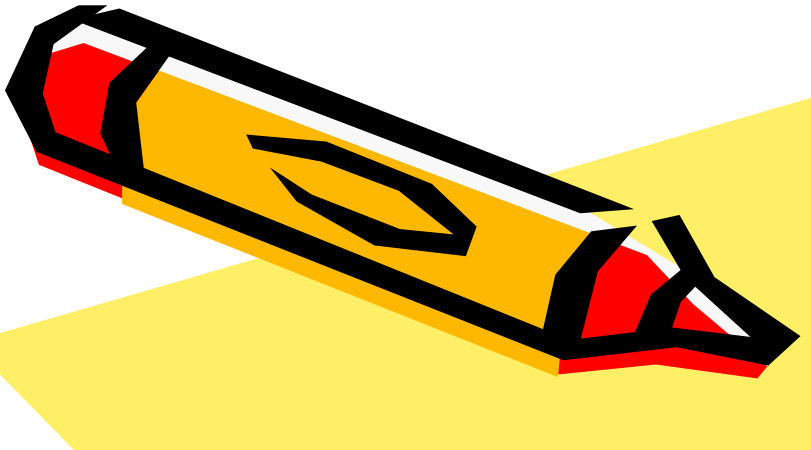
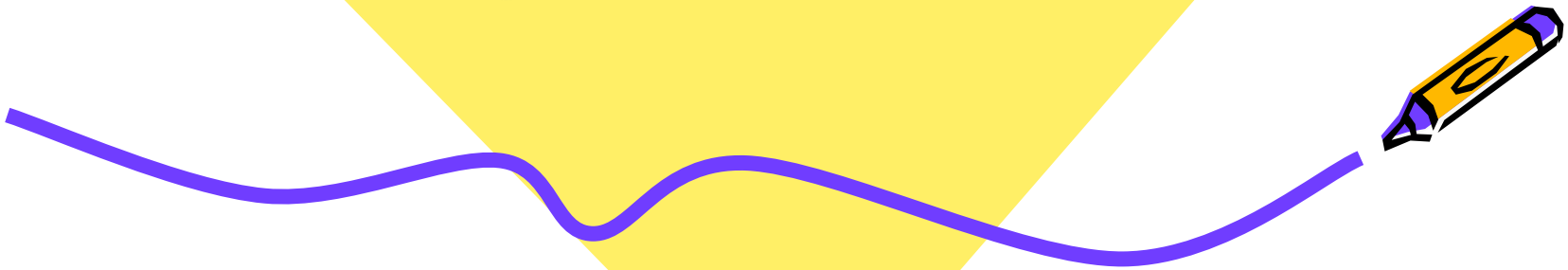


Geometry

Parallel Lines and Transversals

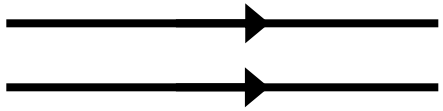


Vocabulary

- Parallel Lines (*ll*):

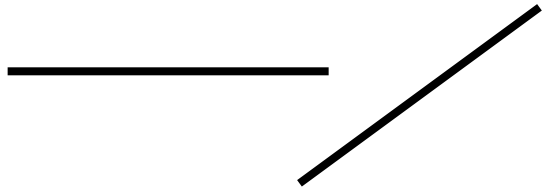
  Lines that do not intersect and are in the same plane.

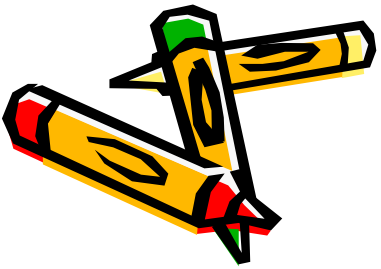
  Ex1. Parallel

  Parallel lines can be indicated in the picture by the use of arrows

  Ex2. Not Parallel

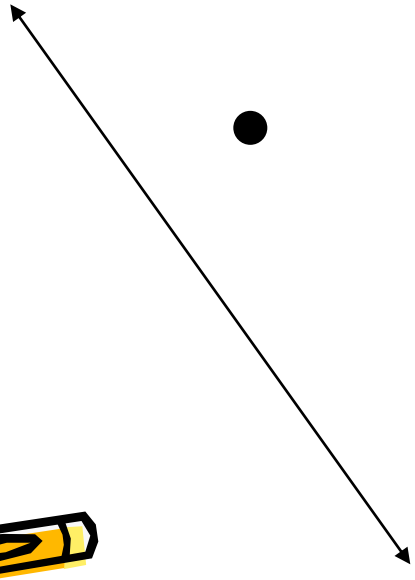
  

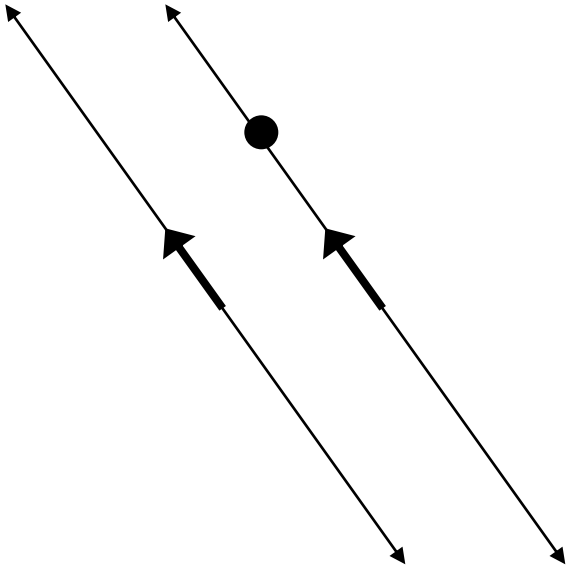


Parallel Lines will always go in the same direction

Concept

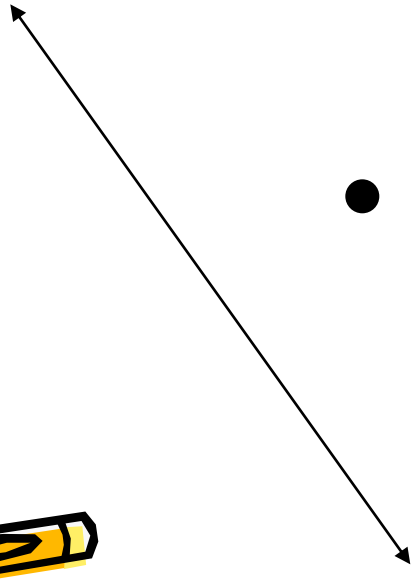
Through any point not on a line, exactly one line can be drawn that is parallel to the first line.

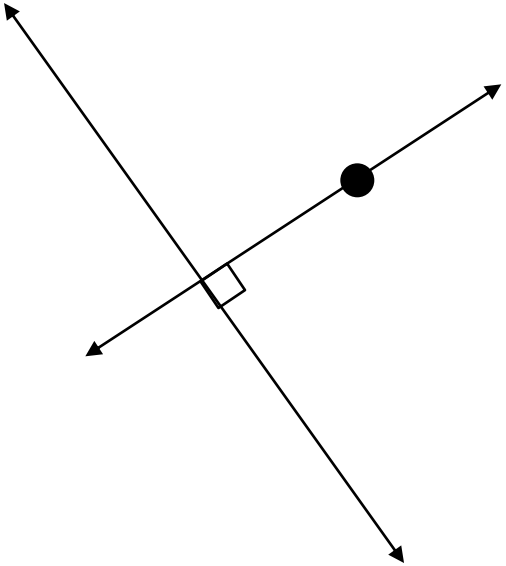




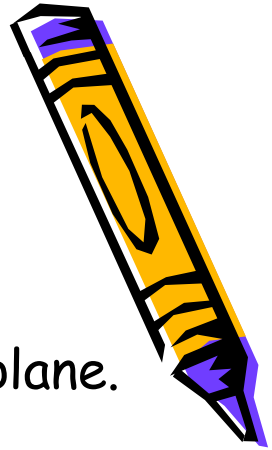
Concept

Through any point not on a line, exactly one line can be drawn that is perpendicular to the first line.





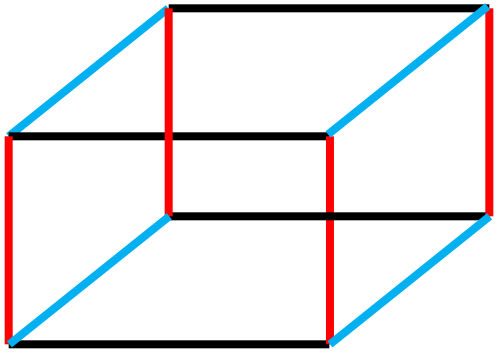
Vocabulary



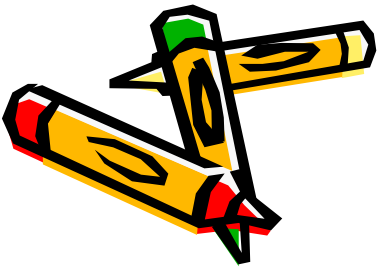
- Skew Lines:

  Lines that do not intersect and are not in the same plane.

  Ex. The black edge across the front, and the red edge down the back are skew.

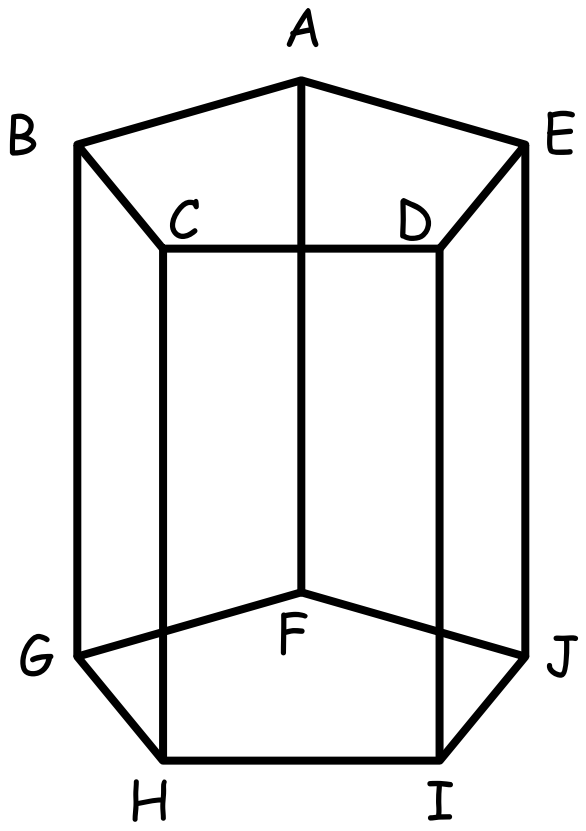


  In this picture, lines that are the same color are parallel. Line that are different colors either intersect, or are skew.



Skew Lines applies in 3 dimensional figures and will always go in different directions.

Parallel and Skew Lines

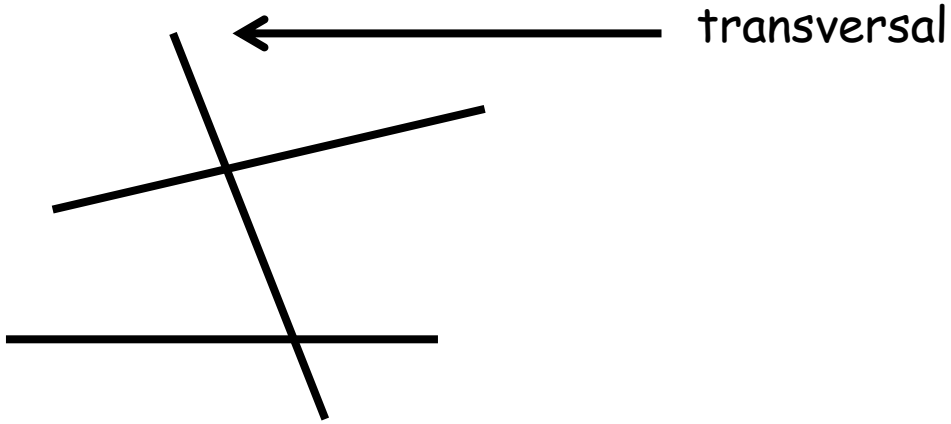


1. How many planes are shown in this figure?
2. If they exist, name parallel planes.
3. Name parallel lines.
4. Name skew lines.
5. Name intersecting lines.
6. FJ // _____
7. BC is skew to _____
8. Is it possible for planes to be skew? Explain.

Vocabulary

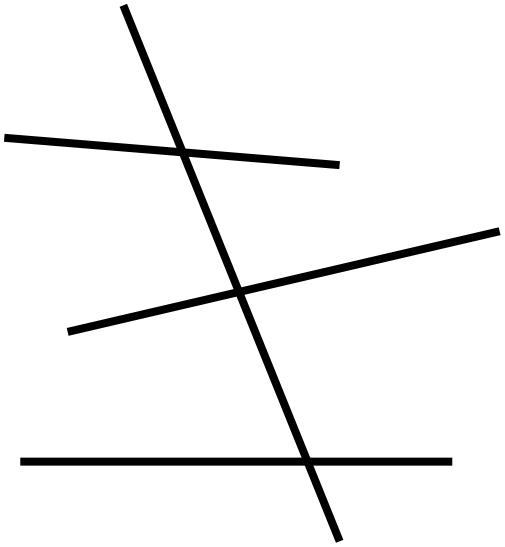
- Transversal:

  A line that intersects 2 or more other lines, at different points…all in the same plane.



The transversal creates 4 angles with each lines it intersects with. In this example, the transversal is responsible for creating 8 angles.

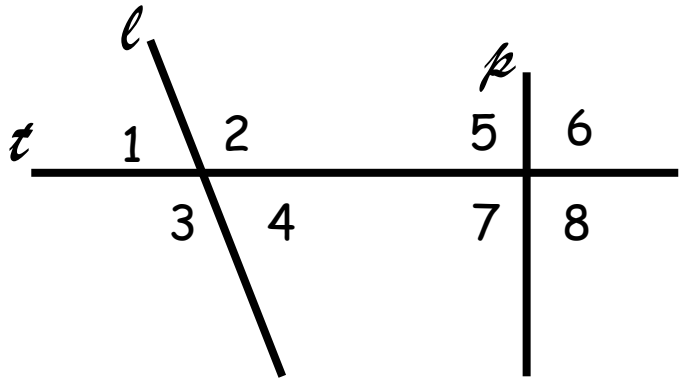
Transversal Concepts



In this example, the transversal is responsible for creating 12 angles.

At each intersection, we have vertical angles and linear pairs. The transversal allows us to relate angles from one intersection to angles from another intersection…

Transversal Concepts



Here we have 8 angles. t is the transversal.

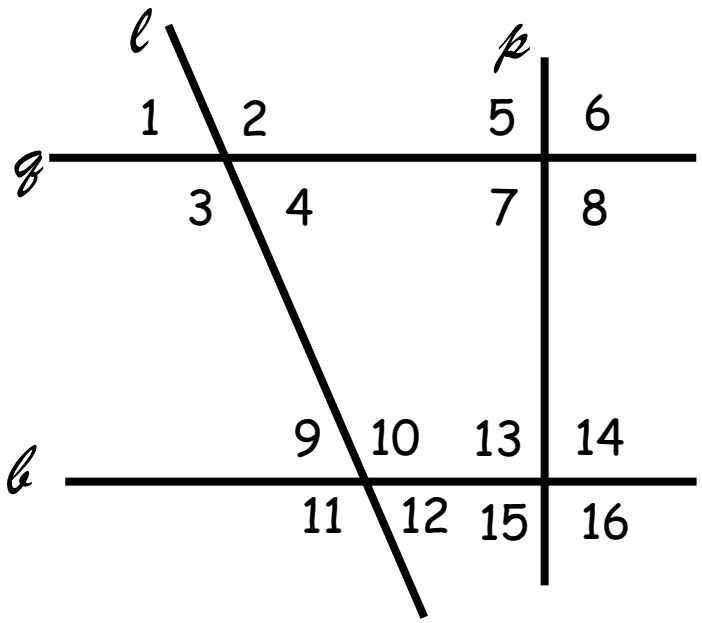
$\angle 1$ and $\angle 4$ are vertical angles

$\angle 1$ and $\angle 2$ are a linear pair

These relationships do not go away.

The transversal will allow us to define relationships between the angles in the left group and the angles in the right group.

Transversal Concepts



Here we have 16 angles. Each line is a transversal.

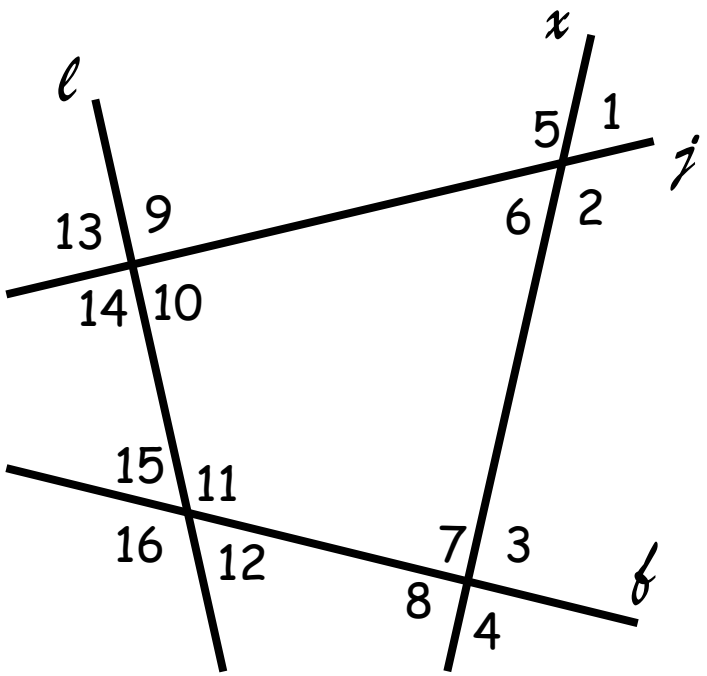
The transversal allows us to relate angles from one intersection to angles from another intersection…as long as they are created by the same transversal.

For example: ℓ is the transversal relating $\angle 1$ and $\angle 12$

b is the transversal relating $\angle 10$ and $\angle 15$

there is no transversal relating $\angle 3$ and $\angle 13$

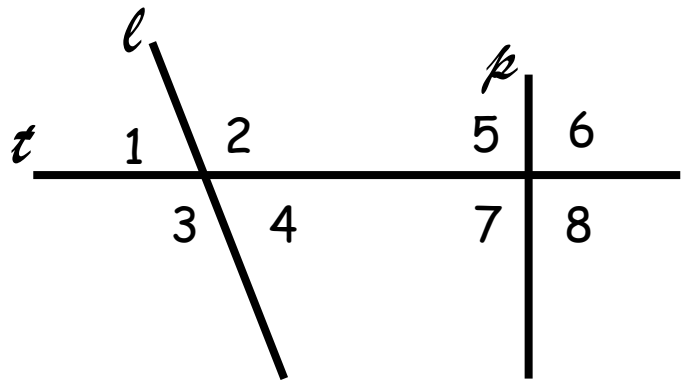
Transversal Concepts



Name the transversal associated with the given pair of angles:

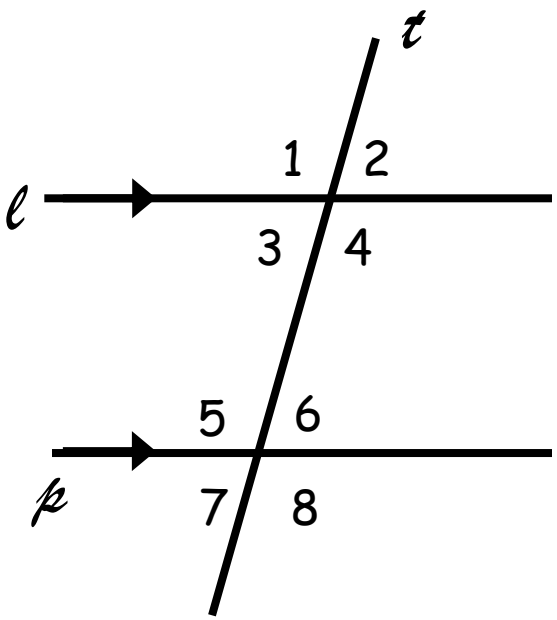
1. ∠4 and ∠5
2. ∠13 and ∠2
3. ∠11 and ∠14
4. ∠6 and ∠8
5. ∠1 and ∠16
6. ∠7 and ∠4

Transversal Concepts



Angles pairs have special named relationships based on their relative location in the picture. Additionally, if the lines that the transversal intersect are parallel, then those angle pairs have specific properties such as congruent or supplementary.

Angle Pair Relationships



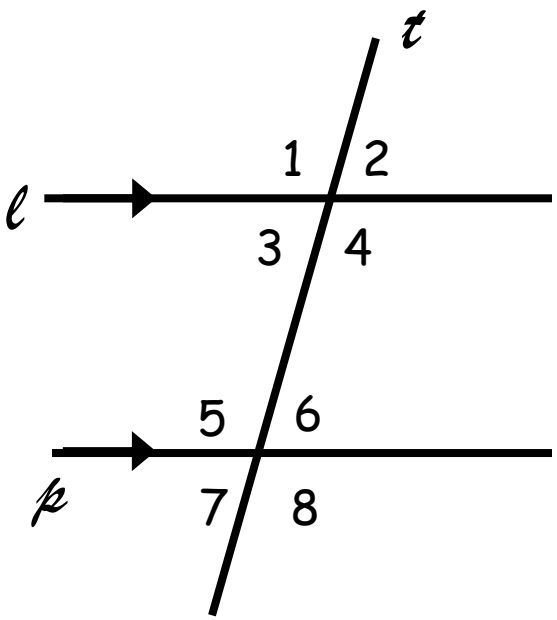
Angle pair names are assigned based on their location in the picture.

We focus on whether they are interior to the parallel lines, exterior to the parallel lines, on the same side or on different sides of the transversal, and if they are in the same location within their group of angles.

Let's see what we mean…

Angle Pair Relationships

In this example…



Angles 1, 2, 7, and 8 are all exterior angles since they are outside the parallel lines.

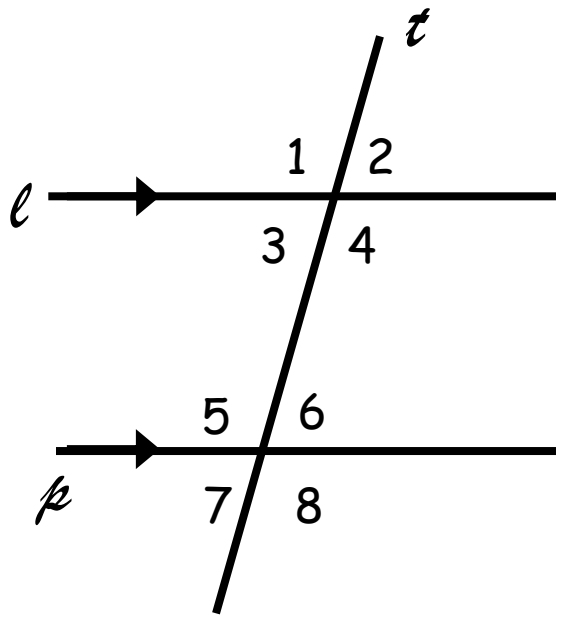
Angles 3, 4, 5, and 6 are all interior angles since they are inside the parallel lines.

Angles 1, 3, 5, and 7 are all on the same side of the transversal. So are angles 2, 4, 6, and 8.

Angles 1 and 5, for example, are in the same location within their group of angles. So are angles 3 and 7; 2 and 6; and 4 and 8.

Angle Pair Relationships

We have 4 defined angle relationship pairs…

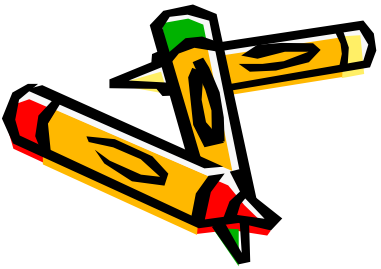


Alternate Interior Angles:

Two angles interior to the parallel lines, but on alternate (different) sides of the transversal.

∠3 and ∠6 are Alternate Interior Angles

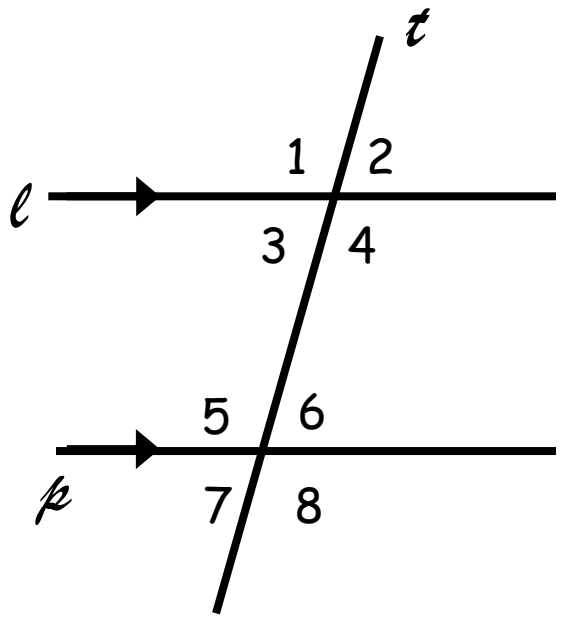
∠4 and ∠5 are Alternate Interior Angles



If two parallel lines are cut by a transversal, then Alternate Interior Angles are Congruent

Angle Pair Relationships

We have 4 defined angle relationship pairs…

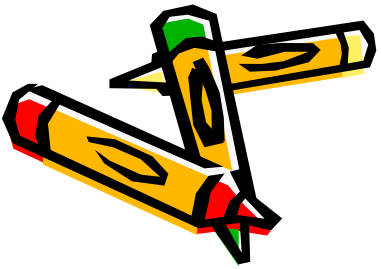


Alternate Exterior Angles:

Two angles exterior to the parallel lines, but on alternate (different) sides of the transversal.

∠1 and ∠8 are Alternate Exterior Angles

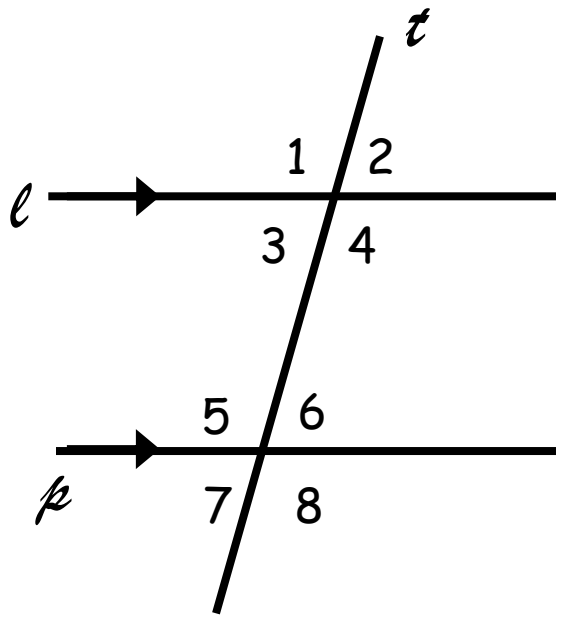
∠2 and ∠7 are Alternate Exterior Angles



If two parallel lines are cut by a transversal, then Alternate Exterior Angles are Congruent

Angle Pair Relationships

We have 4 defined angle relationship pairs…



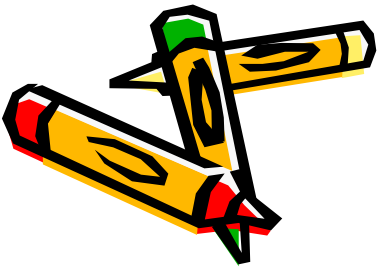
Corresponding Angles:

Two angles that are in the same relative position within their intersection group.

∠1 and ∠5 are Corresponding Angles
(top left of each group)

∠4 and ∠8 are Corresponding Angles
(bottom right of each group)

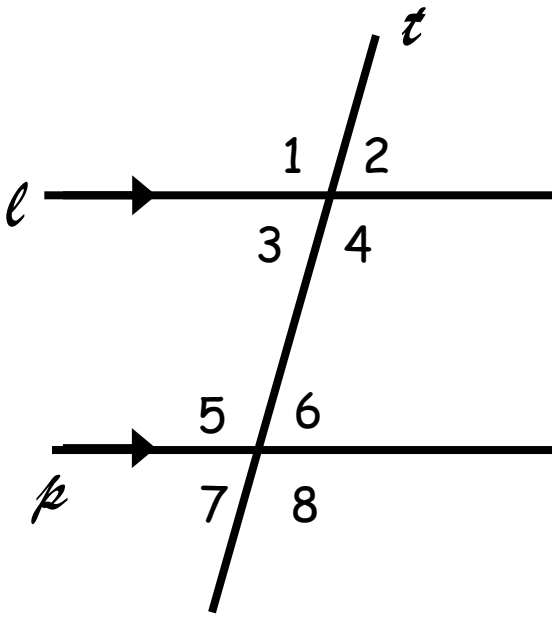
Angles 3 and 7, and angles 2 and 6 are also corresponding angle pairs



If two parallel lines are cut by a transversal, then Corresponding Angles are Congruent

Angle Pair Relationships

We have 4 defined angle relationship pairs…



Consecutive Interior Angles
(also called Same Side Interior Angles):
Two angles interior to the parallel lines, and on the same side of the transversal

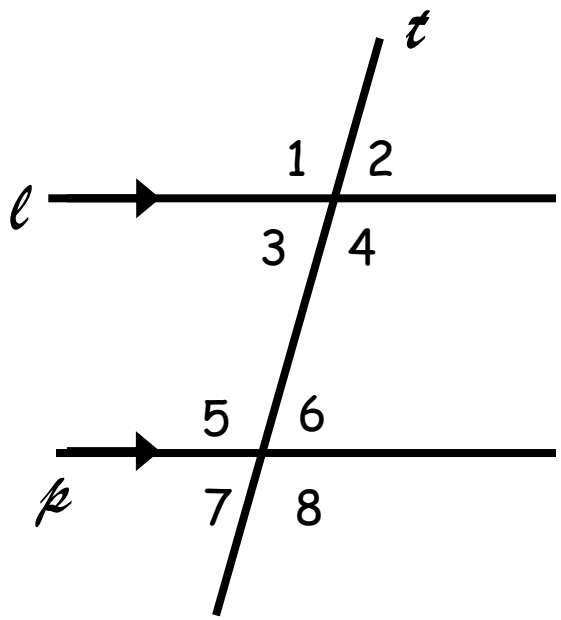
∠3 and ∠5 are
Consecutive Interior Angles

∠4 and ∠6 are
Consecutive Interior Angles

If two parallel lines are cut by a transversal, then Consecutive Interior Angles are Supplementary

Examples

Based on the figure provided...



1. $m\angle 1 = 6x + 10$, $m\angle 5 = 2x + 30$. find x.

2. $m\angle 3 = 5x + 20$, $m\angle 6 = 4x + 15$. find x.

3. $m\angle 4 = 7x + 27$, $m\angle 6 = 4x + 10$. find x.

4. $m\angle 2 = x + 25$, $m\angle 7 = 4x - 5$. find x.

5. $m\angle 3 = 3x + 15$, $m\angle 4 = 6x + 11$. find x.