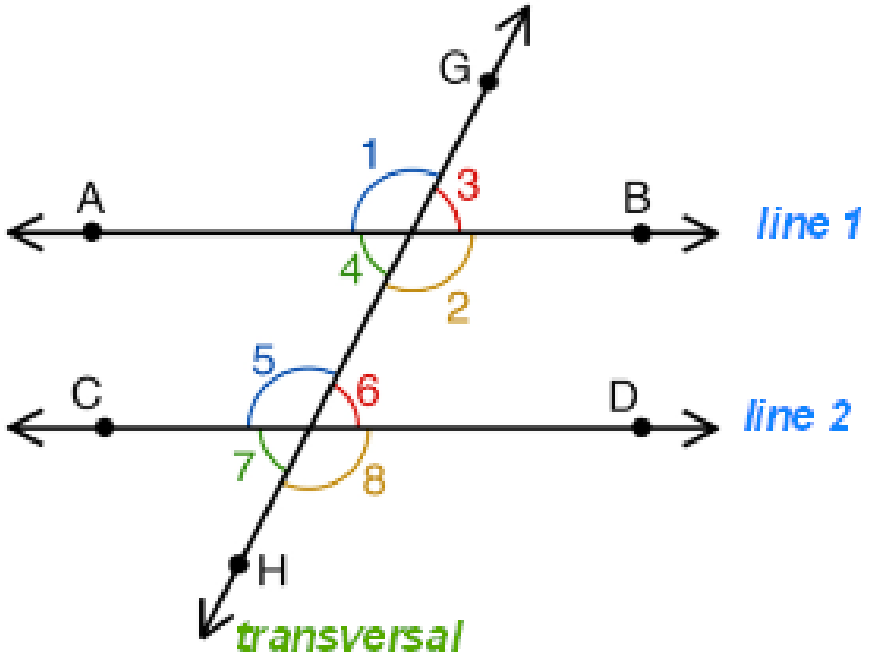
Section 5.2

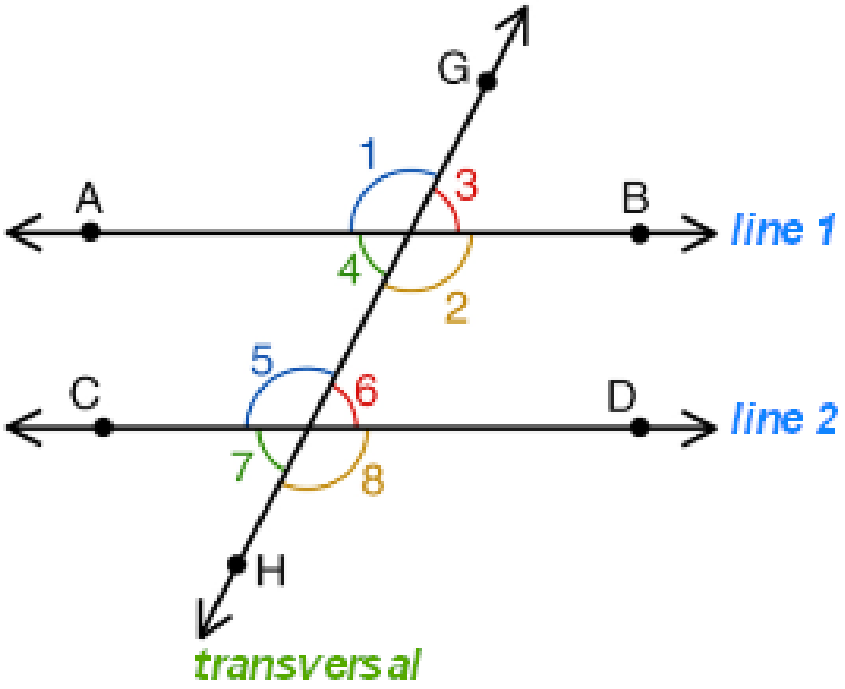
Quadrilaterals

Lesson 5:

Parallel Lines and Transversals

When parallel lines are intersected by a third line (called a *transversal*), 8 angles are created at the points of intersection:

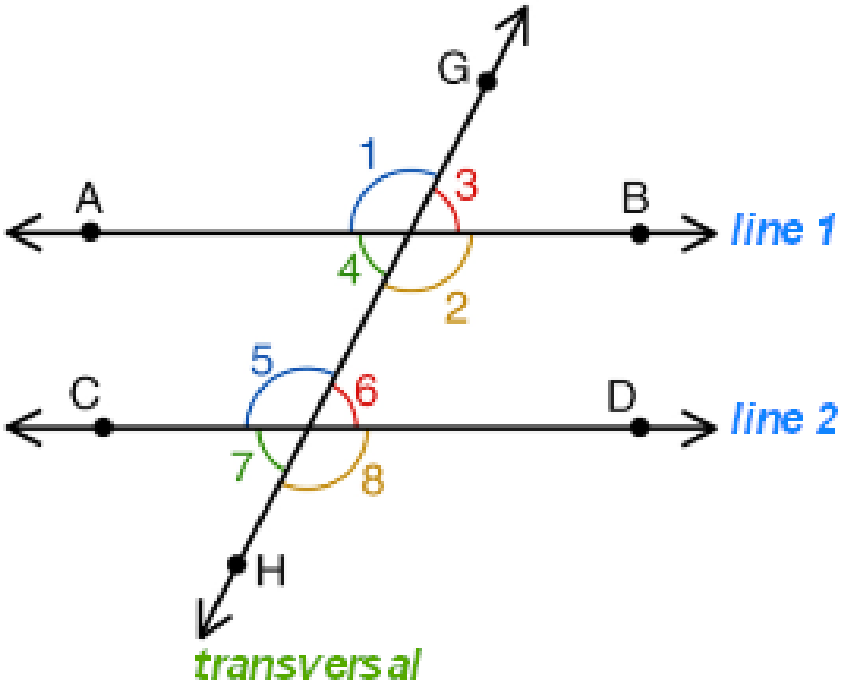




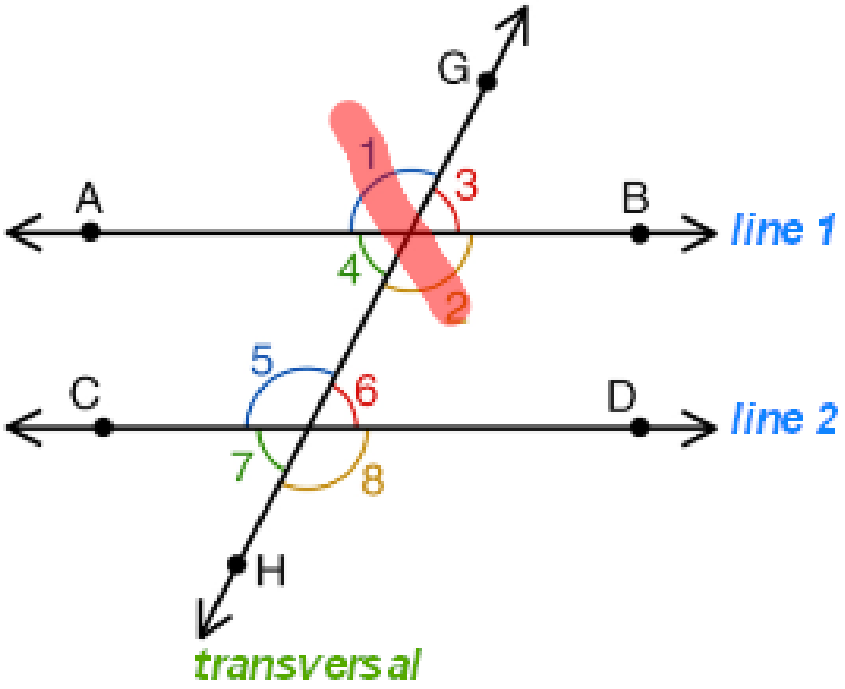
Many of the pairs of angles in this diagram have mathematical relationships.

Some pairs are **congruent** (have the same measure).

Some pairs are **supplementary** (add up to 180°)

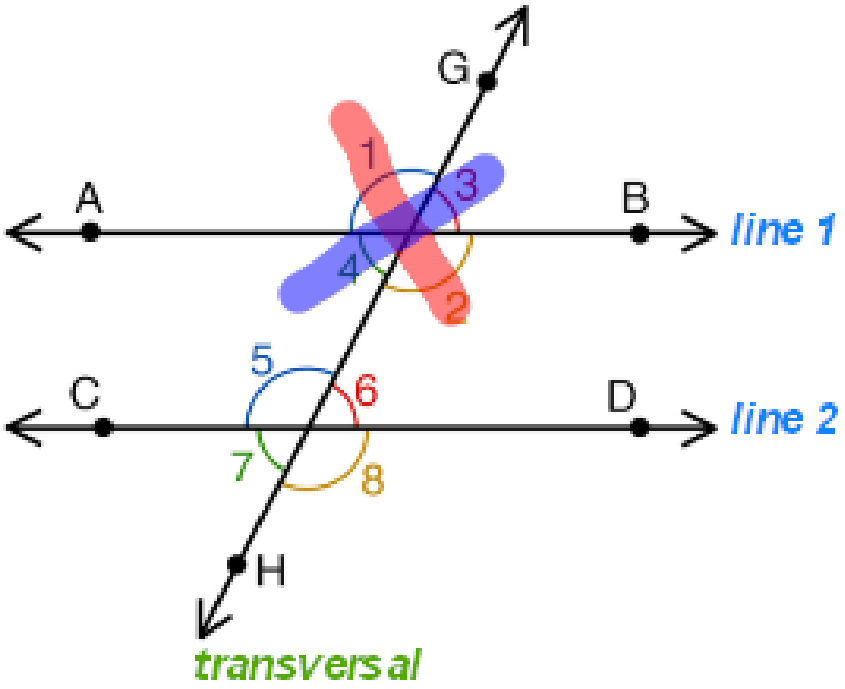


Vertically opposite angles are congruent (equal):



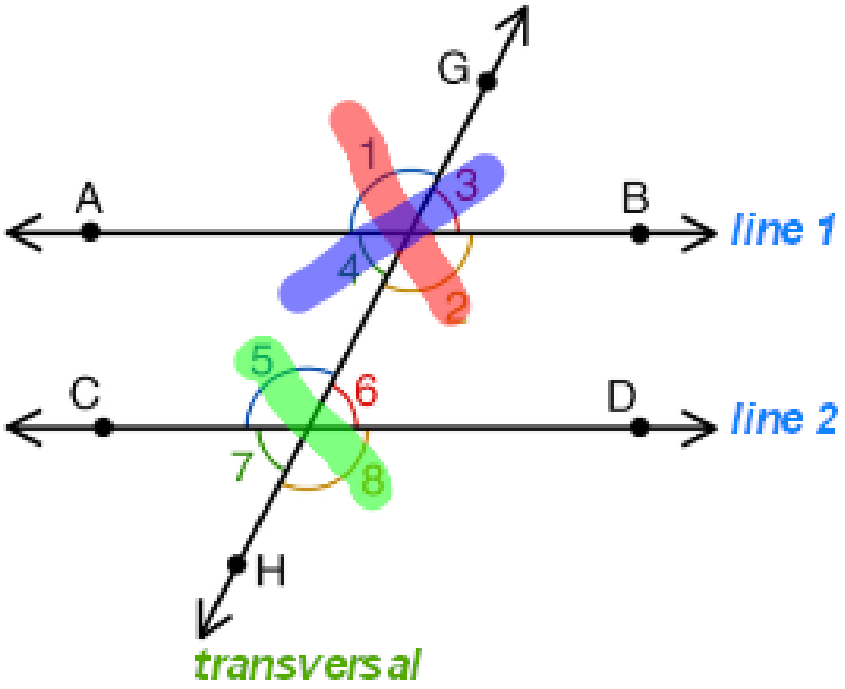
Vertically opposite angles are congruent (equal):

angle 1 = angle 2



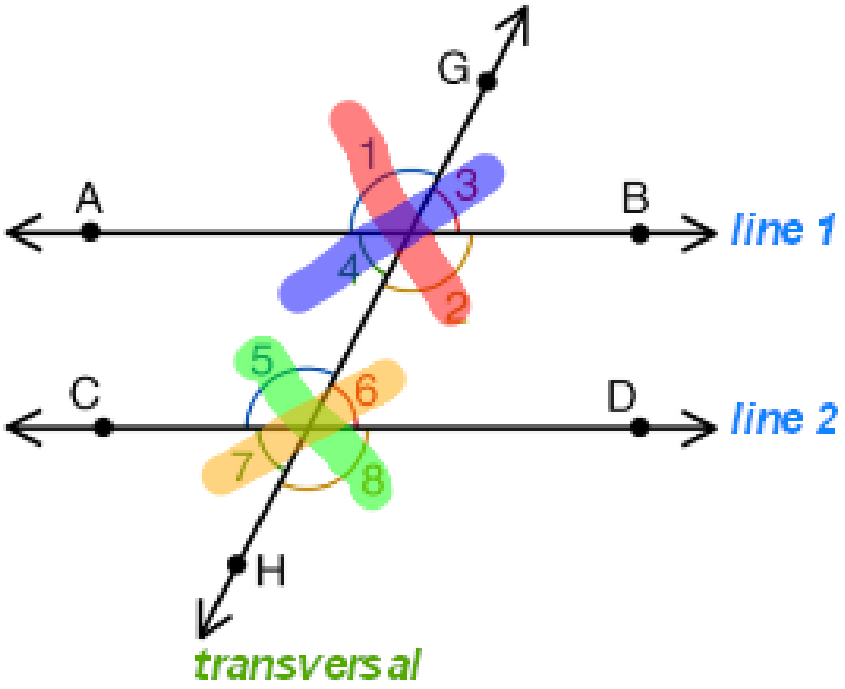
Vertically opposite angles are congruent (equal):

angle 1 = angle 2
angle 3 = angle 4



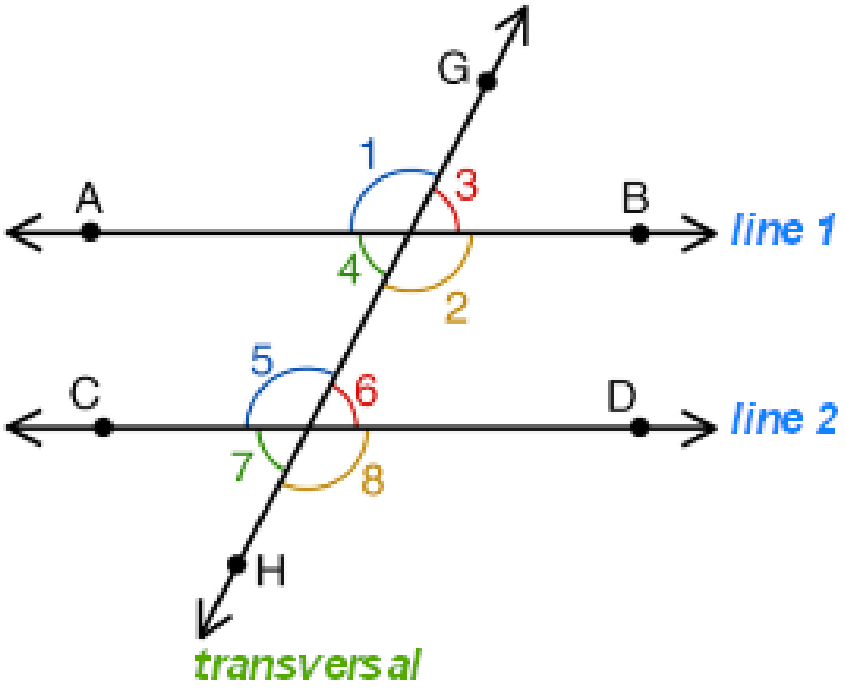
Vertically opposite angles are congruent (equal):

angle 1 = angle 2
angle 3 = angle 4
angle 5 = angle 8

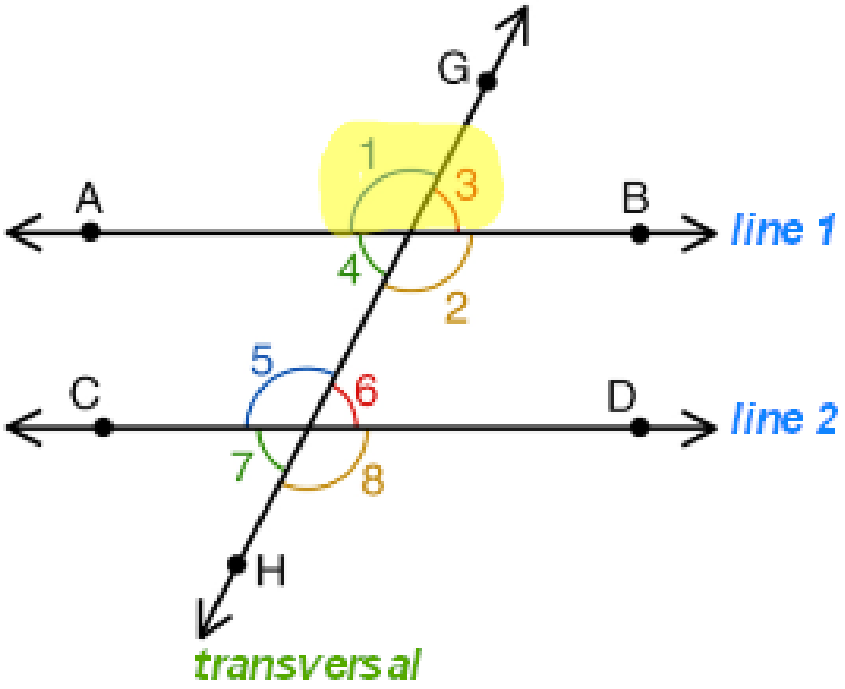


Vertically opposite angles are congruent (equal):

angle 1 = angle 2
angle 3 = angle 4
angle 5 = angle 8
angle 6 = angle 7

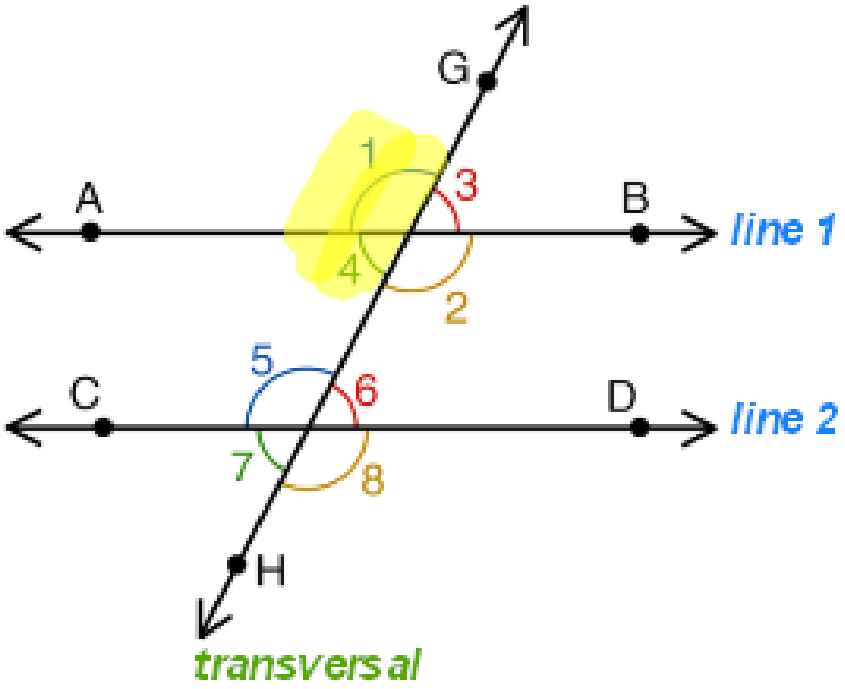


Angles that lie on the same line are supplementary (add to 180°):



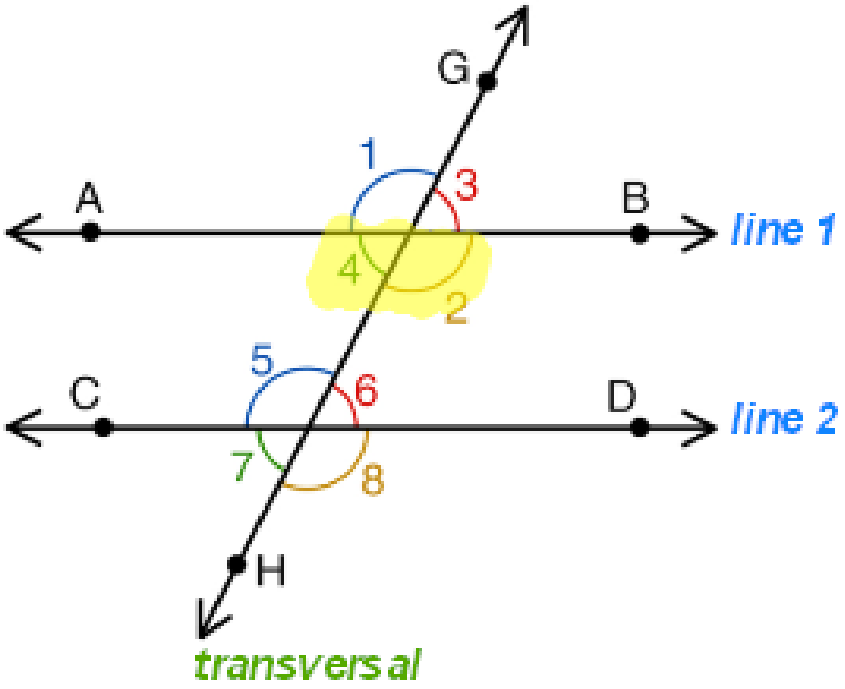
Angles that lie on the same line are supplementary (add to 180°):

angle 1 + angle 3 = 180°



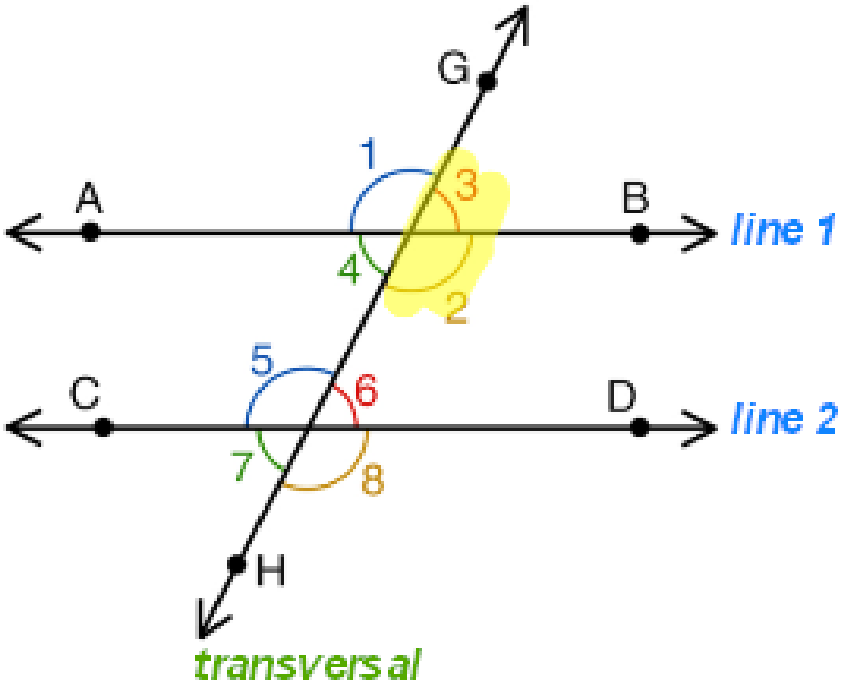
Angles that lie on the same line are supplementary (add to 180°):

angle 1 + angle 3 = 180°
angle 1 + angle 4 = 180°



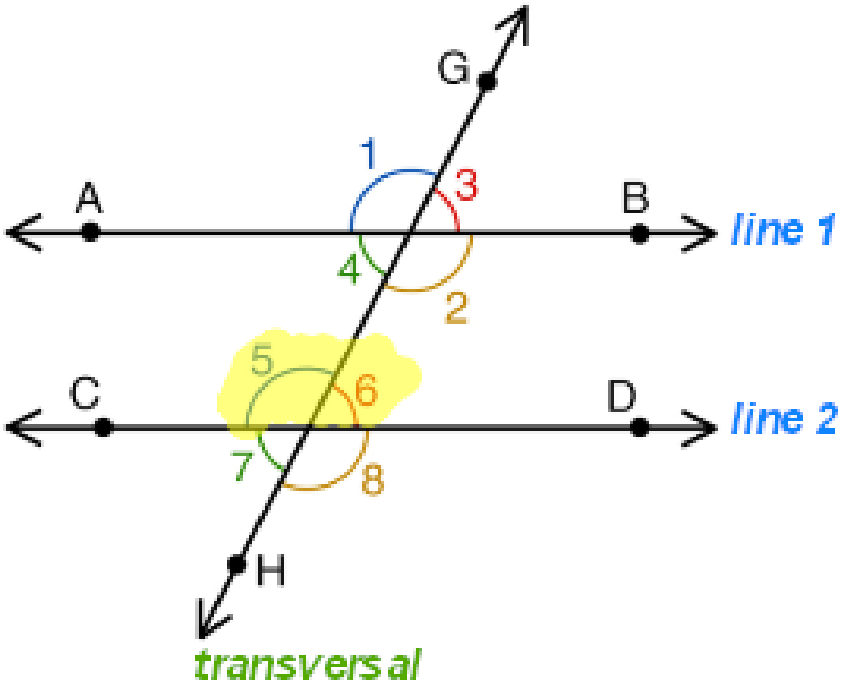
Angles that lie on the same line are supplementary (add to 180°):

angle 1 + angle 3 = 180°
angle 1 + angle 4 = 180°
angle 2 + angle 4 = 180°



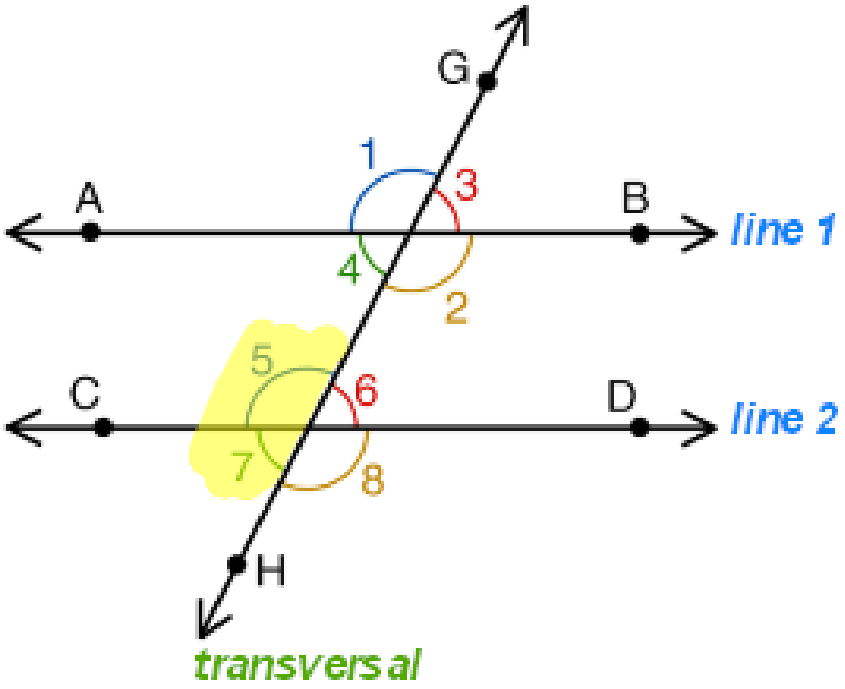
Angles that lie on the same line are supplementary (add to 180°):

angle 1 + angle 3 = 180°
angle 1 + angle 4 = 180°
angle 2 + angle 4 = 180°
angle 2 + angle 3 = 180°



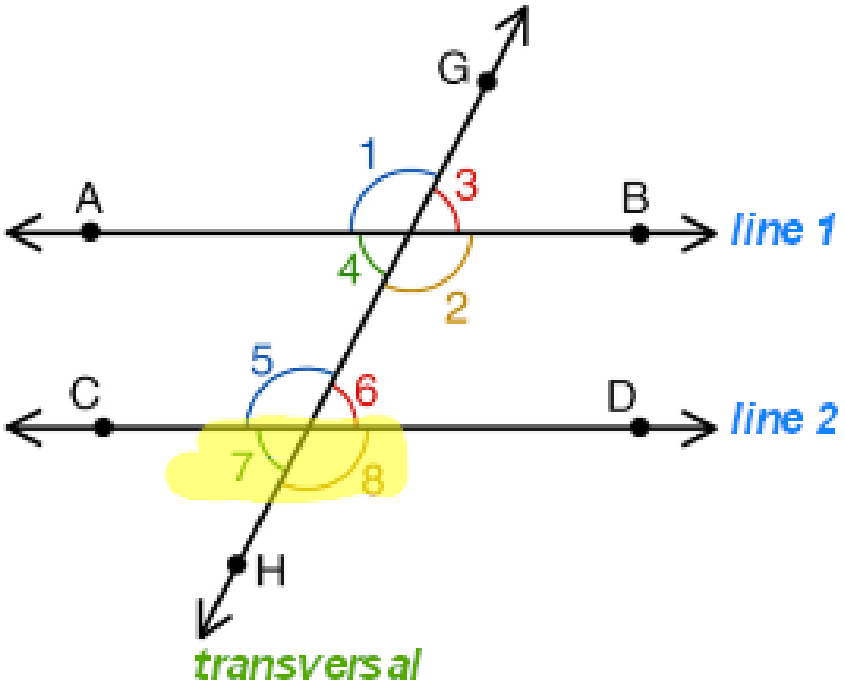
Angles that lie on the same line are supplementary (add to 180°):

angle 1 + angle 3 = 180°
angle 1 + angle 4 = 180°
angle 2 + angle 4 = 180°
angle 2 + angle 3 = 180°
angle 5 + angle 6 = 180°



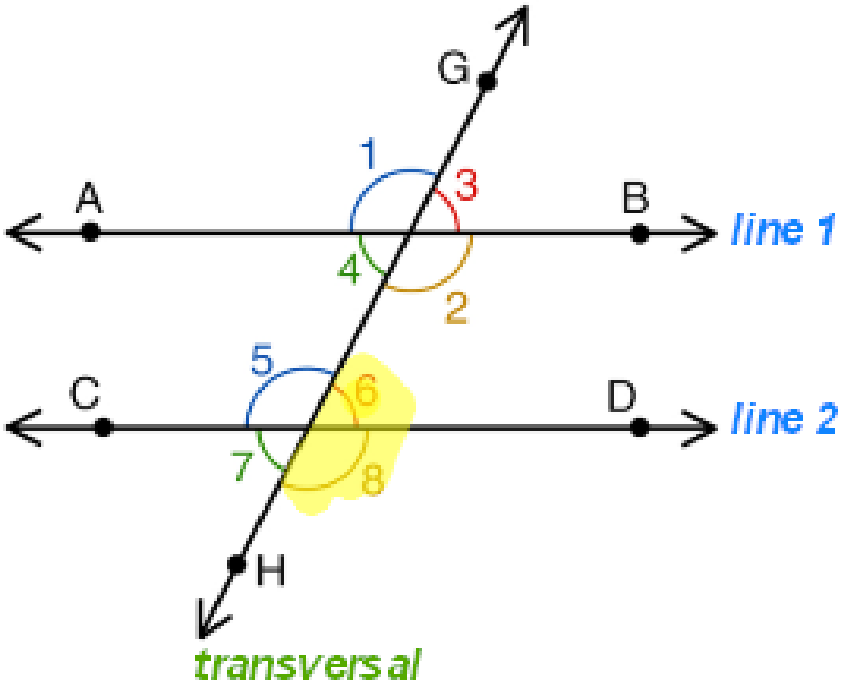
Angles that lie on the same line are supplementary (add to 180°):

angle 1 + angle 3 = 180o
angle 1 + angle 4 = 180°
angle 2 + angle 4 = 180°
angle 2 + angle 3 = 180°
angle 5 + angle 6 = 180°
angle 5 + angle 7 = 180°



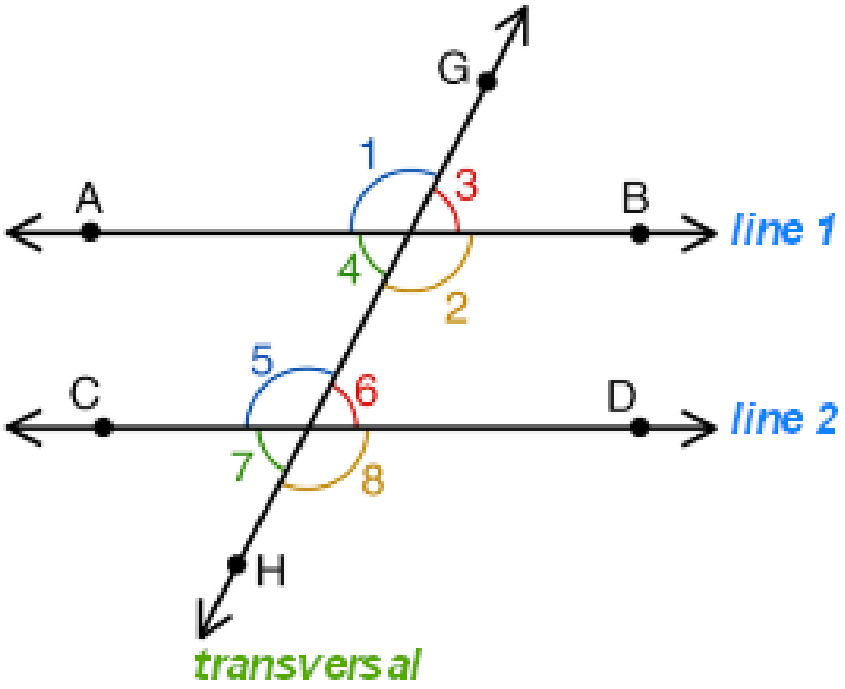
Angles that lie on the same line are supplementary (add to 180°):

angle 1 + angle 3 = 180°
angle 1 + angle 4 = 180°
angle 2 + angle 4 = 180°
angle 2 + angle 3 = 180°
angle 5 + angle 6 = 180°
angle 5 + angle 7 = 180°
angle 7 + angle 8 = 180°

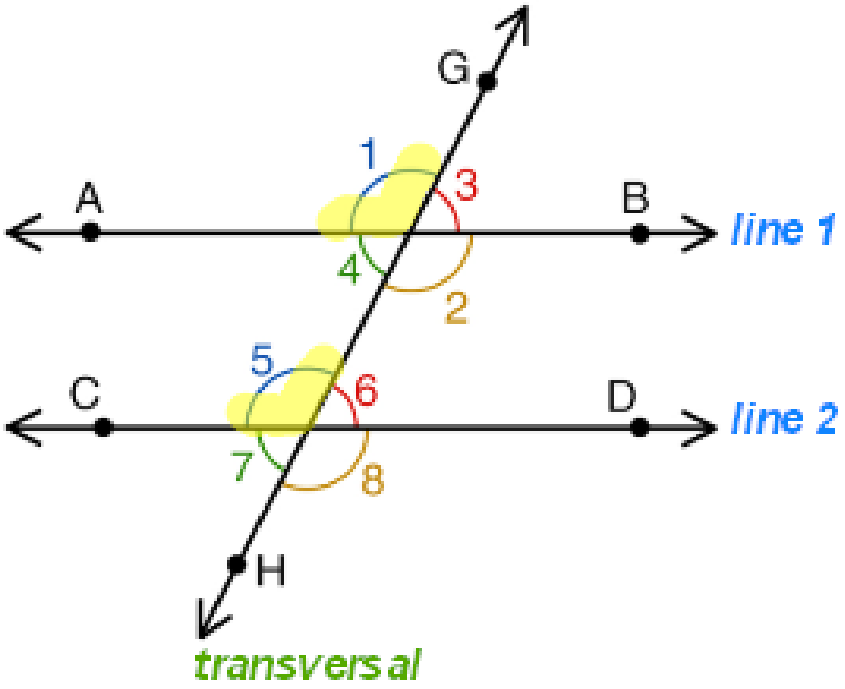


Angles that lie on the same line are supplementary (add to 180°):

angle 1 + angle 3 = 180°
angle 1 + angle 4 = 180°
angle 2 + angle 4 = 180°
angle 2 + angle 3 = 180°
angle 5 + angle 6 = 180°
angle 5 + angle 7 = 180°
angle 7 + angle 8 = 180°
angle 6 + angle 8 = 180°

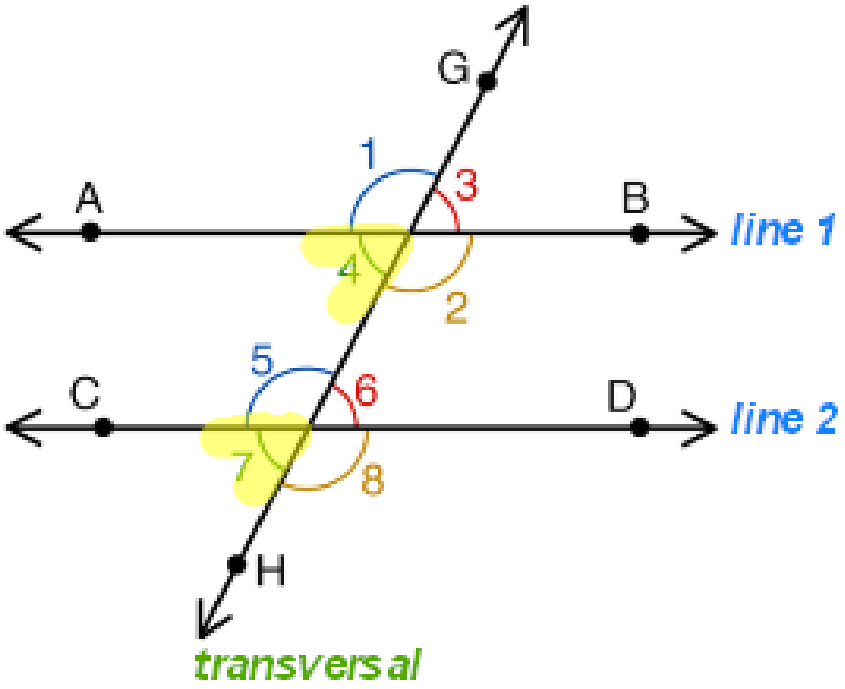


Corresponding angles are found in the same relative position at each intersection point and are congruent (equal):



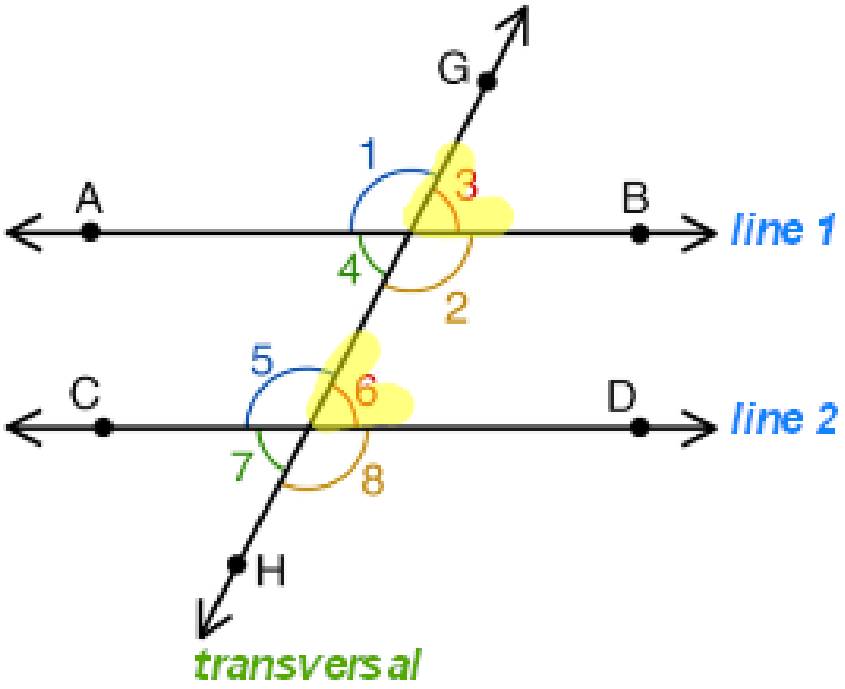
Corresponding angles are found in the same relative position at each intersection point and are congruent (equal):

angle 1 = angle 5



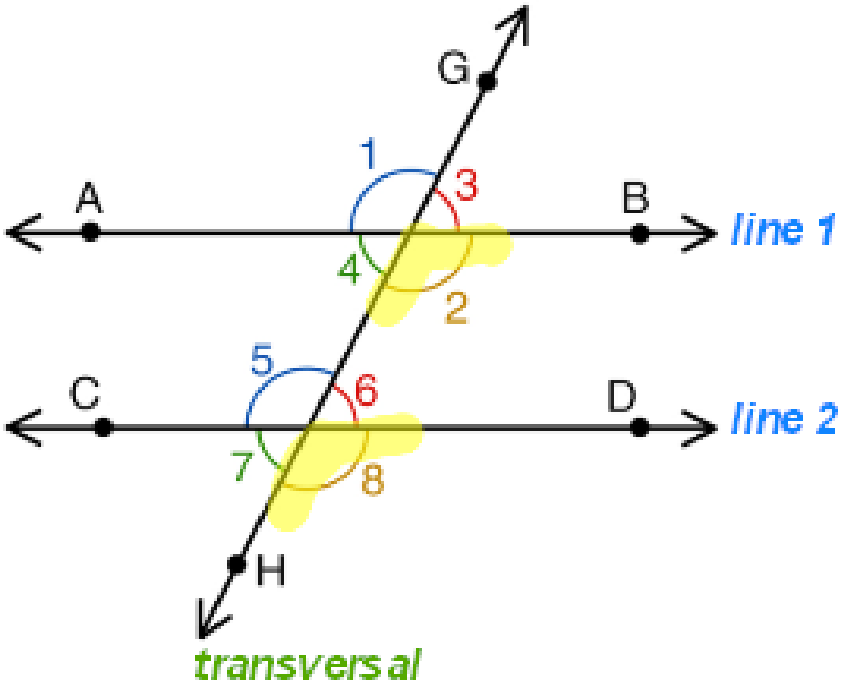
Corresponding angles are found in the same relative position at each intersection point and are congruent (equal):

angle 1 = angle 5
angle 4 = angle 7



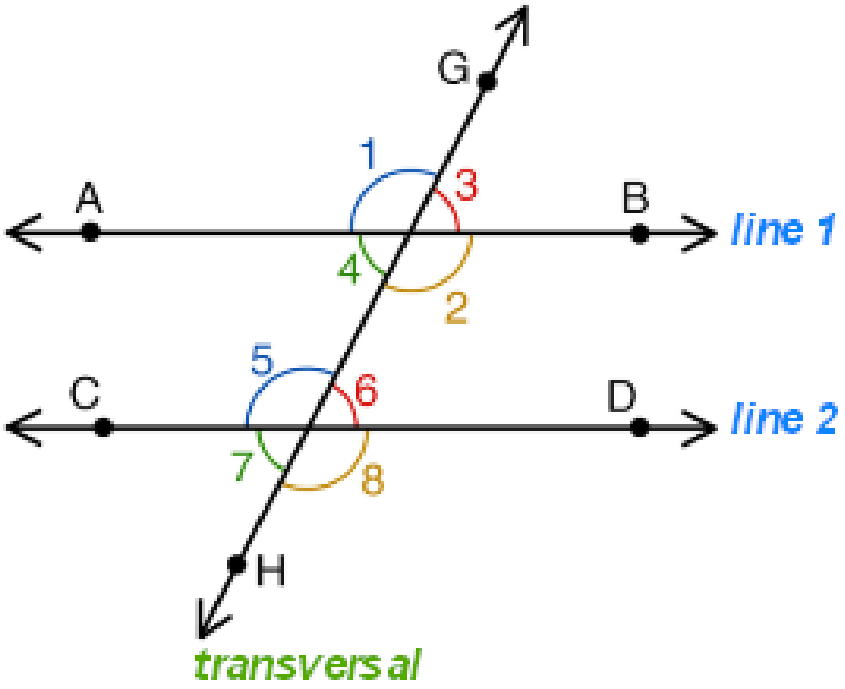
Corresponding angles are found in the same relative position at each intersection point and are congruent (equal):

angle 1 = angle 5
angle 4 = angle 7
angle 3 = angle 6

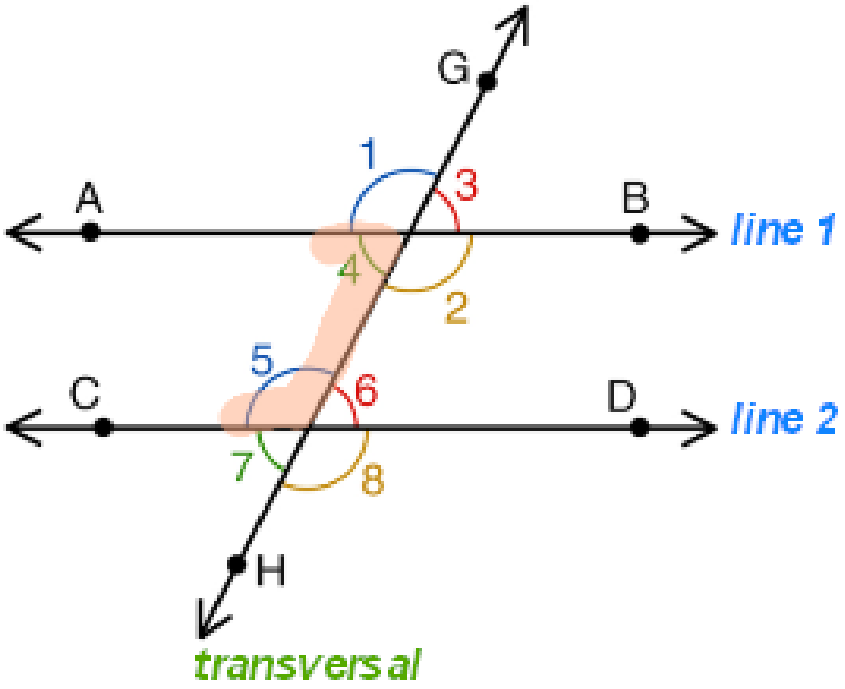


Corresponding angles are found in the same relative position at each intersection point and are congruent (equal):

angle 1 = angle 5
angle 4 = angle 7
angle 3 = angle 6
angle 2 = angle 8

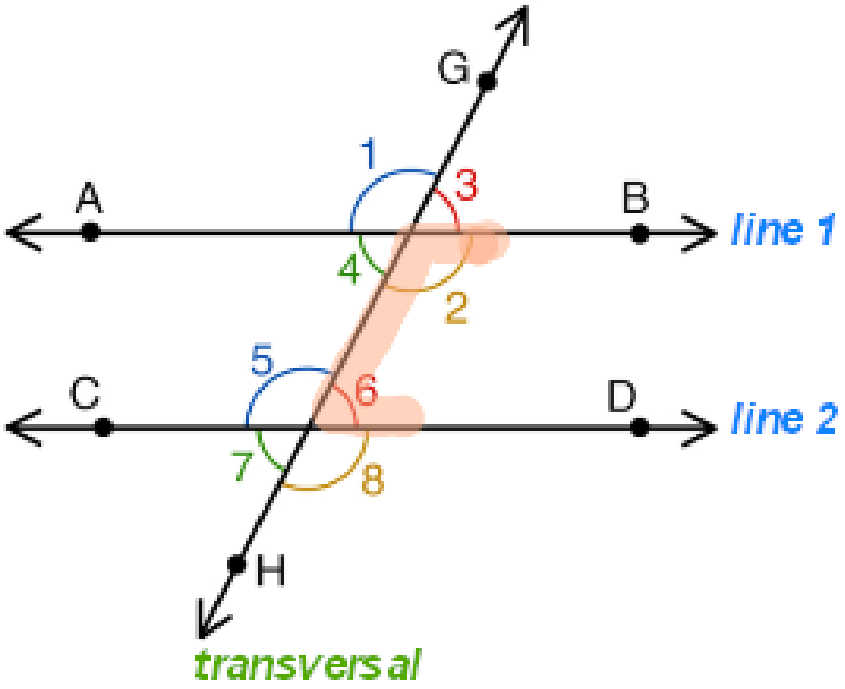


Same-side interior angles are supplementary (add up to 180°):



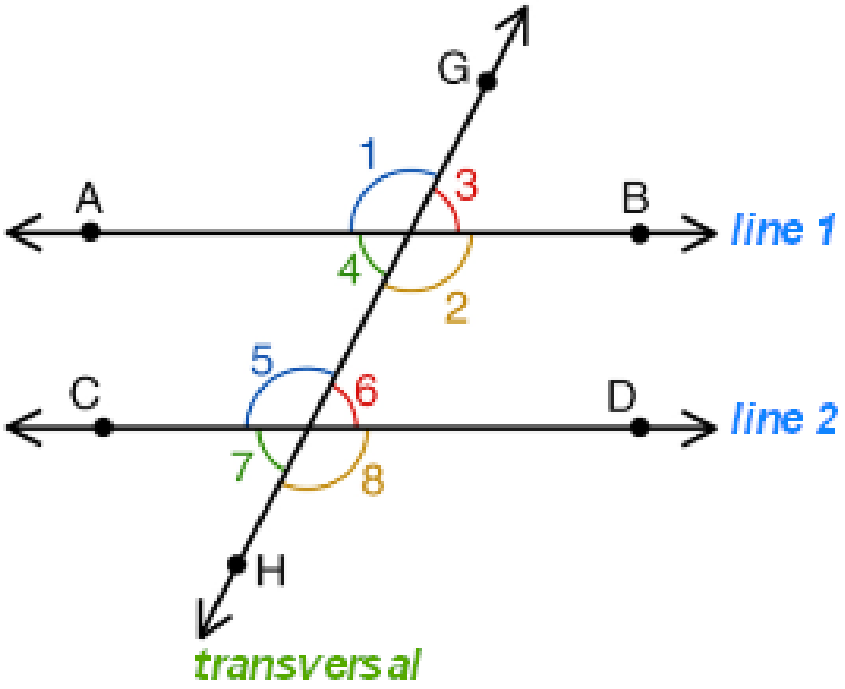
Same-side interior angles are supplementary (add up to 180°):

angle 4 + angle 5 = 180°

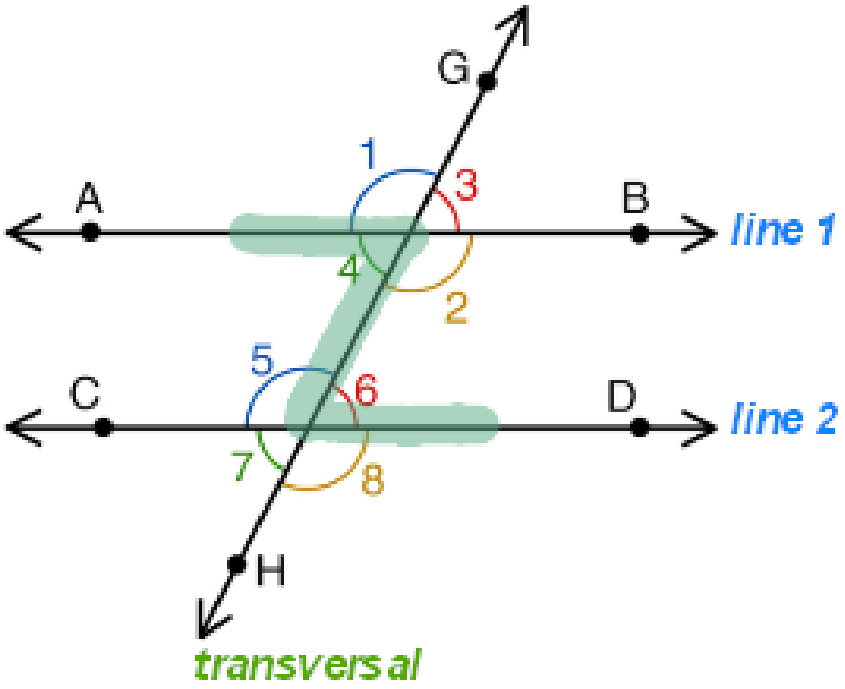


Same-side interior angles are supplementary (add up to 180°):

angle 4 + angle 5 = 180°
angle 2 + angle 6 = 180°

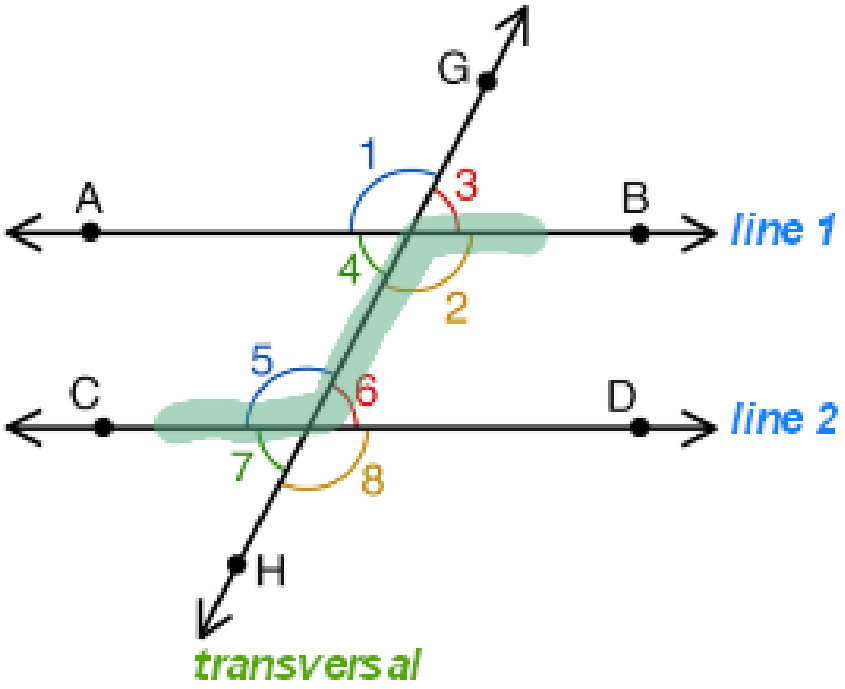


Alternate interior angles are congruent (equal):



Alternate interior angles are congruent (equal):

angle 4 = angle 6



Alternate interior angles are congruent (equal):

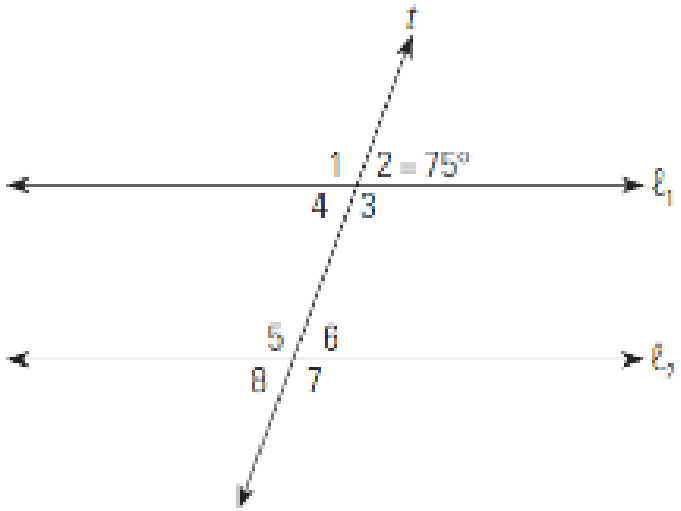
angle 4 = angle 6
angle 2 = angle 5

Conclusion:

When parallel lines are intersected by a **transversal**, several angles are formed. When you know the lines are parallel and you know one of the angles, you can determine the rest of the angle measures because they are related to each other.

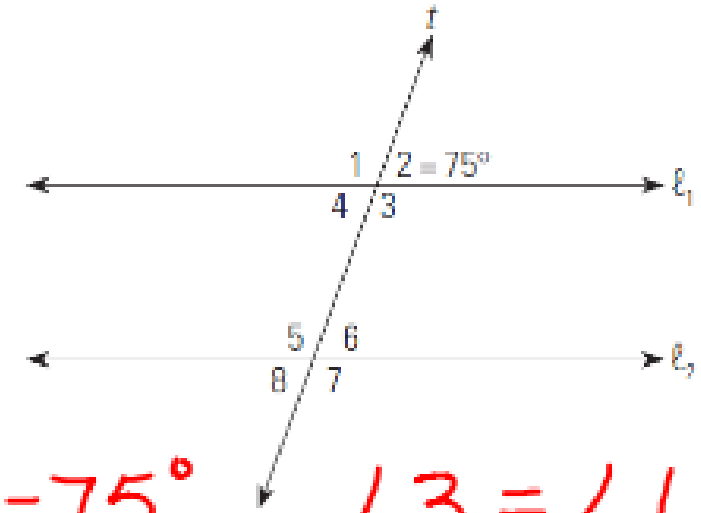
Example 1

In the following diagram, ℓ_1 is parallel to ℓ_2. What are the measures of the indicated angles?



Example 1

In the following diagram, ℓ_1 is parallel to ℓ_2. What are the measures of the indicated angles?



$\angle 1 = 180° - 75°$

$\angle 1 = 105°$

$\angle 5 = \angle 1 = 105°$

$\angle 3 = \angle 1 = 105°$

$\angle 4 = \angle 2 = 75°$

$\angle 6 = \angle 2 = 75°$

$\angle 7 = \angle 3 = 105°$

$\angle 8 = \angle 4 = 75°$

Homework:

Build Your Skills
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3 Additional Worksheets