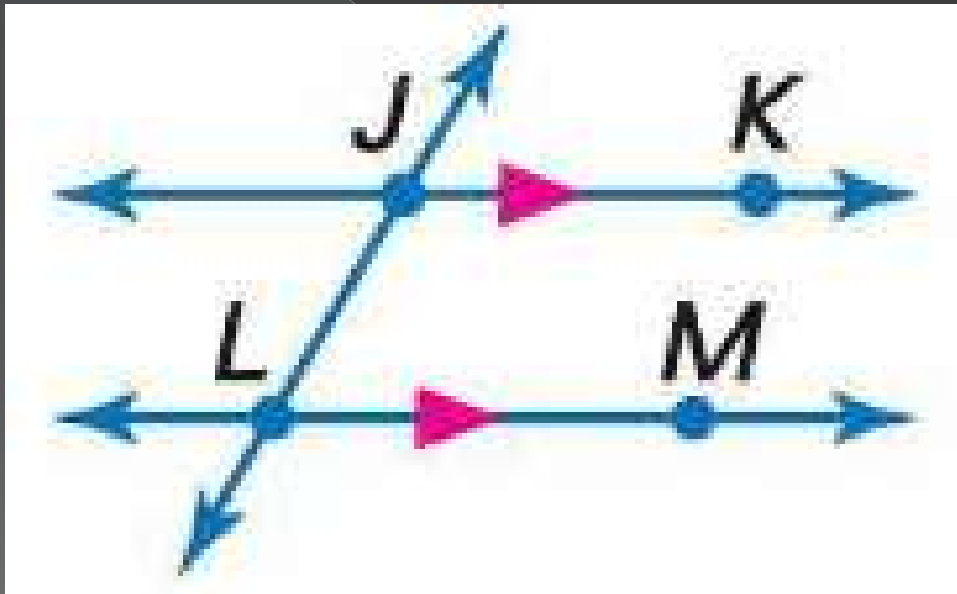# Parallel Lines and Transversals
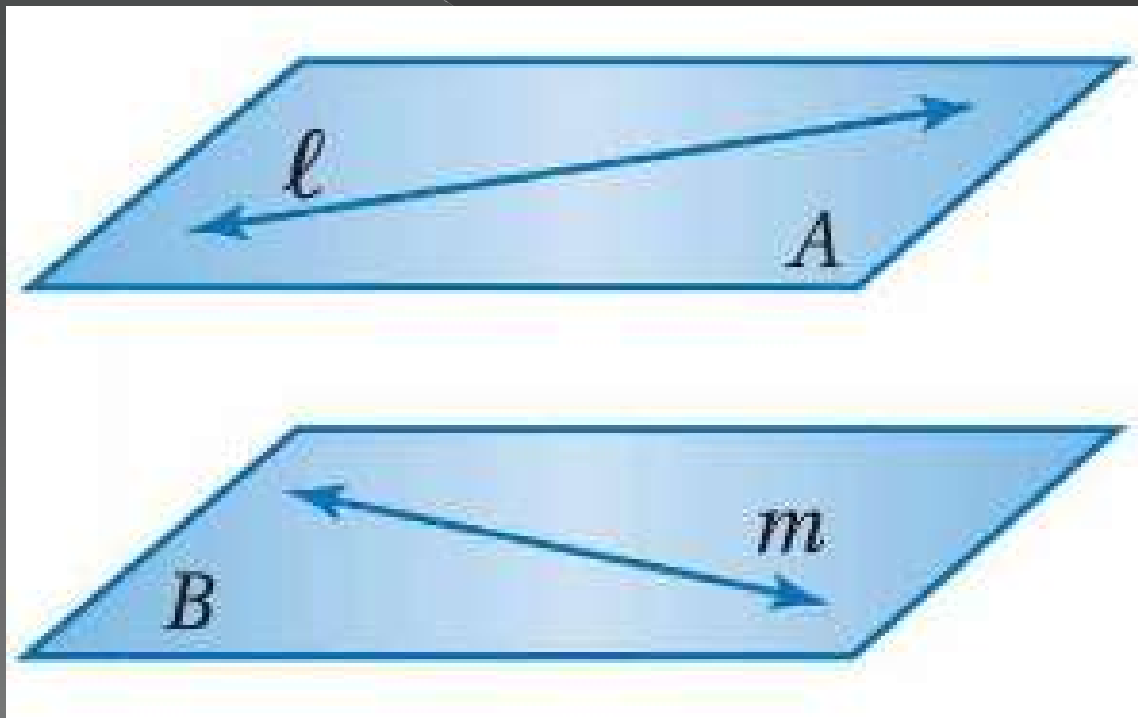
Angles and Parallel Lines

Parallel Lines

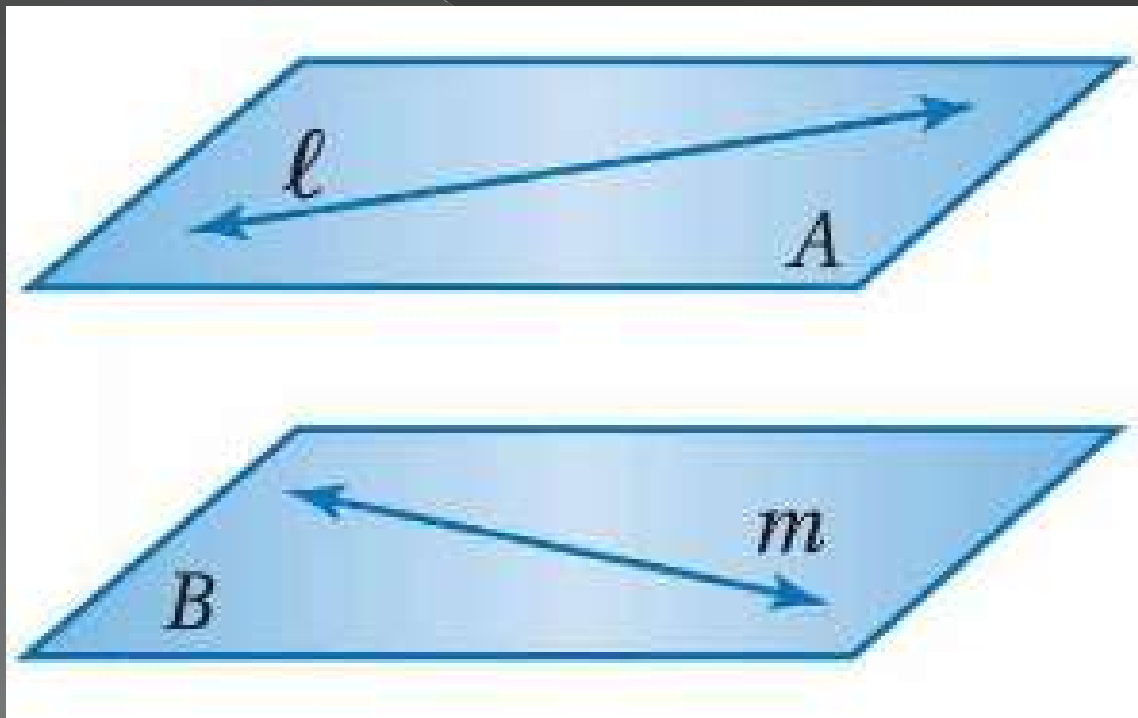- Parallel lines are coplanar lines that do not intersect

Skew Lines

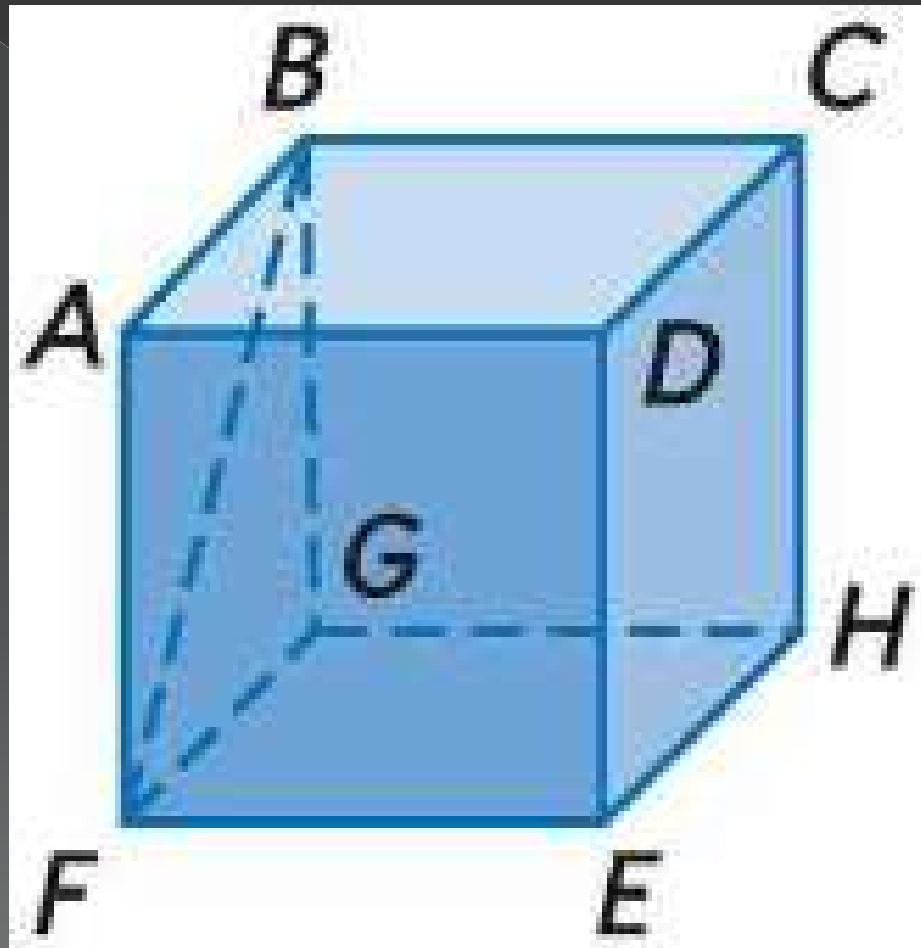- Skew lines are lines that do not intersect and are not coplanar.

Parallel Planes

- Parallel planes are planes that do not intersect.
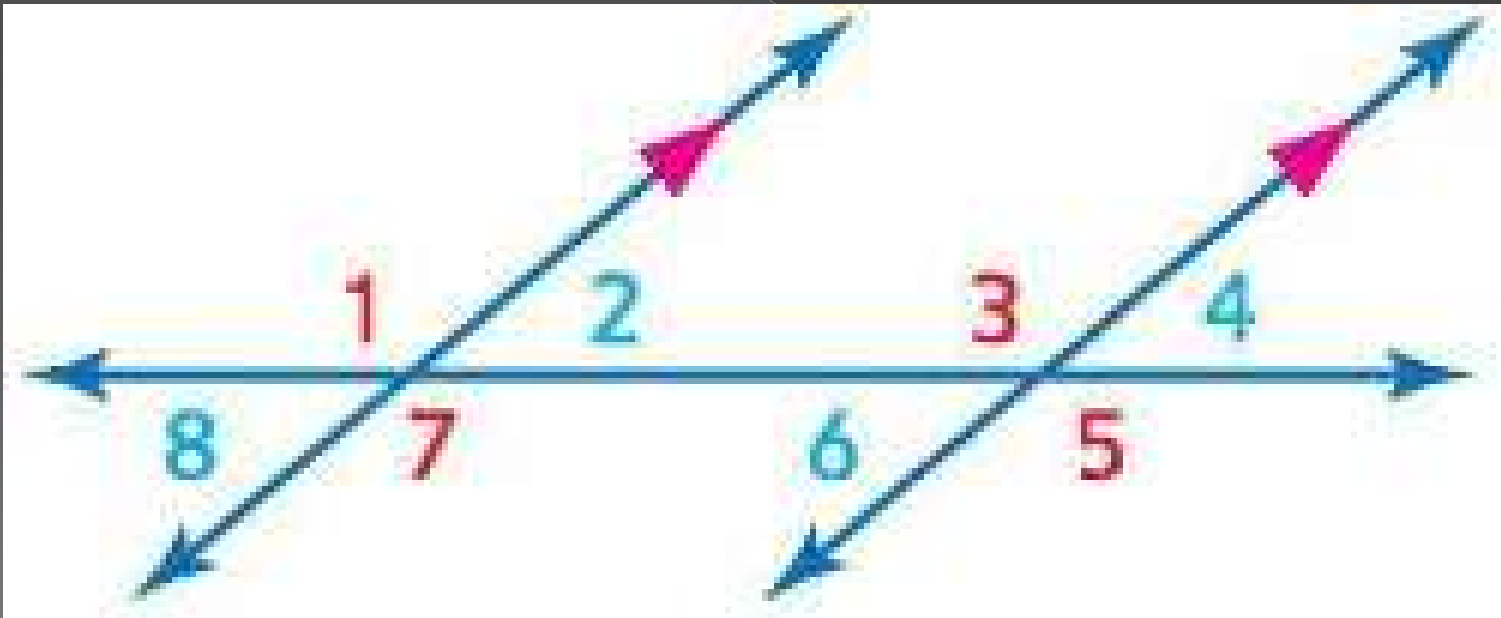
Examples

Transversals

- A transversal is a line that intersects two or more coplanar lines at two different points.

Transversal Angle Pair Relationships

Four **interior angles** lie in the region between lines q and r.	∠3, ∠4, ∠5, ∠6	
Four **exterior angles** lie in the two regions that are not between lines q and r.	∠1, ∠2, ∠7, ∠8	
Consecutive interior angles are interior angles that lie on the same side of transversal t.	∠4 and ∠5, ∠3 and ∠6	exterior
Alternate interior angles are nonadjacent interior angles that lie on opposite sides of transversal t.	∠3 and ∠5, ∠4 and ∠6	interior
Alternate exterior angles are nonadjacent exterior angles that lie on opposite sides of transversal t.	∠1 and ∠7, ∠2 and ∠8	
Corresponding angles lie on the same side of transversal t and on the same side of lines q and r.	∠1 and ∠5, ∠2 and ∠6 ∠3 and ∠7, ∠4 and ∠8	exterior

Corresponding Angles Postulate

- If two parallel lines are cut by a transversal, then each pair of corresponding angles is congruent
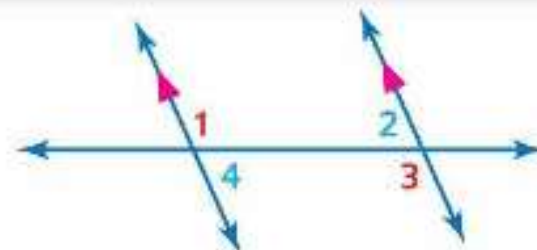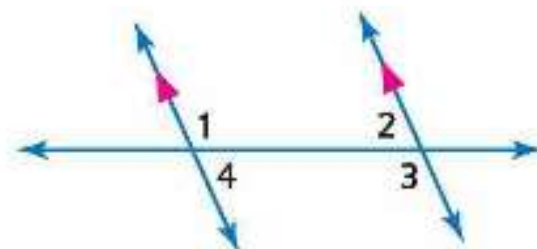
Parallel Lines and Angle Pairs

3.1 Alternate Interior Angles Theorem If two parallel lines are cut by a transversal, then each pair of alternate interior angles is congruent.

**Examples** $\angle 1 \cong \angle 3$ and $\angle 2 \cong \angle 4$

3.2 Consecutive Interior Angles Theorem If two parallel lines are cut by a transversal, then each pair of consecutive interior angles is supplementary.

Examples $\angle 1$ and $\angle 2$ are supplementary.
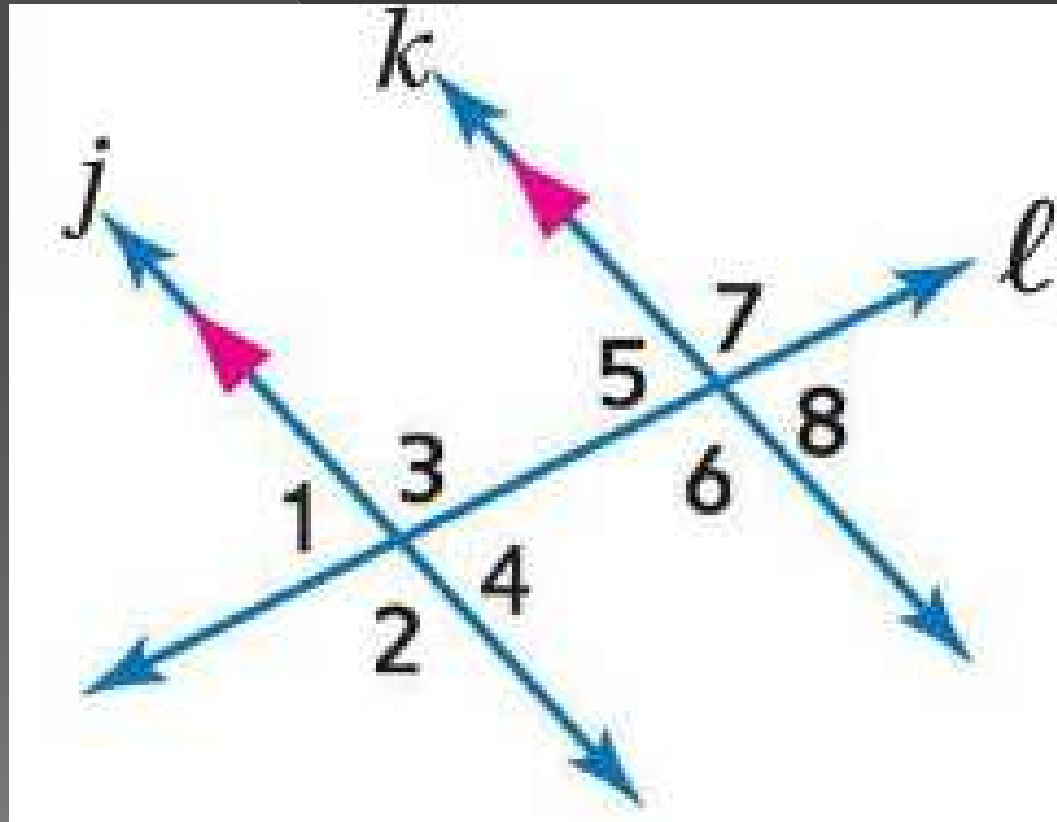$\angle 3$ and $\angle 4$ are supplementary.

3.3 Alternate Exterior Angles Theorem If two parallel lines are cut by a transversal, then each pair of alternate exterior angles is congruent.

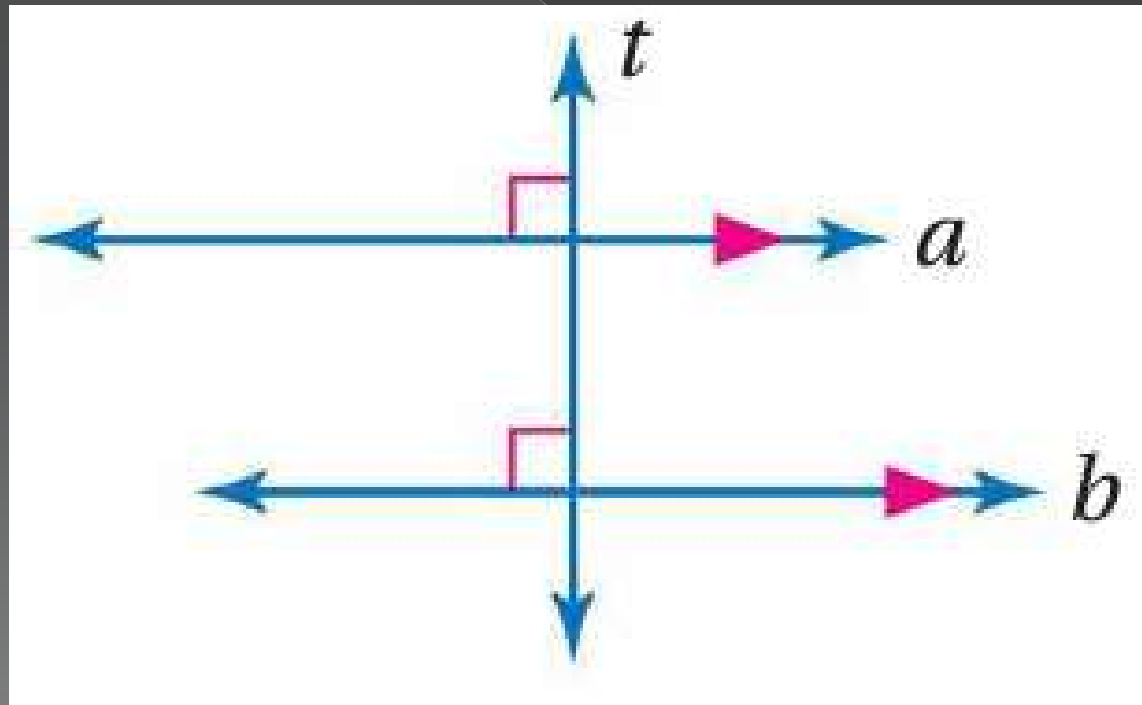**Examples** $\angle 5 \cong \angle 7$ and $\angle 6 \cong \angle 8$
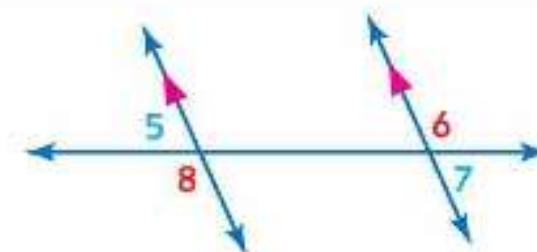
Examples

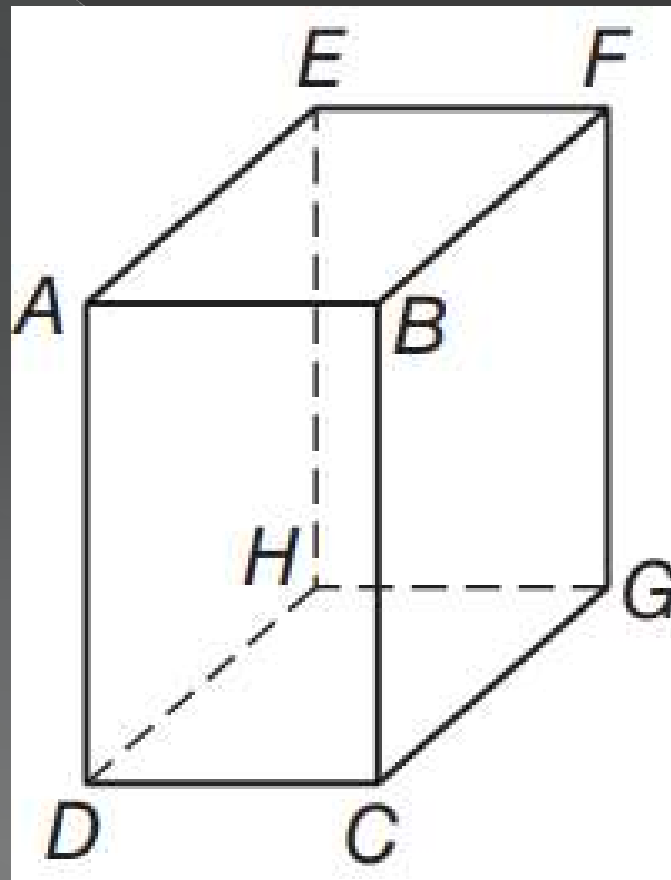- If $m\angle 2 = 4x + 7$ and $m\angle 7 = 5x - 13$, find x

Perpendicular Transversal Theorem

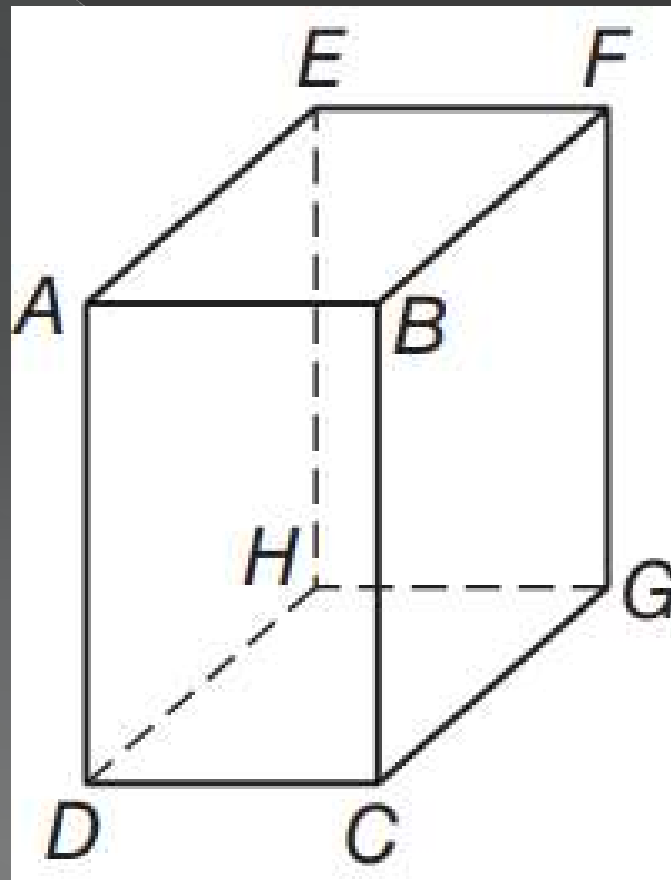- In a plane, if a line is perpendicular to one of two parallel lines, then it is perpendicular to the other.
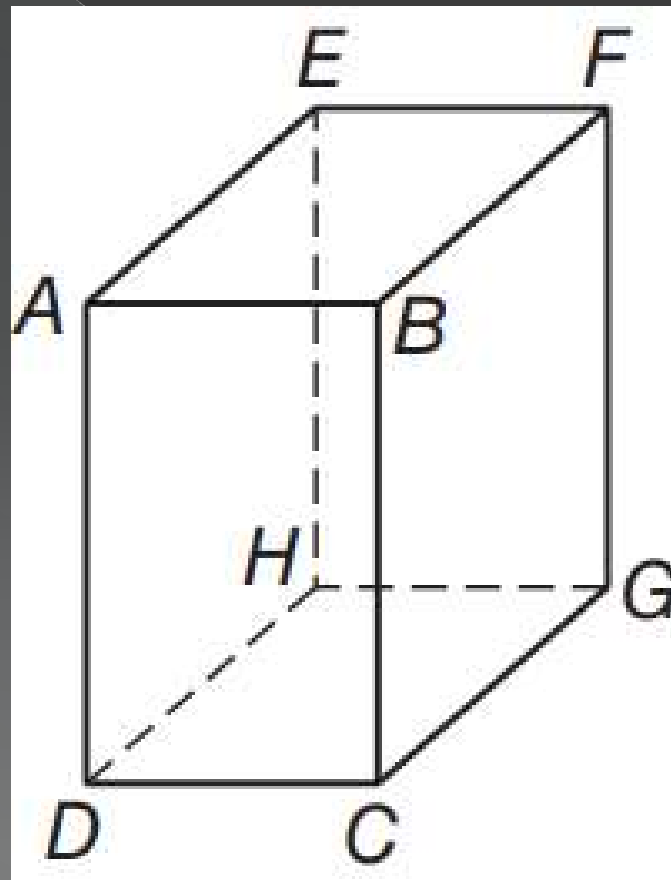
Examples

- Identify all planes parallel to plane *DEH*.

Examples

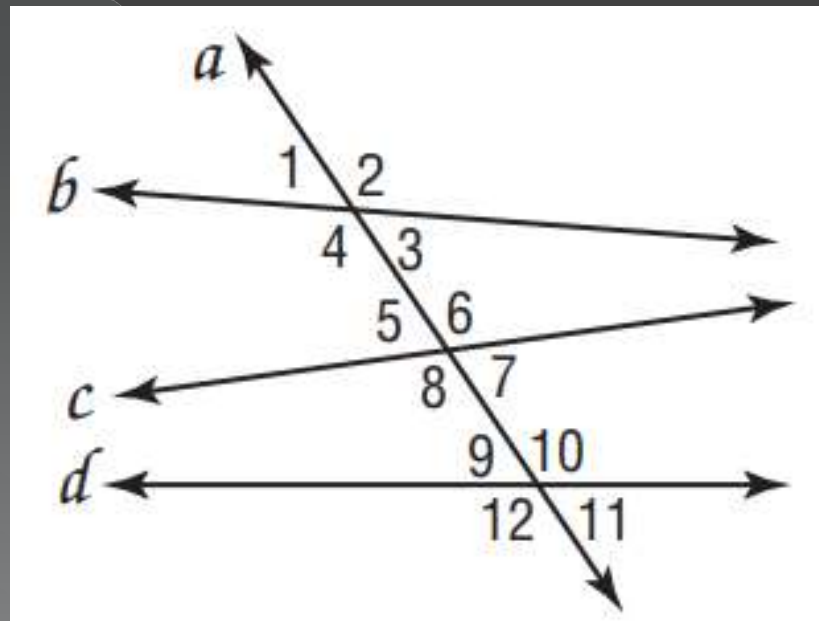- Identify all segments parallel to plane *AB*.

Examples

- Identify all segments that intersect *GH*.

Examples

- Classify each pair of angles as *alternate interior, alternate exterior, corresponding,* or *consecutive interior* angles.

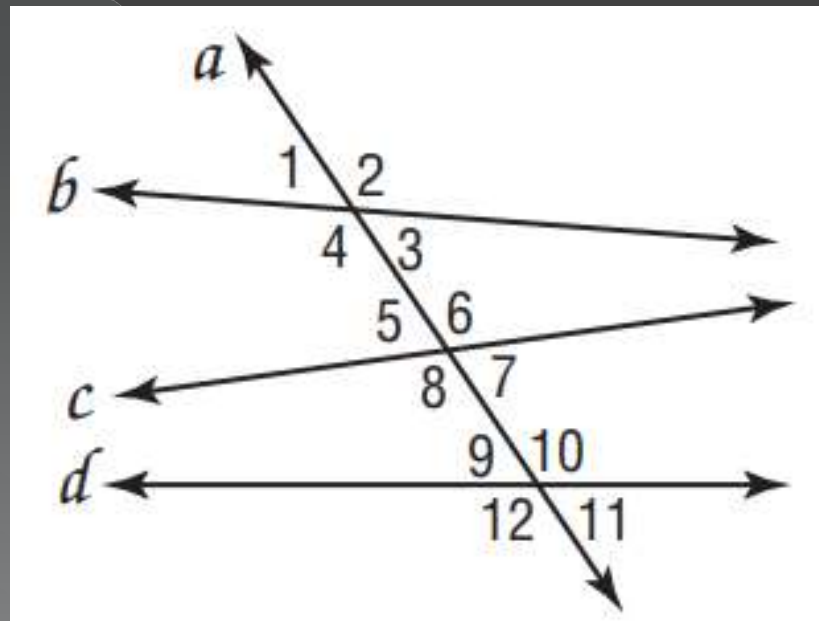- ∠4 and ∠5

Examples

- Classify each pair of angles as *alternate interior, alternate exterior, corresponding,* or *consecutive interior* angles.
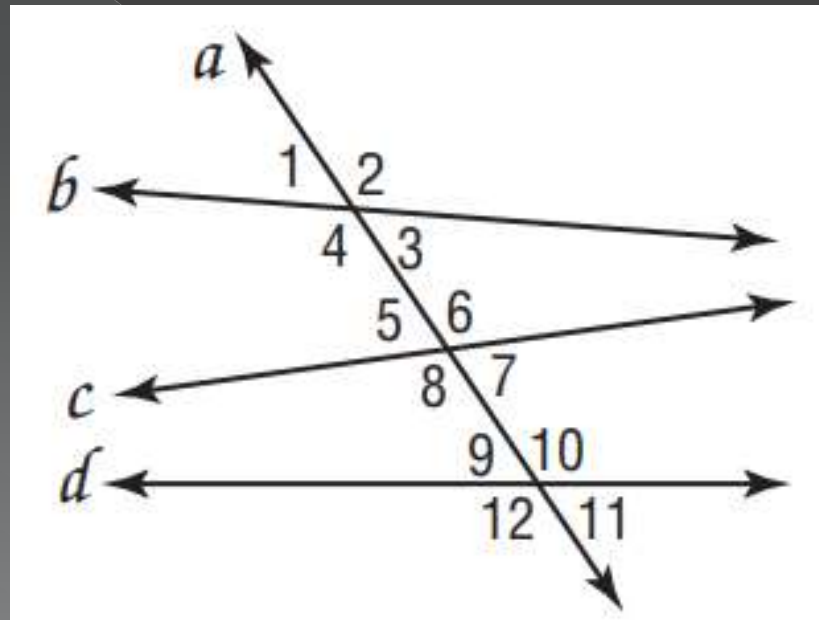
- ∠3 and ∠6

Examples

- Classify each pair of angles as *alternate interior, alternate exterior, corresponding,* or *consecutive interior* angles.
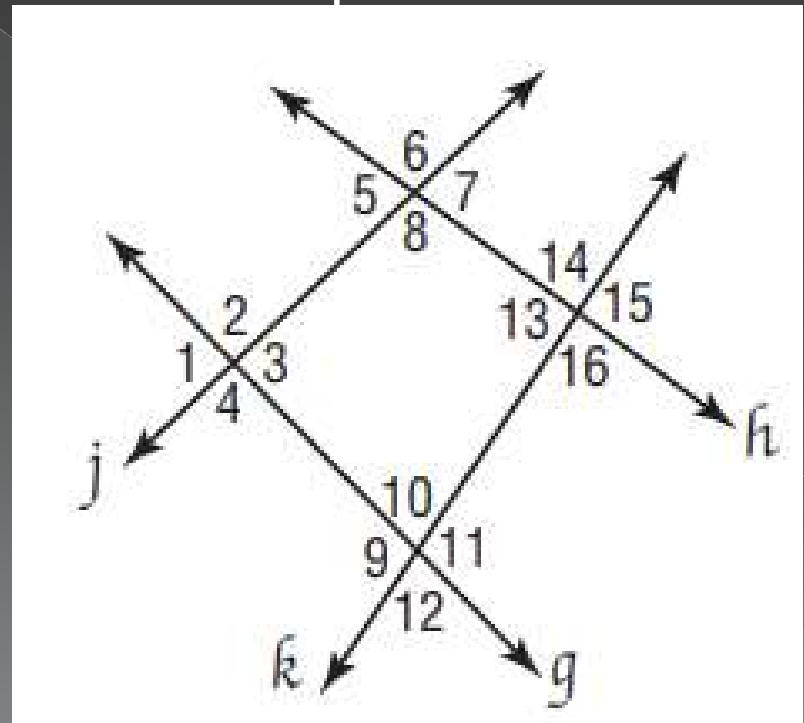
- ∠7 and ∠11

Examples

- Indentify the transversal connecting each pair of angles. Then classify the relationship between each pair of angles.

- ∠2 and ∠12
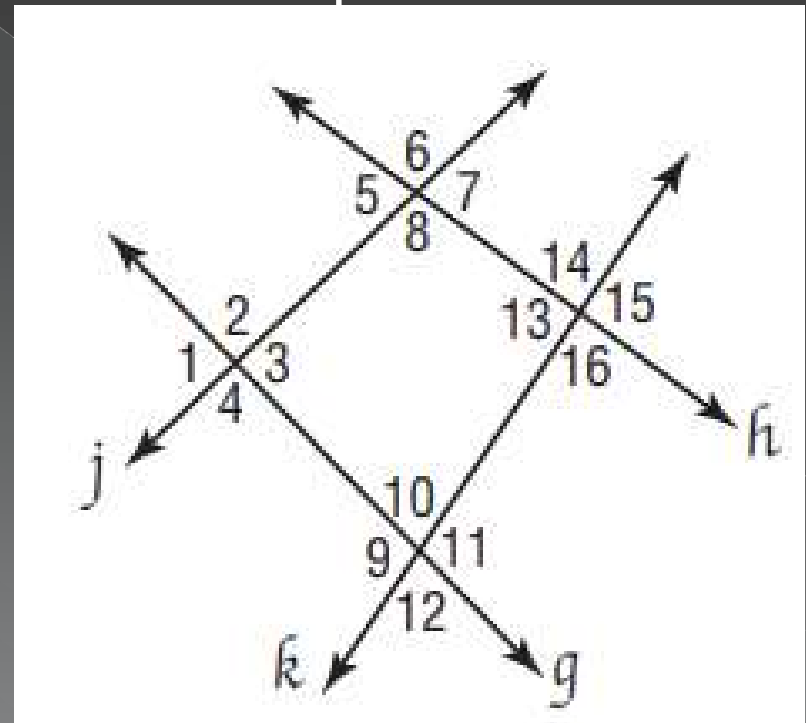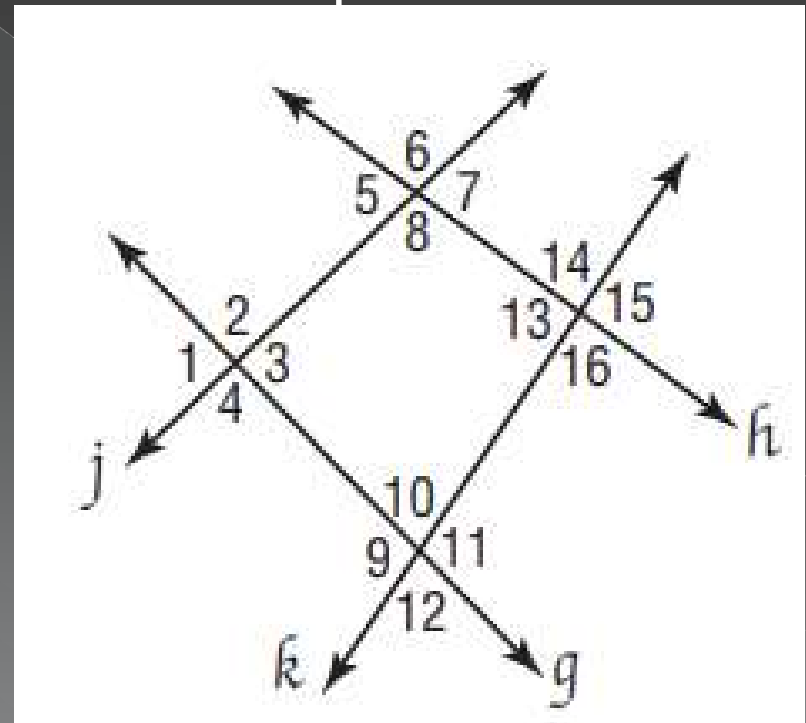
Examples

- Indentify the transversal connecting each pair of angles. Then classify the relationship between each pair of angles.

- ∠13 and ∠10

Examples

- Indentify the transversal connecting each pair of angles. Then classify the relationship between each pair of angles.

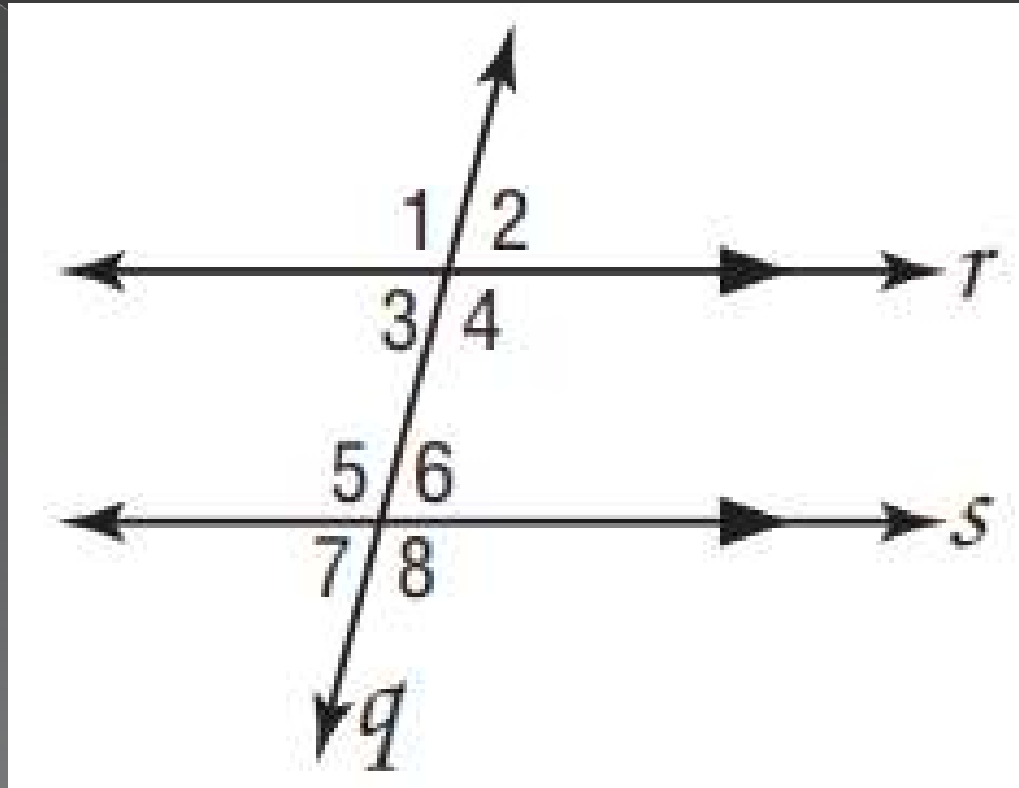- ∠6 and ∠14

Examples

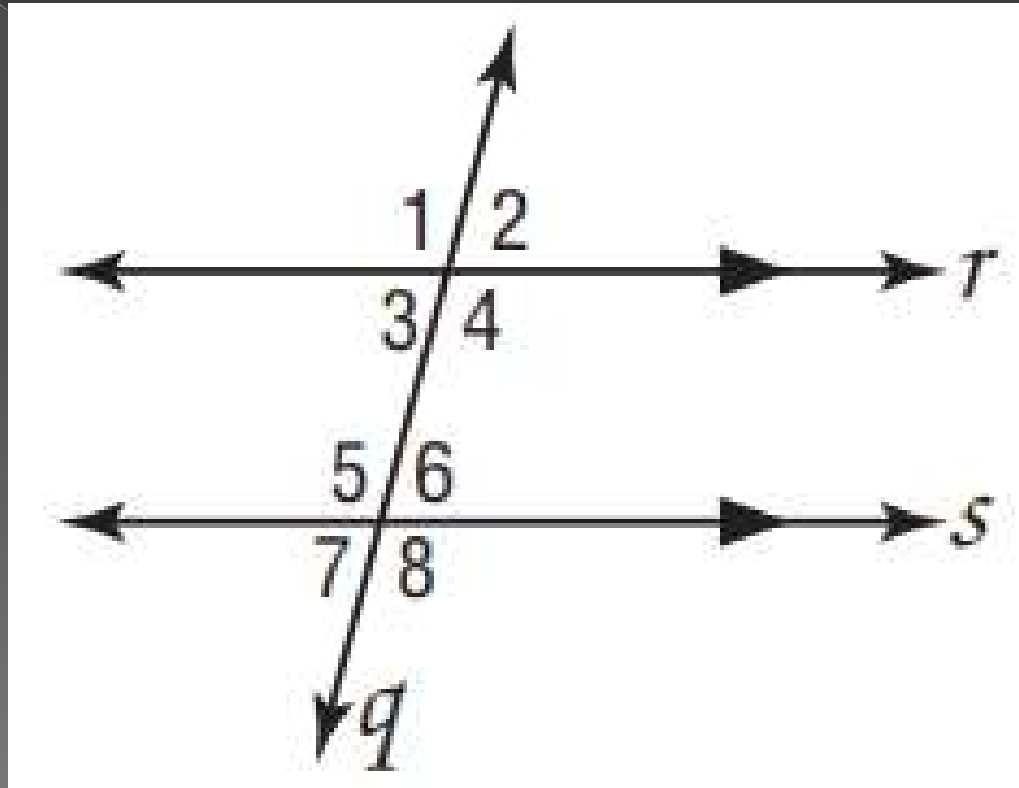- If $m\angle2 = 70$, find the measure of each angle.
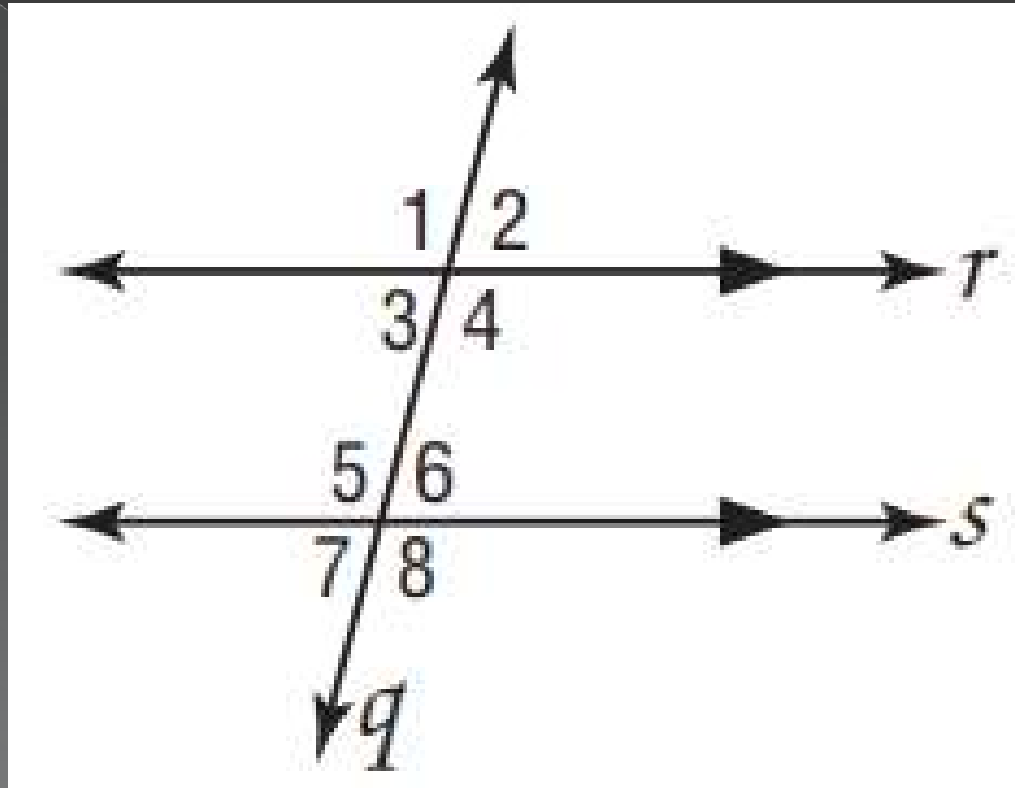

- $\angle3$

Examples

- If $m\angle 2 = 70$, find the measure of each angle.
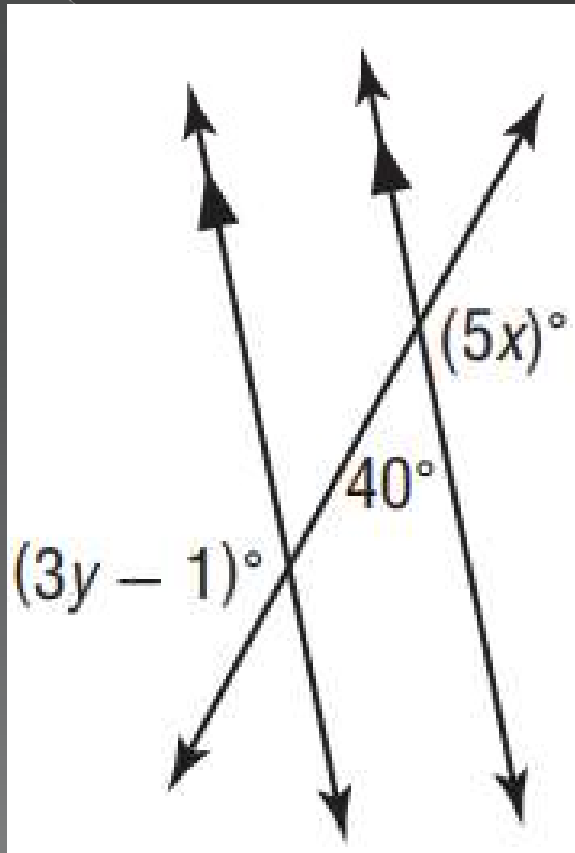

- $\angle 1$

Examples

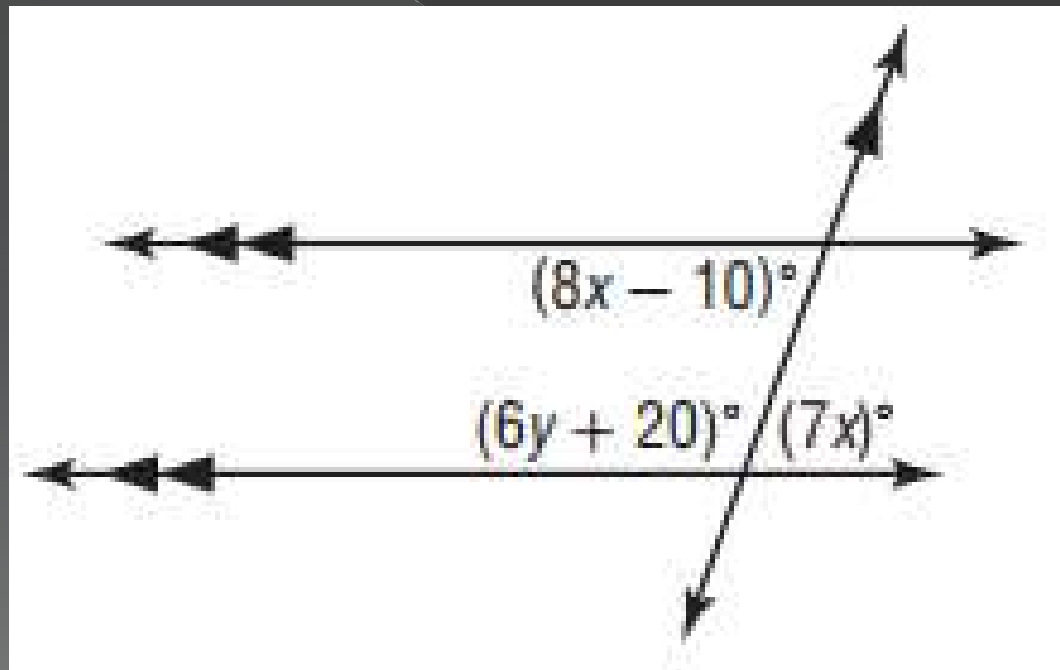- If $m\angle 2 = 70$, find the measure of each angle.

- $\angle 6$

Examples

- Find the value of the variables in the figure.

Examples

- Find the value of the variables in the figure.

$(8x - 10)°$

$(6y + 20)°$ / $(7x)°$

Examples

- Find the value of the variables in the figure.