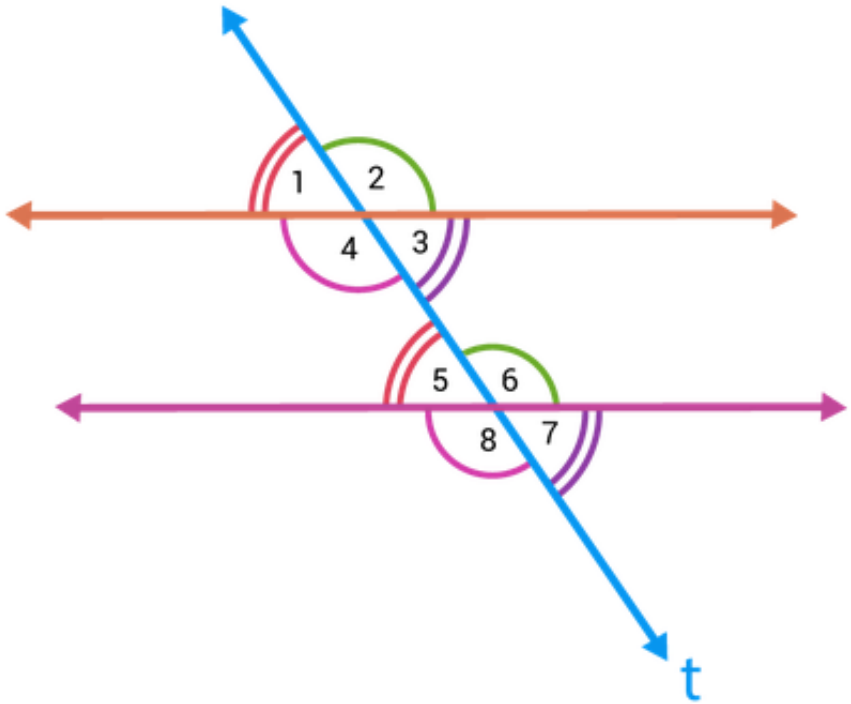

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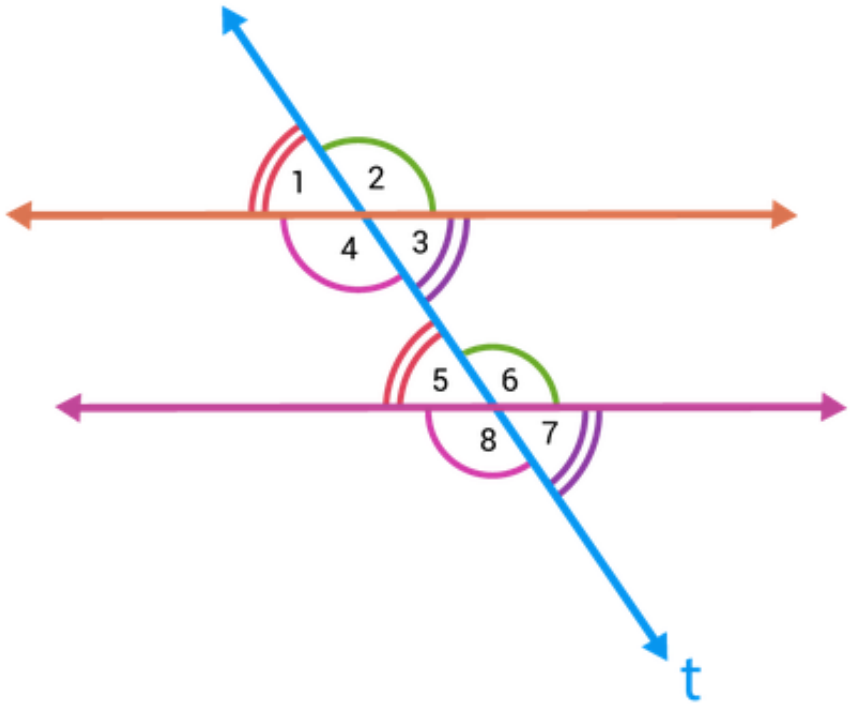

$\angle 1 \cong \angle 5$

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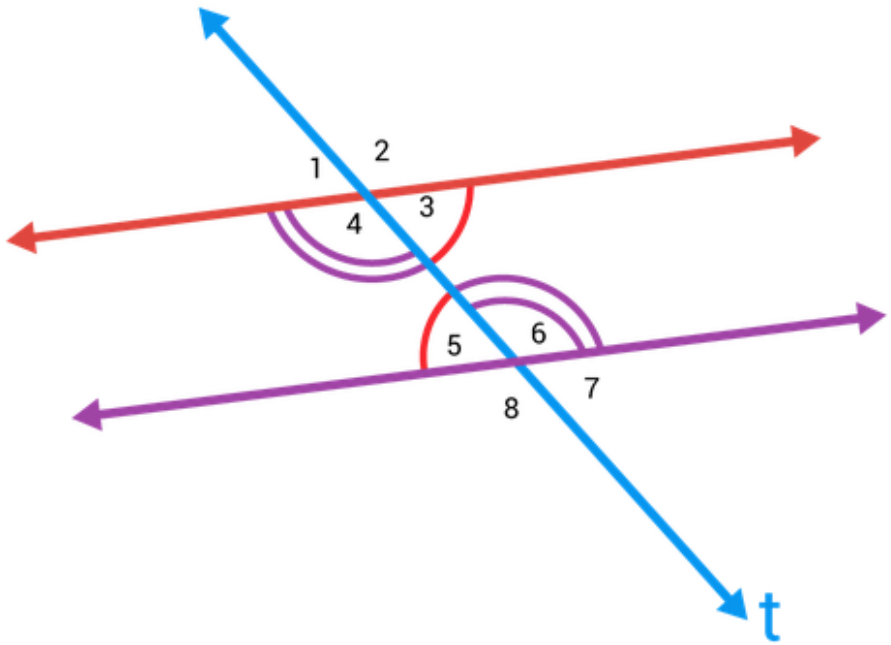
$\angle 4 \cong \angle 8$

Properties of Angles Formed by Parallel Lines Cut by a Transversal

Alternate Interior Angles theorem: If two parallel lines are cut by a transversal, then the alternate interior angles are congruent.



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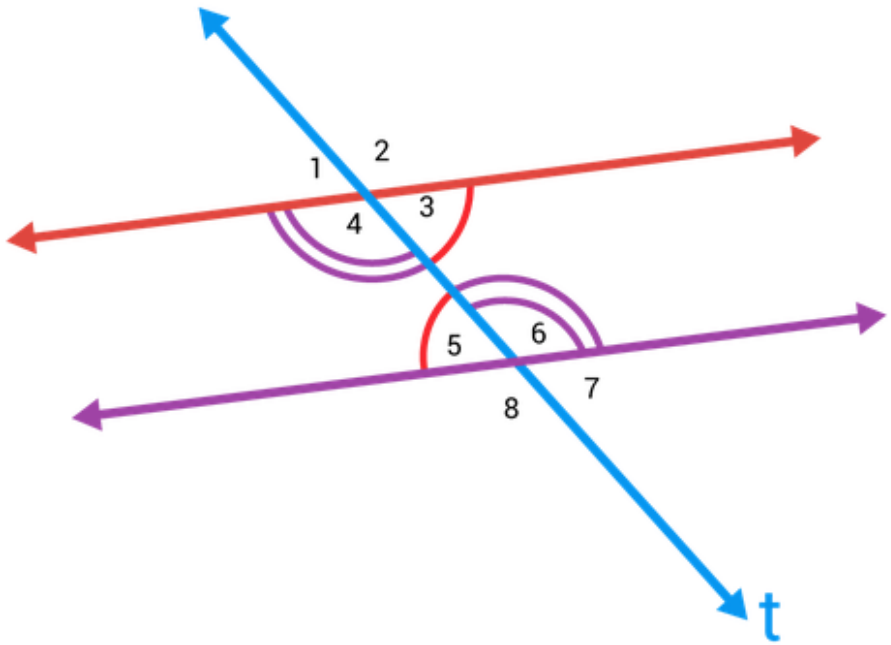

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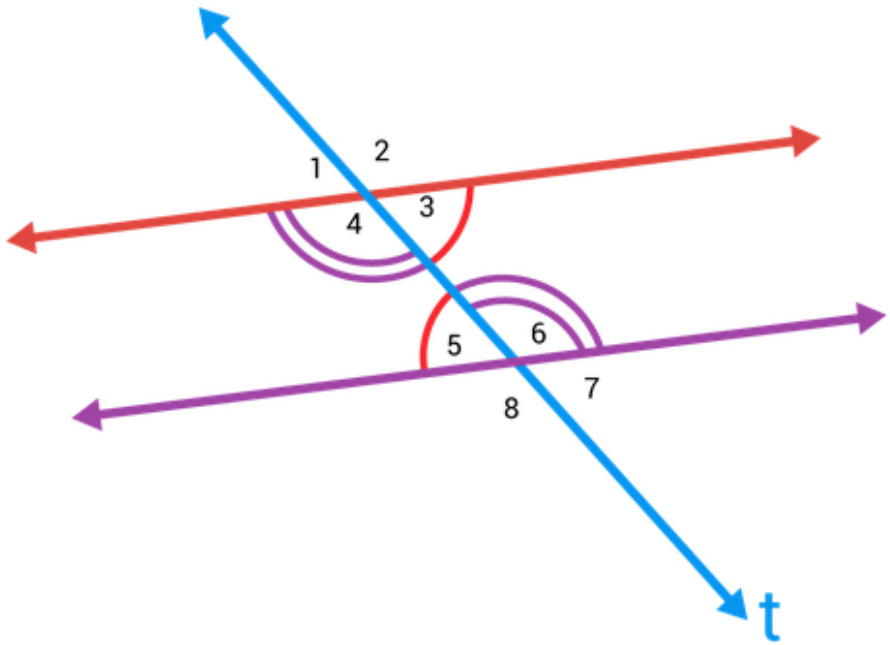

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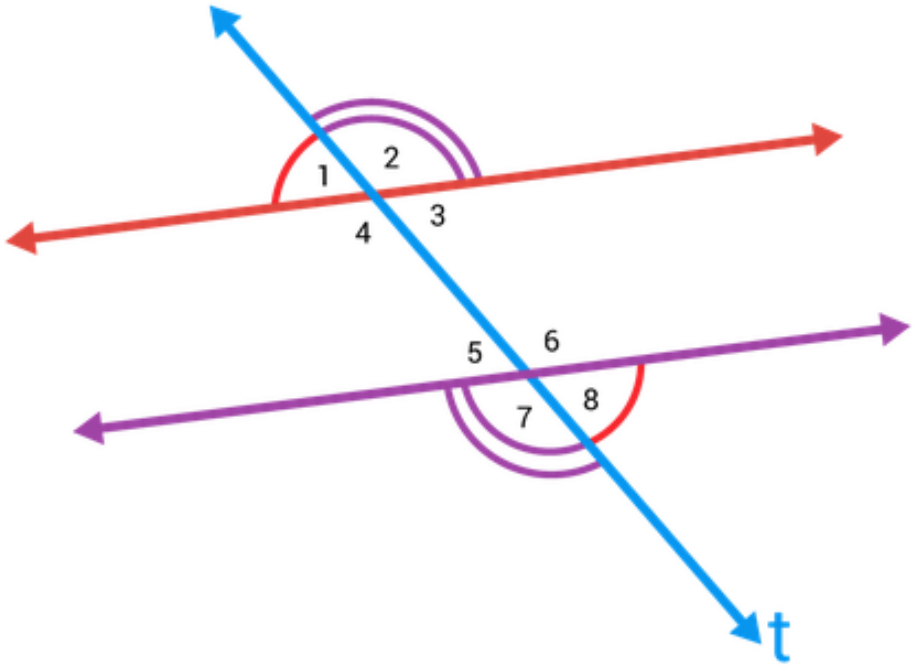

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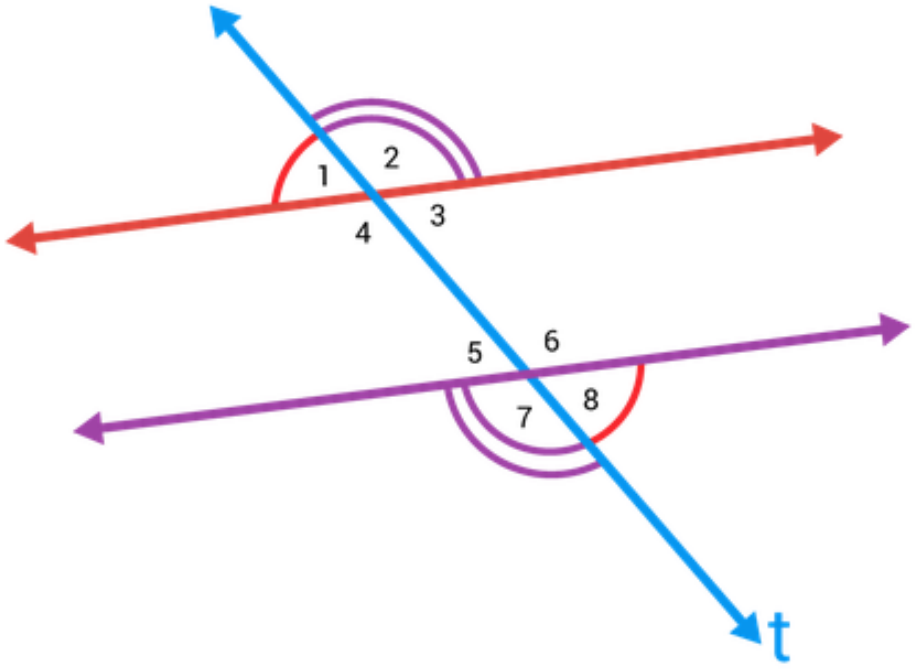

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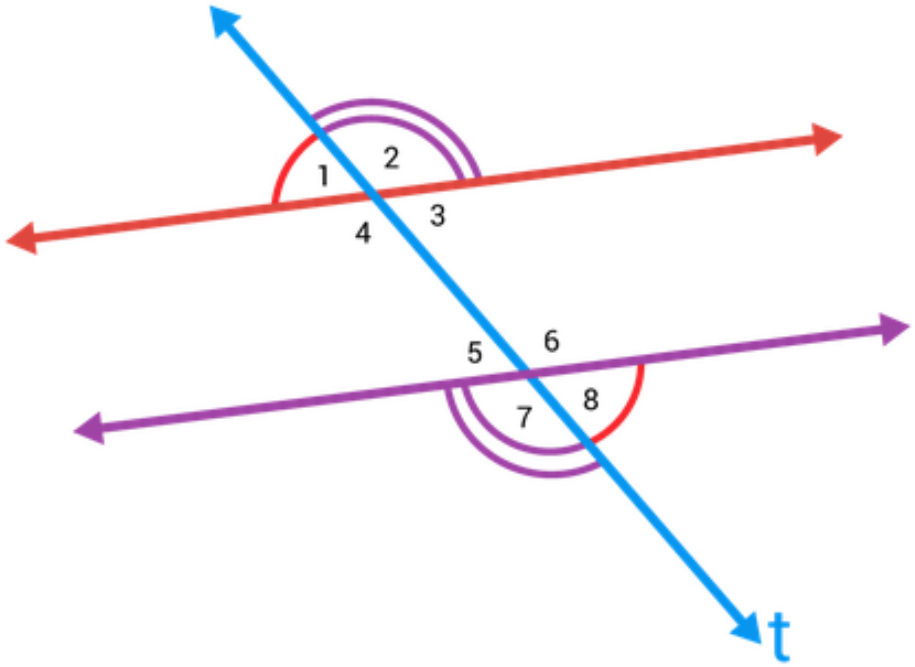
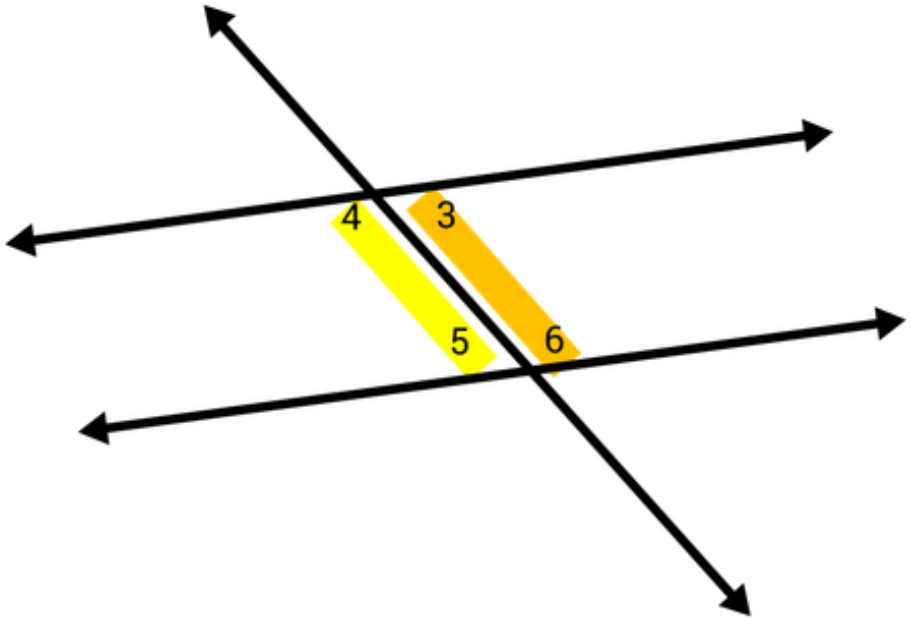


$\angle 1 \cong \angle 8$

$\angle 2 \cong \angle 7$

Properties of Angles Formed by Parallel Lines Cut by a Transversal

Consecutive Interior Angles theorem: If two parallel lines are cut by a transversal, then the consecutive or same-side interior angles are supplementary.



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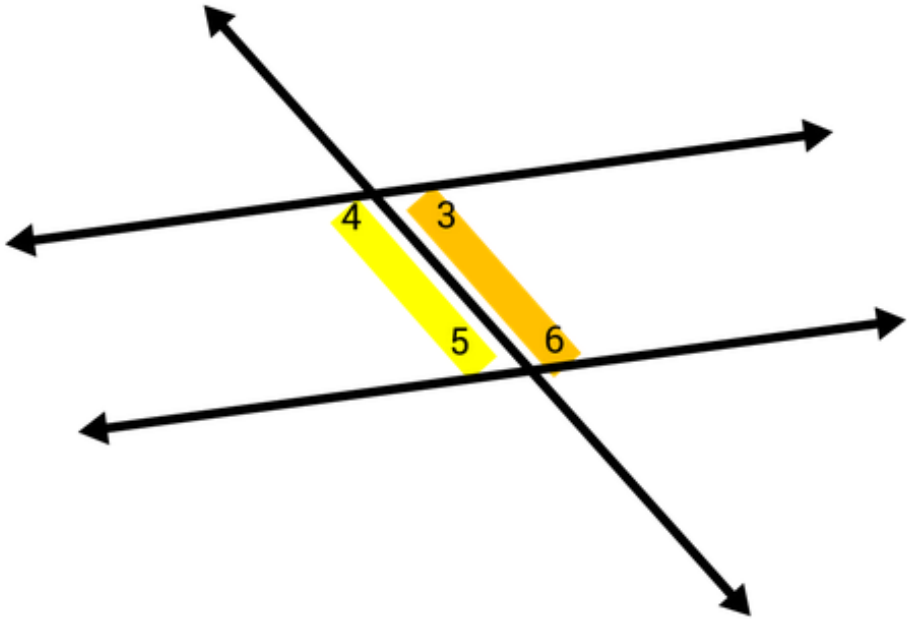

$m\angle 3 + m\angle 6 = 180^\circ$

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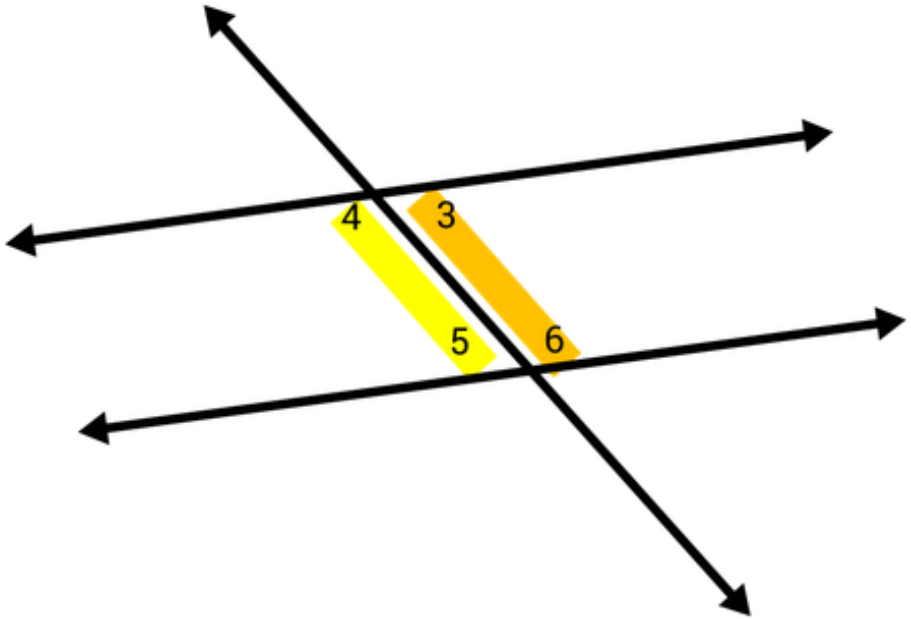

$m\angle 3 + m\angle 6 = 180^\circ$ $\quad$ $m\angle 4 + m\angle 5 = 180^\circ$

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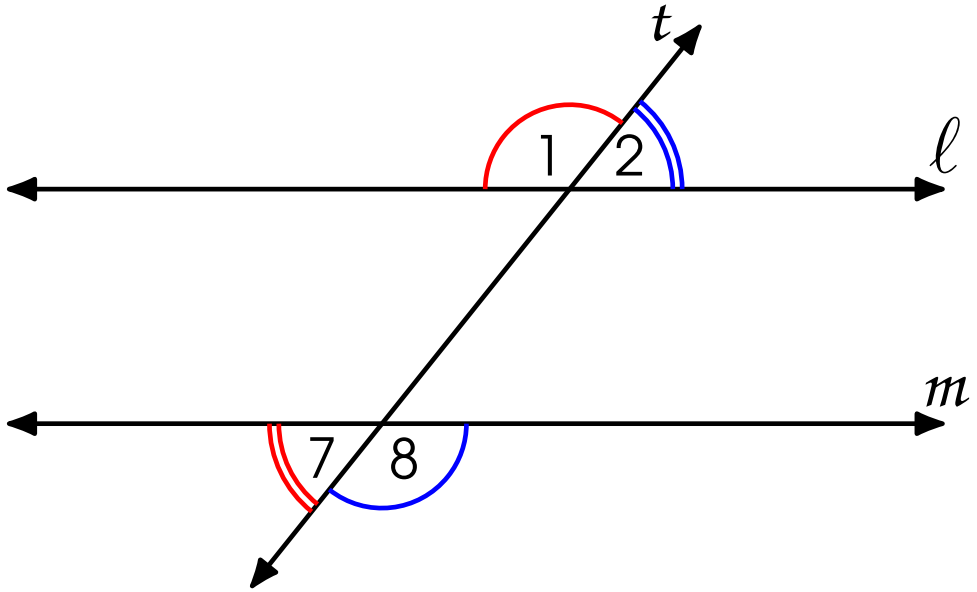

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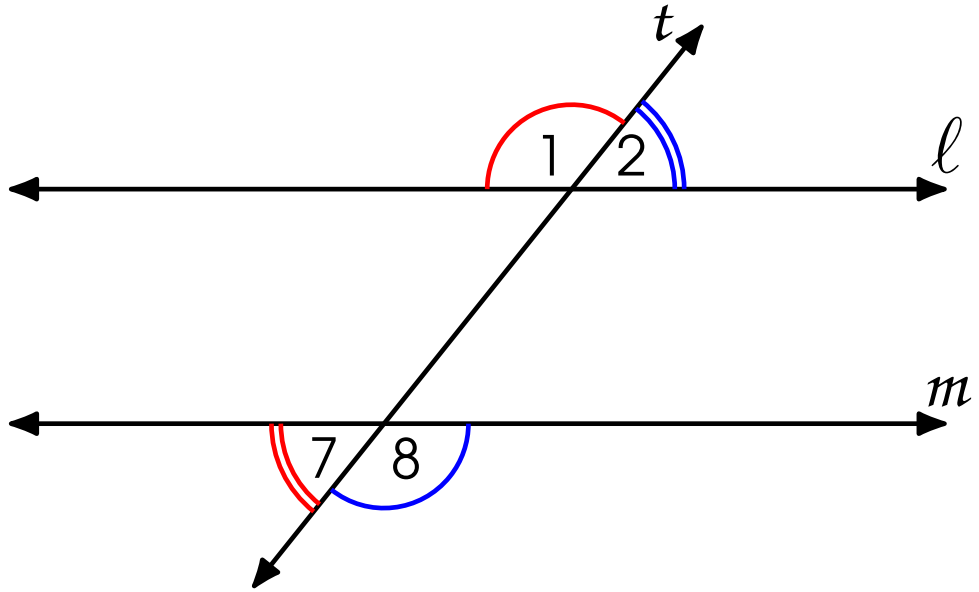

$m\angle 1 + m\angle 7 = 180^\circ$

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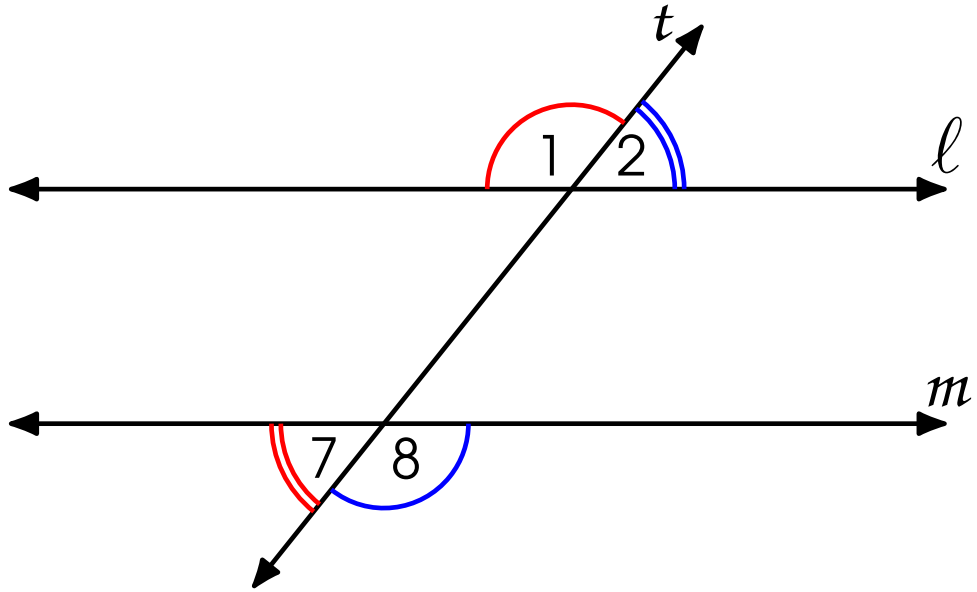
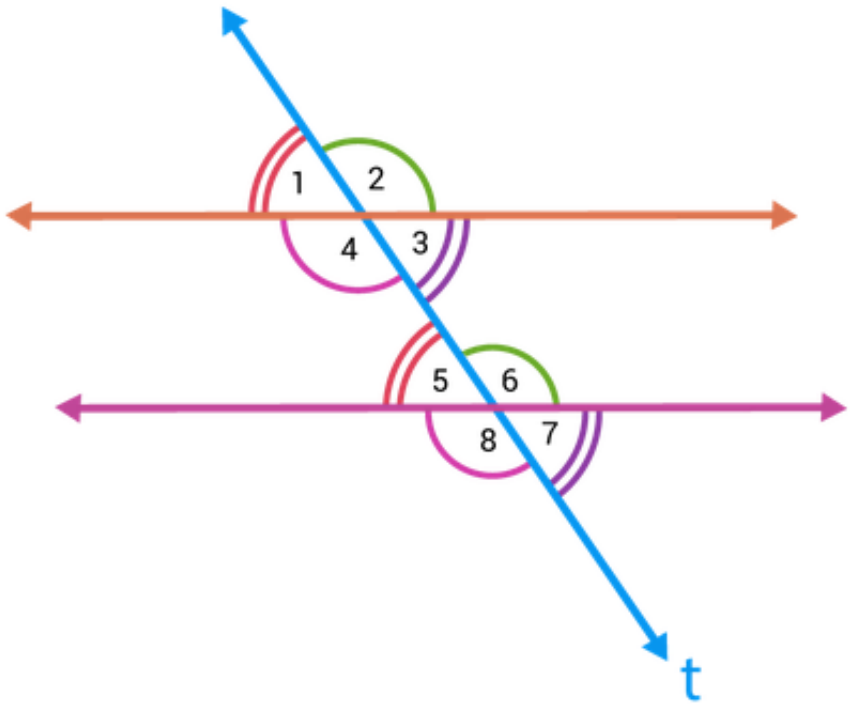


$m\angle 1 + m\angle 7 = 180^\circ$ $\quad$ $m\angle 2 + m\angle 8 = 180^\circ$

Definitions, Postulates, and Theorems

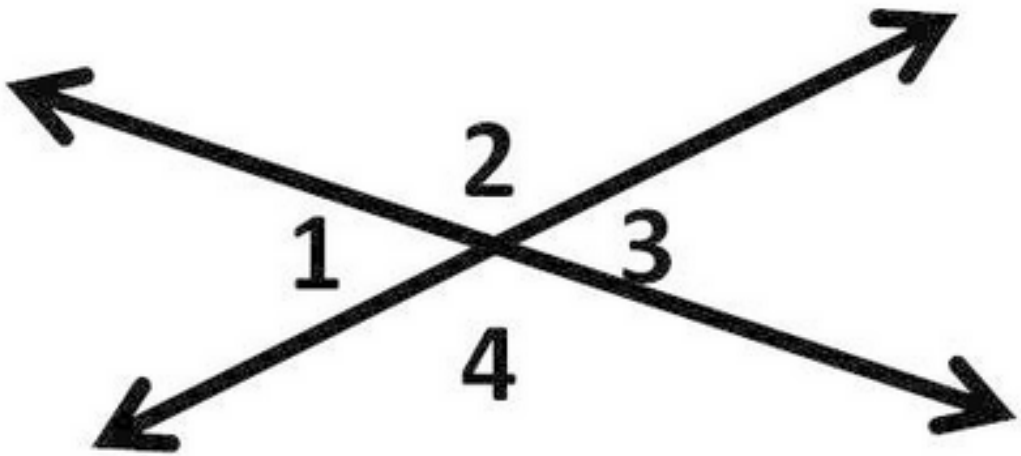
Corresponding Angles Postulate



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

Definitions, Postulates, and Theorems

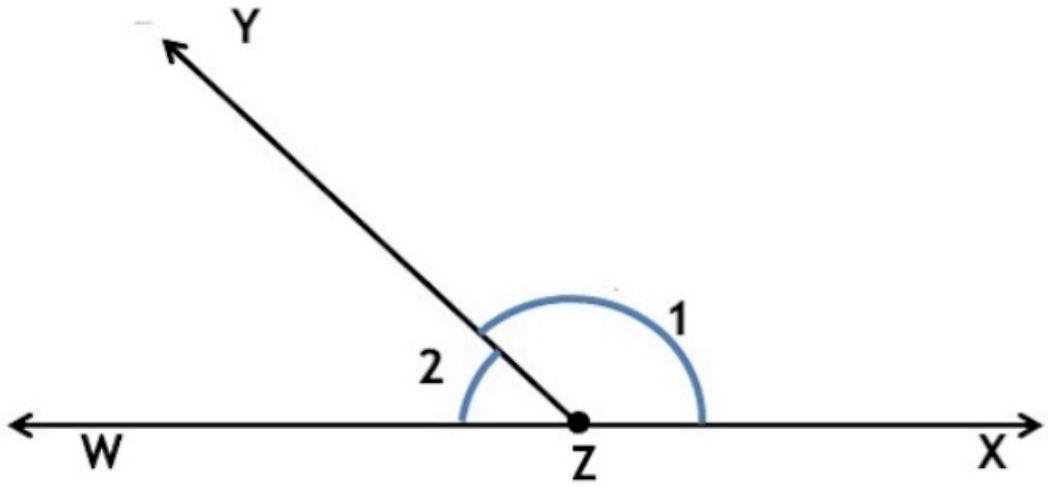
Vertical Angles theorem



If $\angle 1$ and $\angle 3$ are vertical angles, then $\angle 1 \cong \angle 3$.

Definitions, Postulates, and Theorems

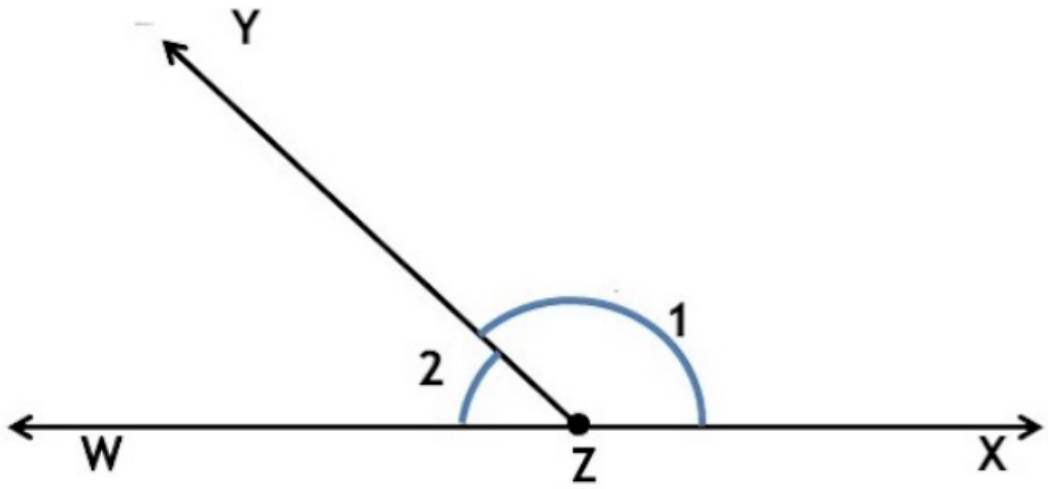
Definition of Linear Pair



If two angles are adjacent such that two of the rays are opposite, then they form a linear pair.

Definitions, Postulates, and Theorems

Linear Pair Postulate



If two angles form a linear pair, then they are supplementary.

Definitions, Postulates, and Theorems

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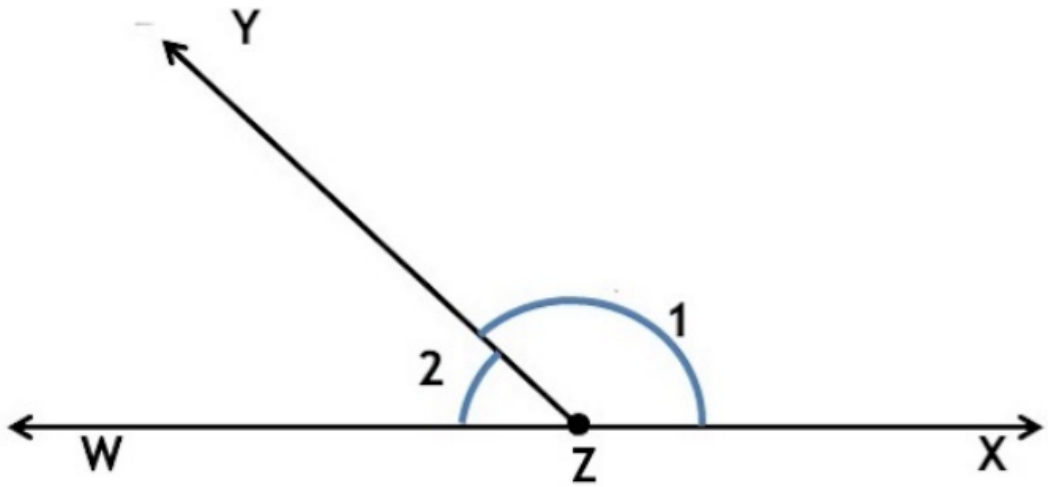


If two angles form a linear pair, then they are supplementary.

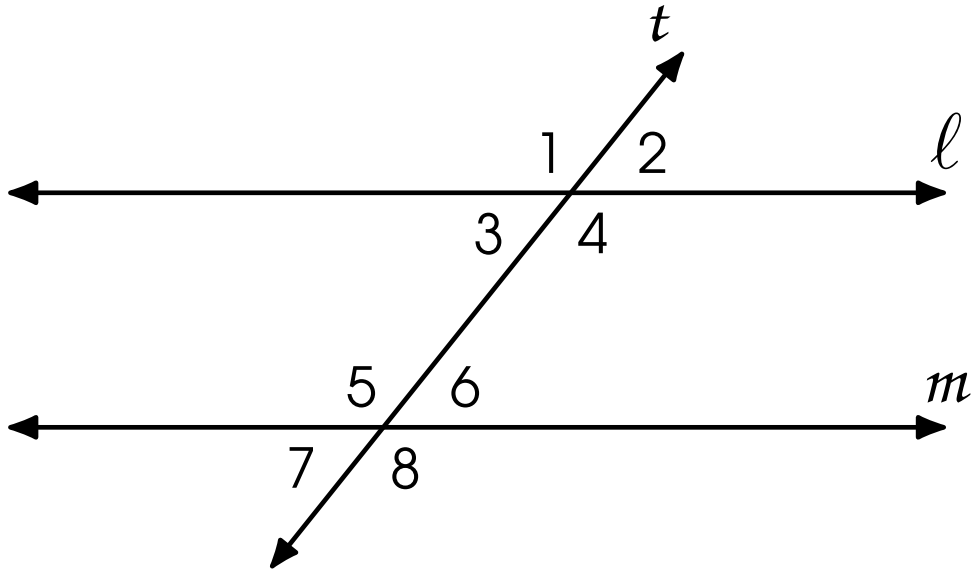
$m\angle 1 + m\angle 2 = 180^\circ$

Alternate Interior Angles Theorem

Given: t is a transversal

$\ell \parallel m$

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



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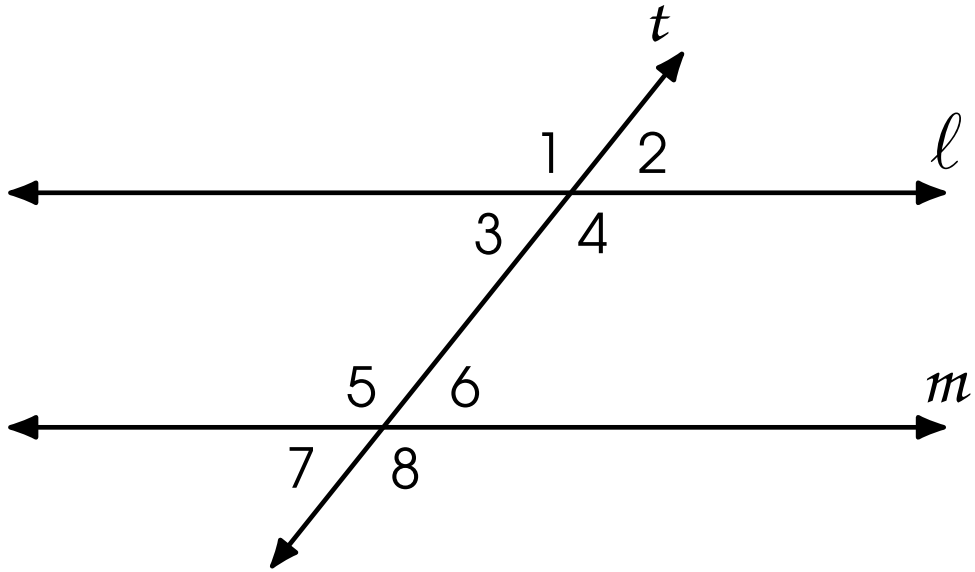

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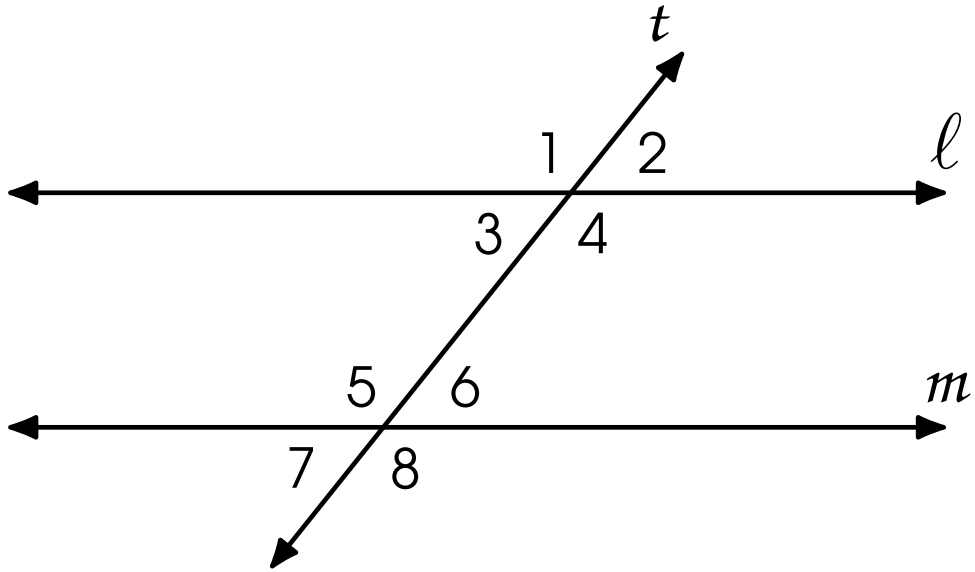

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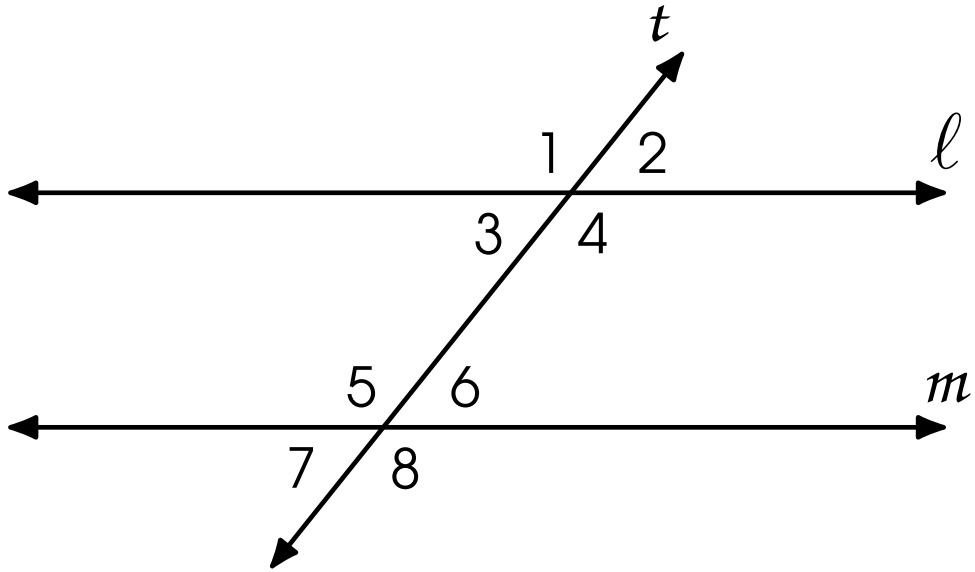

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1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 3 \cong \angle 7$	2. Corresponding Angles theorem

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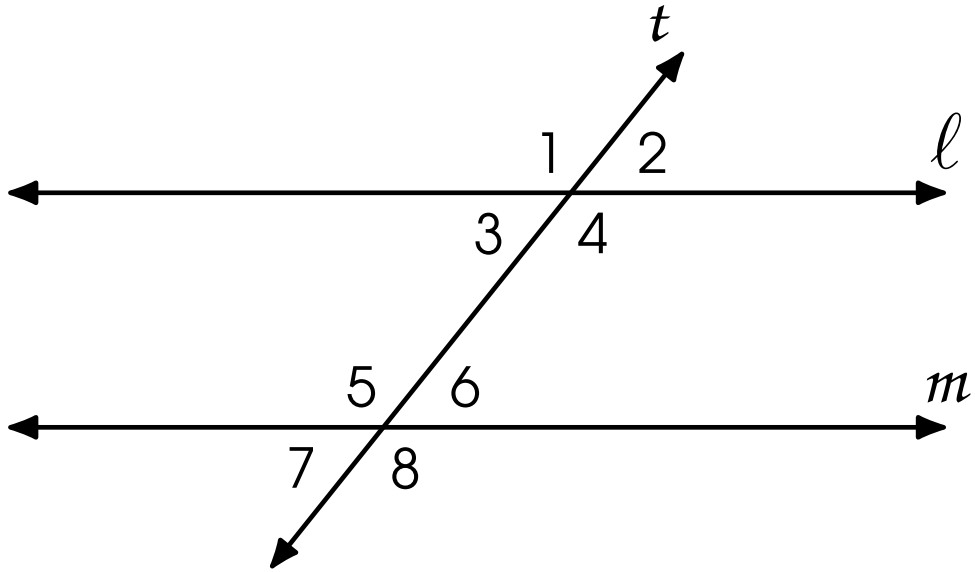
Proof:



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1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 3 \cong \angle 7$	2. Corresponding Angles theorem
3. $\angle 7 \cong \angle 6$	3. Vertical Angles theorem

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Given: t is a transversal
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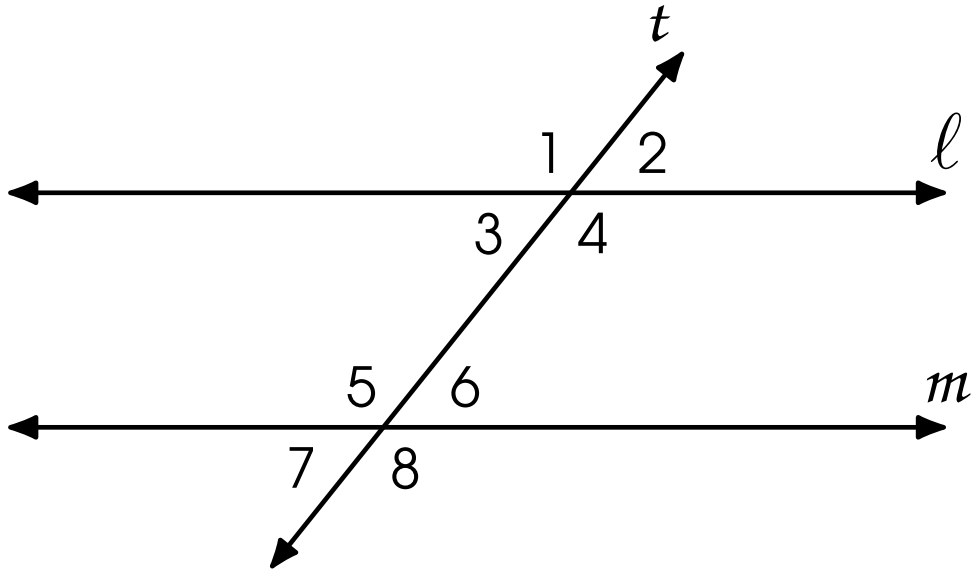
Prove: $\angle 3 \cong \angle 6$

Proof:



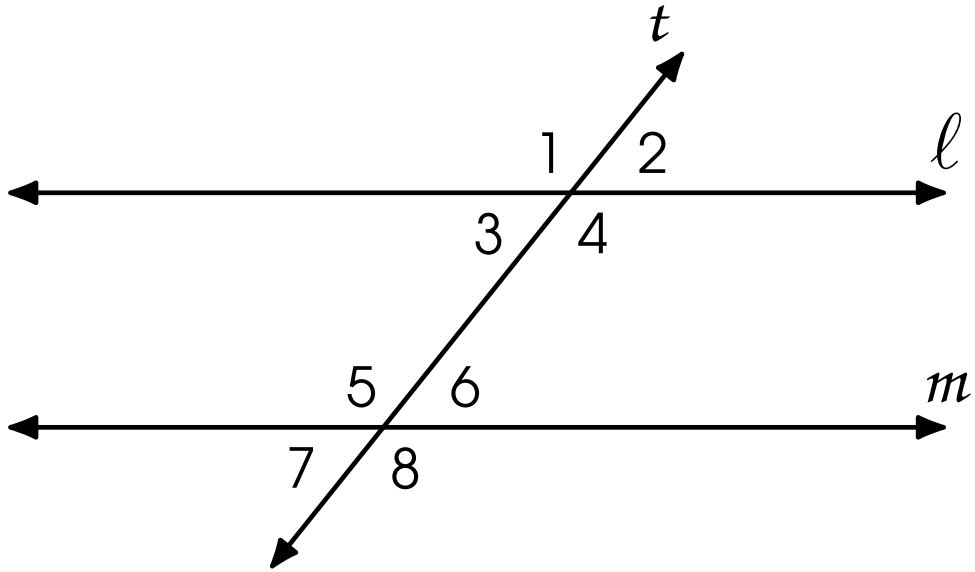
Statements	Reasons
1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 3 \cong \angle 7$	2. Corresponding Angles theorem
3. $\angle 7 \cong \angle 6$	3. Vertical Angles theorem
4. $\angle 3 \cong \angle 6$	4. Transitive Property

Alternate Exterior Angles Theorem

Given: t is a transversal

$\ell \parallel m$

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



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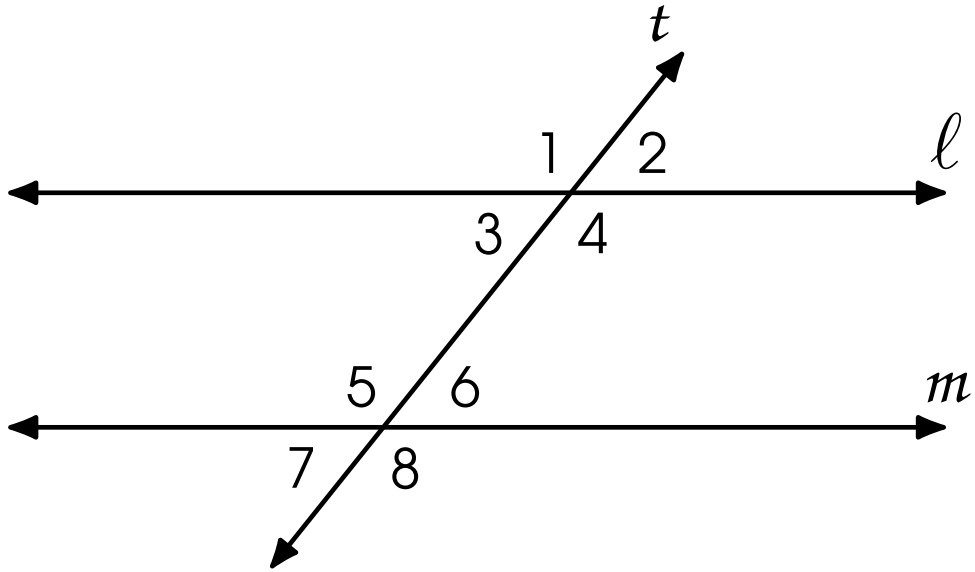

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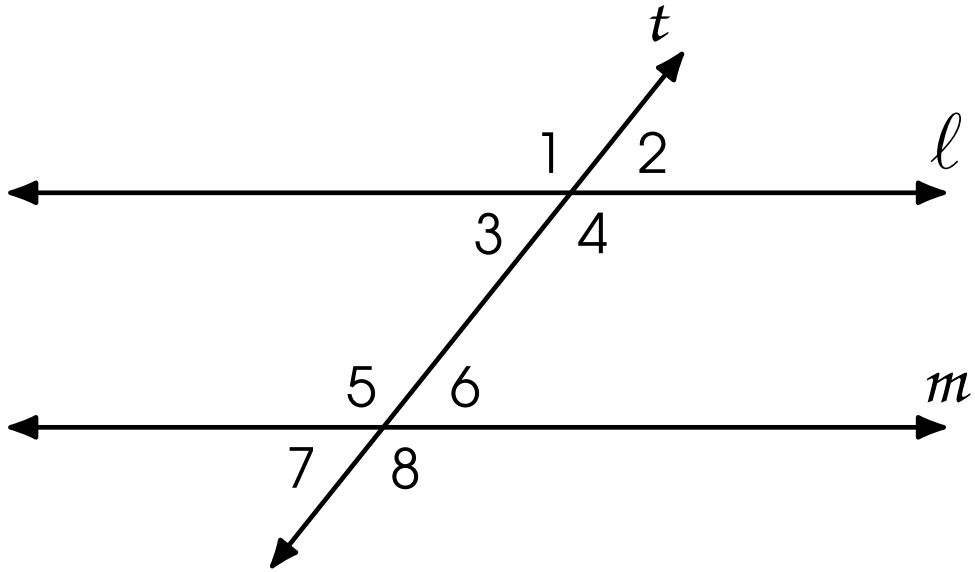

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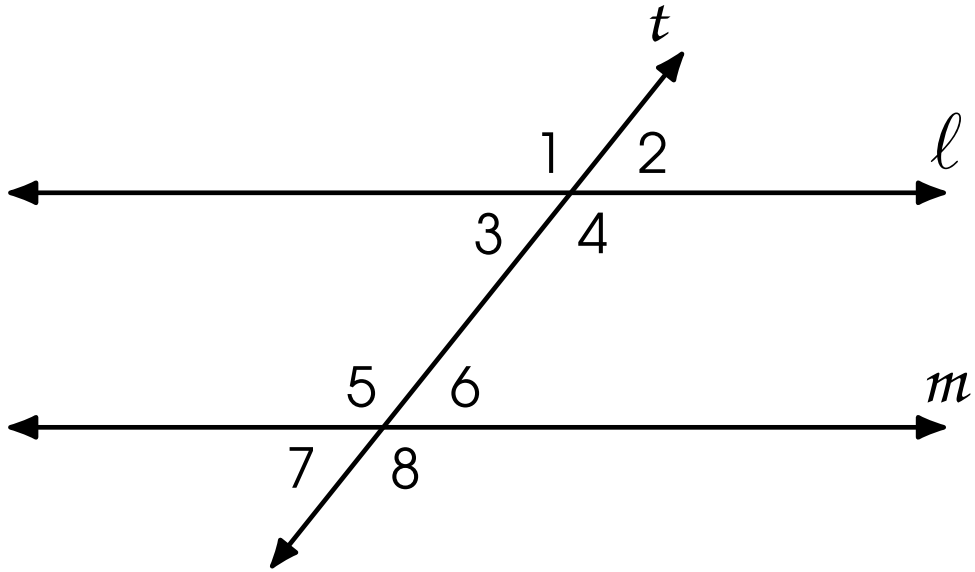

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1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 1 \cong \angle 5$	2. Corresponding Angles theorem

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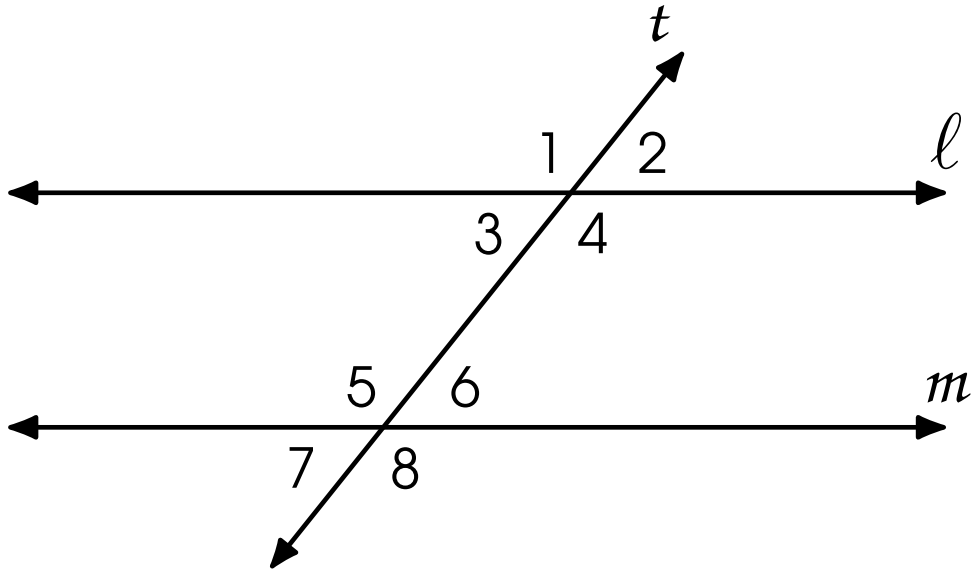

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1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 1 \cong \angle 5$	2. Corresponding Angles theorem
3. $\angle 5 \cong \angle 8$	3. Vertical Angles theorem

Alternate Exterior Angles Theorem

Given: t is a transversal
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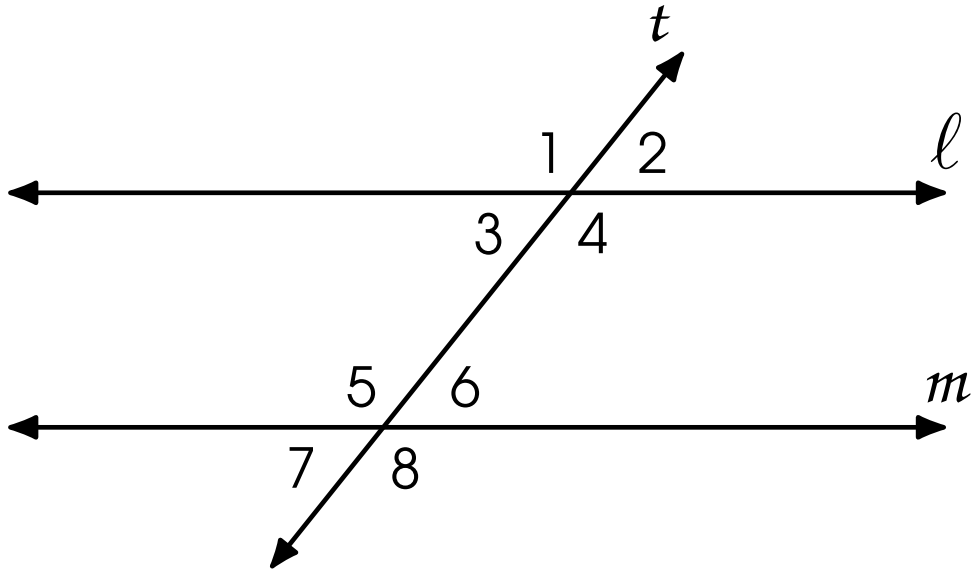
Prove: $\angle 1 \cong \angle 8$

Proof:



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4. $\angle 1 \cong \angle 8$	4. Transitive Property

Consecutive Interior Angles Thm

Given: t is a transversal

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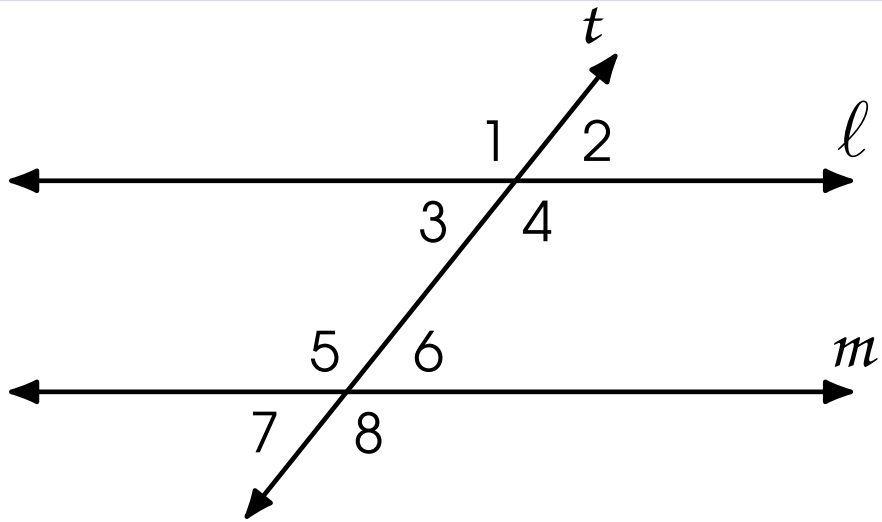
Prove: $\angle 3$ and $\angle 5$ are supplementary



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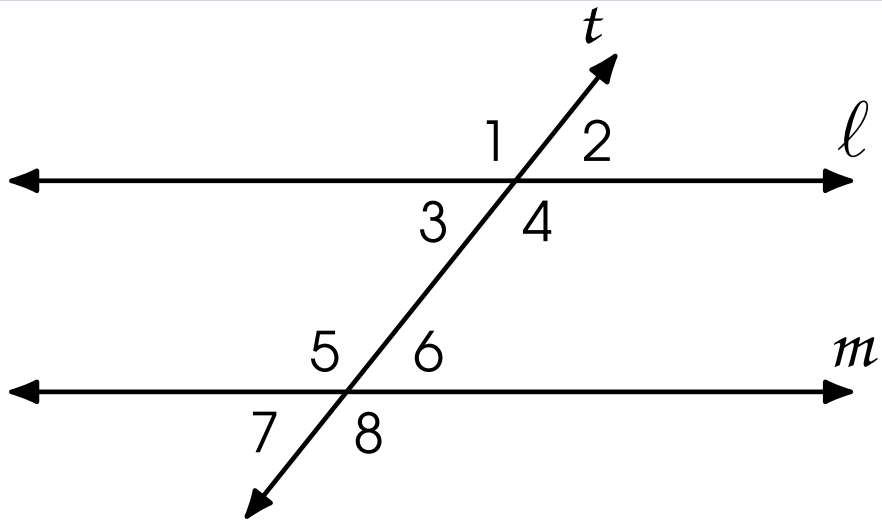
Prove: $\angle 3$ and $\angle 5$ are supplementary



Proof:

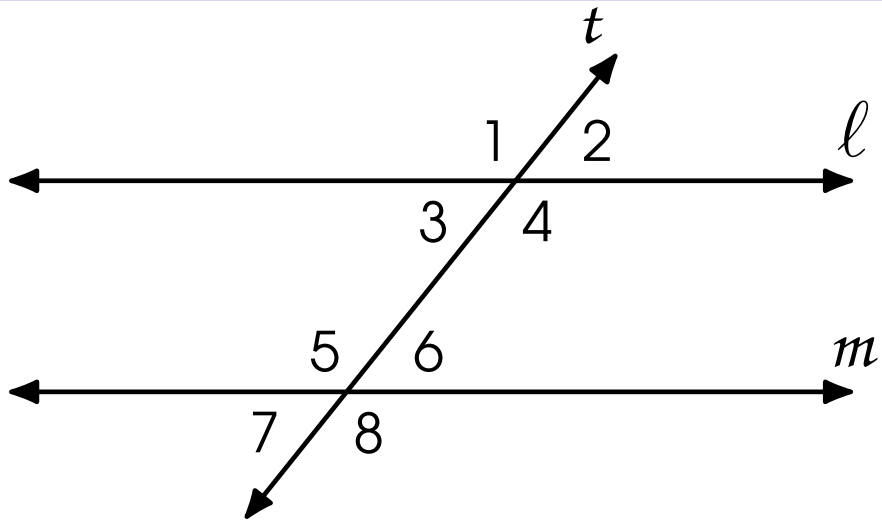
Statements	Reasons

Consecutive Interior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 3$ and $\angle 5$ are supplementary



Proof:

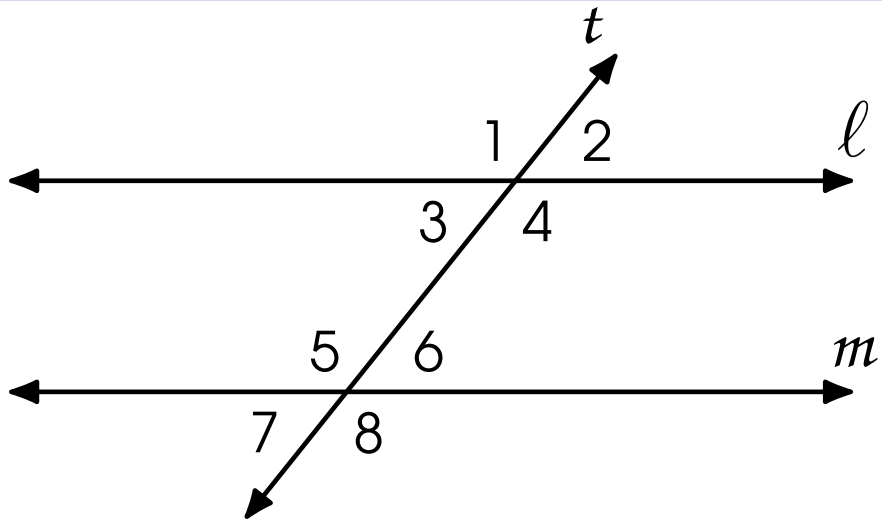
Statements	Reasons
1. t is a transversal, $\ell \parallel m$	1. Given

Consecutive Interior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 3$ and $\angle 5$ are supplementary



Proof:

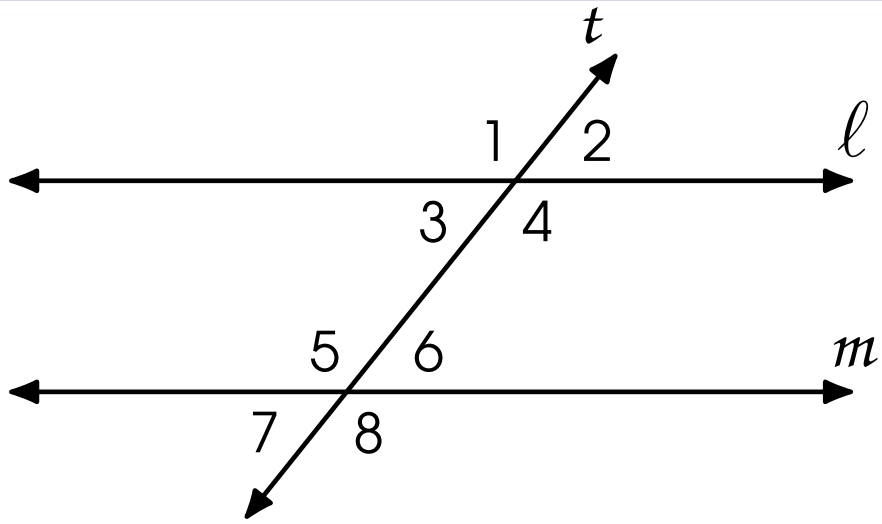
Statements	Reasons
1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 3 \cong \angle 7$	2. Corresponding Angles theorem

Consecutive Interior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 3$ and $\angle 5$ are supplementary



Proof:

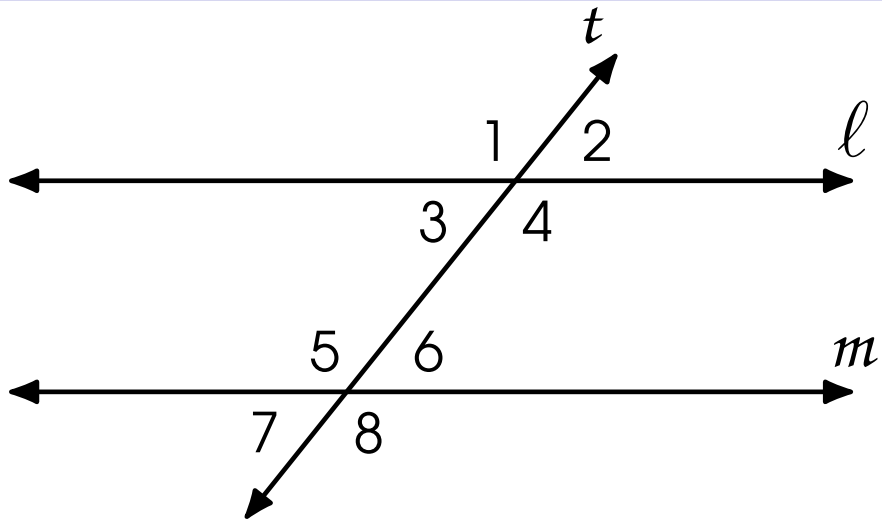
Statements	Reasons
1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 3 \cong \angle 7$	2. Corresponding Angles theorem
3. $\angle 7$ and $\angle 5$ form a linear pair	3. Definition of Linear Pair

Consecutive Interior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 3$ and $\angle 5$ are supplementary



Proof:

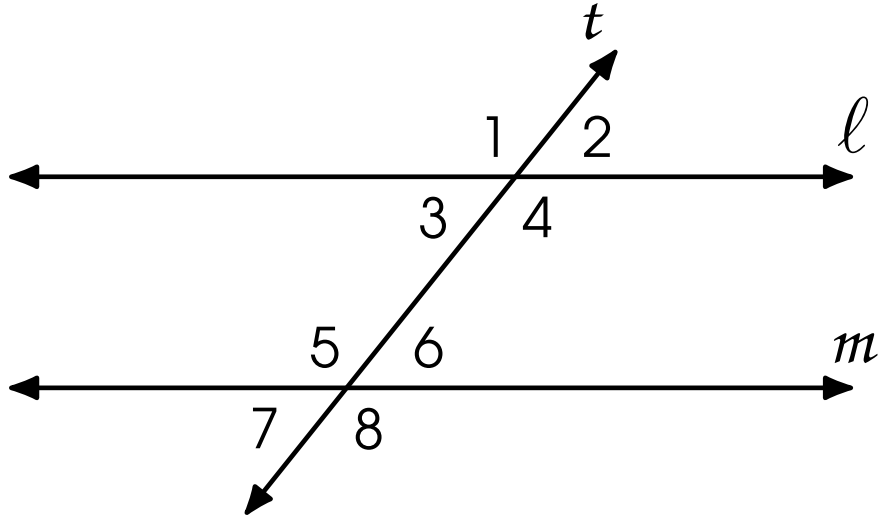
Statements	Reasons
1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 3 \cong \angle 7$	2. Corresponding Angles theorem
3. $\angle 7$ and $\angle 5$ form a linear pair	3. Definition of Linear Pair
4. $\angle 7$ and $\angle 5$ are supplementary	4. Linear Pair Postulate

Consecutive Interior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 3$ and $\angle 5$ are supplementary



Proof:

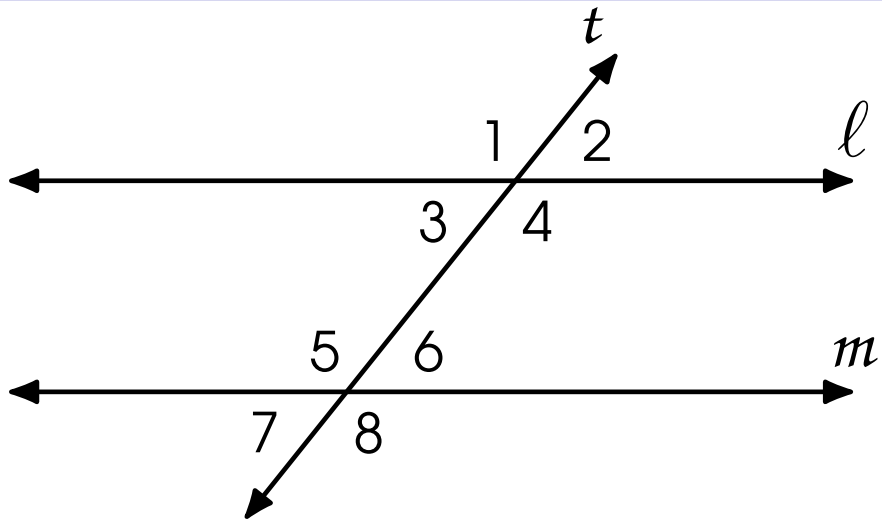
Statements	Reasons
1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 3 \cong \angle 7$	2. Corresponding Angles theorem
3. $\angle 7$ and $\angle 5$ form a linear pair	3. Definition of Linear Pair
4. $\angle 7$ and $\angle 5$ are supplementary	4. Linear Pair Postulate
5. $\angle 3$ and $\angle 5$ are supplementary	5. Substitution Property

Consecutive Exterior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 2$ and $\angle 8$ are supplementary

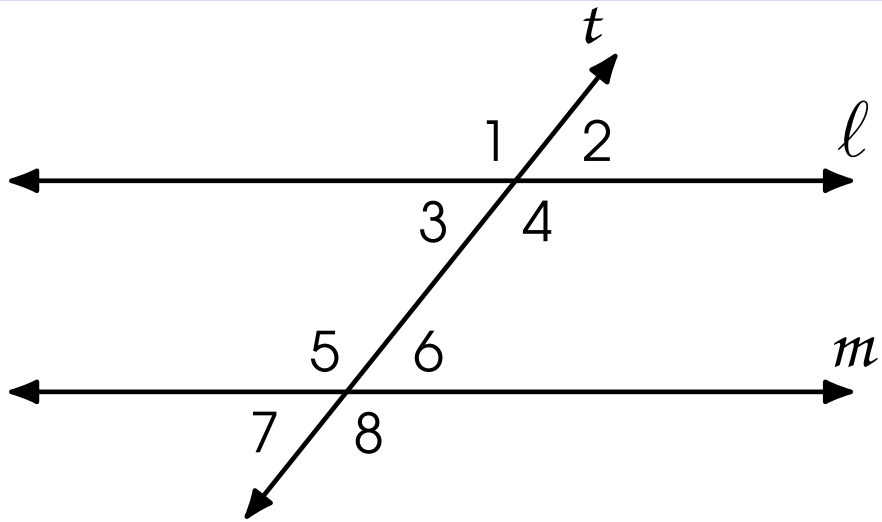


Consecutive Exterior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 2$ and $\angle 8$ are supplementary



Proof:

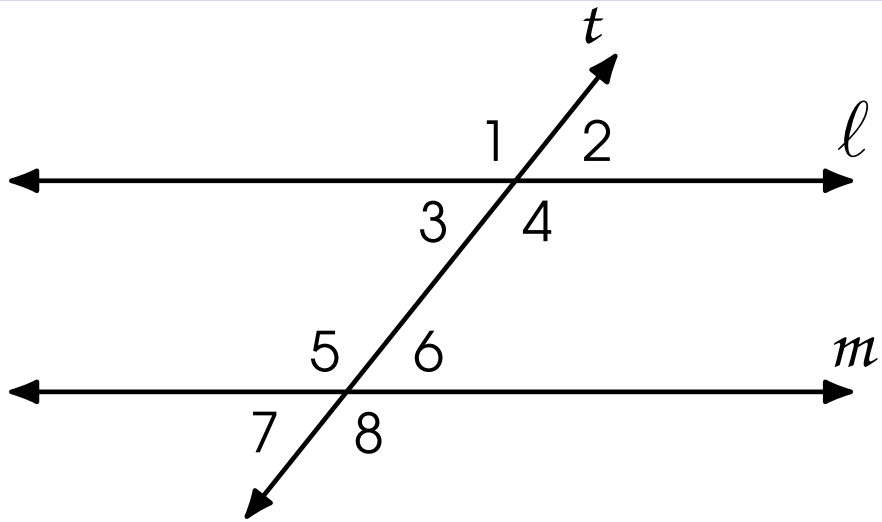
Statements	Reasons

Consecutive Exterior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 2$ and $\angle 8$ are supplementary



Proof:

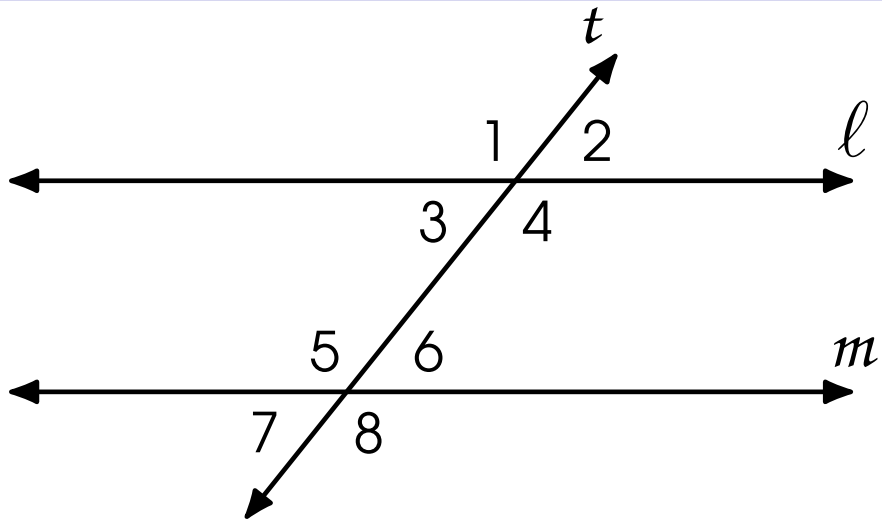
Statements	Reasons
1. t is a transversal, $\ell \parallel m$	1. Given

Consecutive Exterior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 2$ and $\angle 8$ are supplementary



Proof:

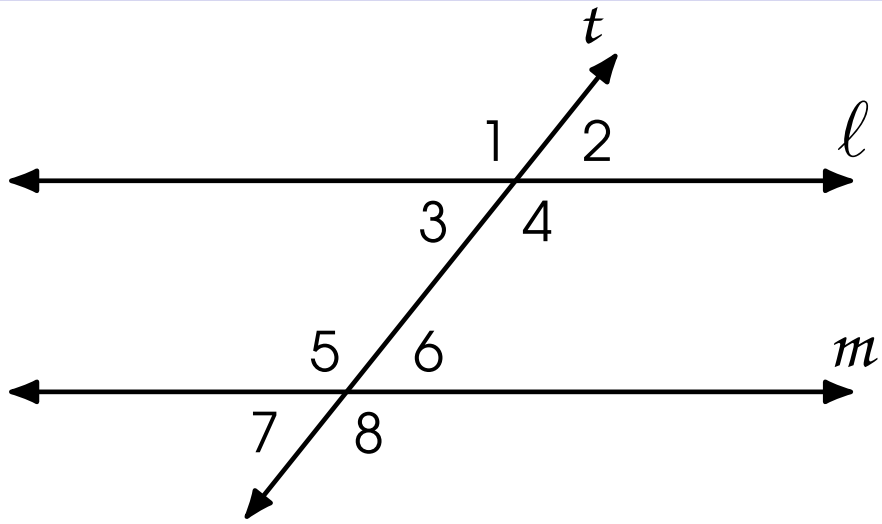
Statements	Reasons
1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 2 \cong \angle 6$	2. Corresponding Angles theorem

Consecutive Exterior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 2$ and $\angle 8$ are supplementary



Proof:

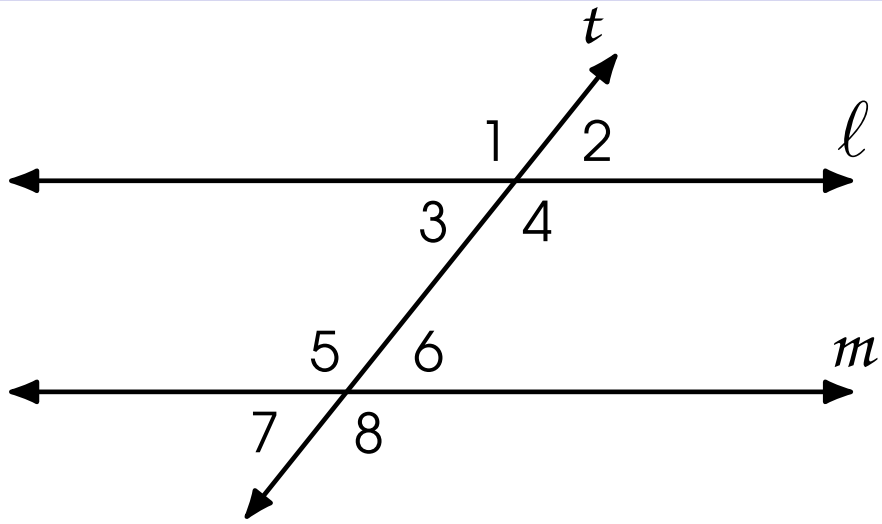
Statements	Reasons
1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 2 \cong \angle 6$	2. Corresponding Angles theorem
3. $\angle 6$ and $\angle 8$ form a linear pair	3. Definition of Linear Pair

Consecutive Exterior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 2$ and $\angle 8$ are supplementary



Proof:

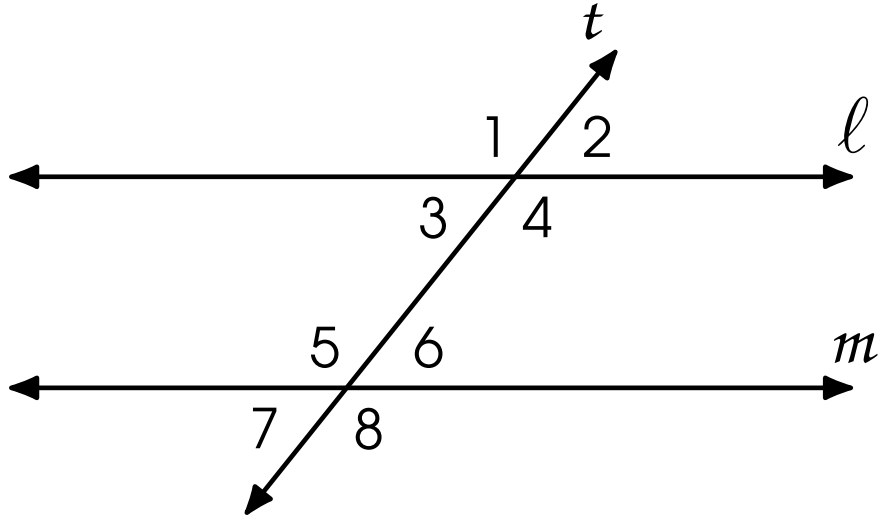
Statements	Reasons
1. t is a transversal, $\ell \parallel m$	1. Given
2. $\angle 2 \cong \angle 6$	2. Corresponding Angles theorem
3. $\angle 6$ and $\angle 8$ form a linear pair	3. Definition of Linear Pair
4. $\angle 6$ and $\angle 8$ are supplementary	4. Linear Pair Postulate

Consecutive Exterior Angles Thm

Given: t is a transversal

$\ell \parallel m$

Prove: $\angle 2$ and $\angle 8$ are supplementary



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5. $\angle 2$ and $\angle 8$ are supplementary	5. Substitution Property

Thank you for attending the virtual class.