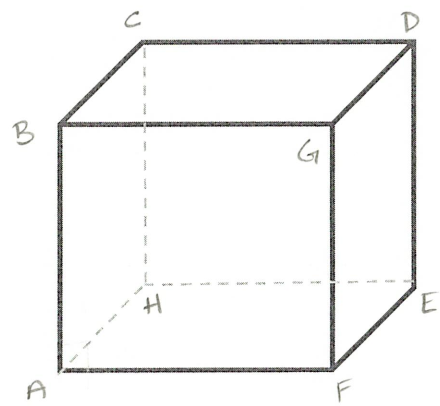
Chapter 3.1: Identify Pairs of Lines
Chapter 3.2: Identify Pairs of Angles using Parallel Lines and Transversals

Objectives:

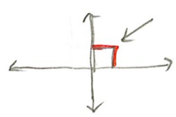
1. I can identify corresponding, alternating interior, alternate exterior and consecutive interior angles using parallel lines and a transversal.
2. I can apply the relationships between corresponding, alternating interior, alternate exterior and consecutive interior angles to find unknown angle measures.

Definitions:



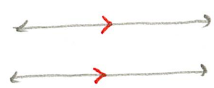
Perpendicular Lines: two lines that intersect to form a right angle $\rightarrow m\angle = 90°$.

Symbols: $\overleftrightarrow{AB} \perp \overleftrightarrow{AF}$



Parallel Lines: two lines that do not intersect and are coplanar.

Symbols: $\overleftrightarrow{AF} \parallel \overleftrightarrow{BG}$, $\overleftrightarrow{CB} \parallel \overleftrightarrow{DG}$

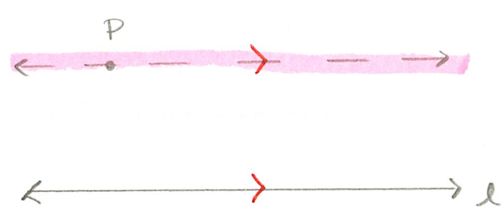


Parallel Planes: two planes that do not intersect.

Skew Lines: two lines that do not intersect and are not coplanar. Ex. $\overleftrightarrow{AB}$ and $\overleftrightarrow{GD}$; $\overleftrightarrow{EF}$ and $\overleftrightarrow{CH}$

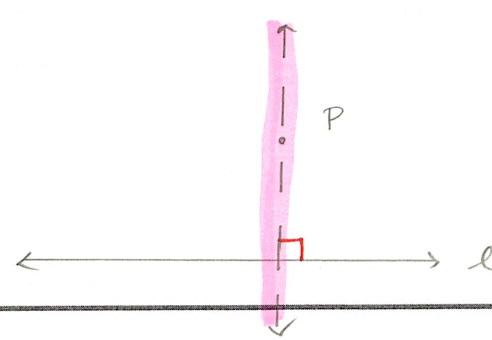
Parallel Postulate #13:

Given a line and a point not on the line, then there is exactly one line through the point parallel to the given line.

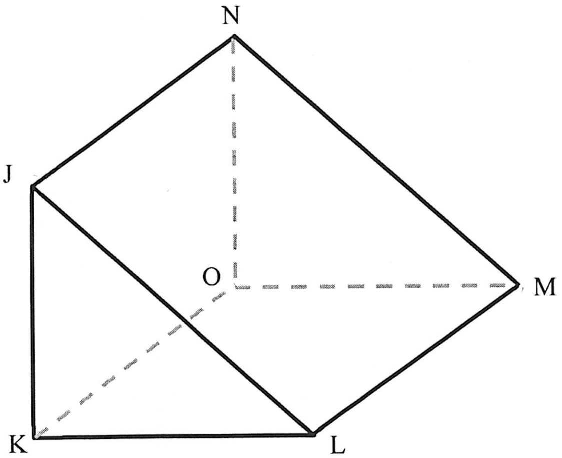


Perpendicular Postulate #14:

Given a line and a point not on the line, then there is exactly one line through the point perpendicular to the given line.



Example #1: Which line(s) or planes(s) in the figure appear to fit the description?

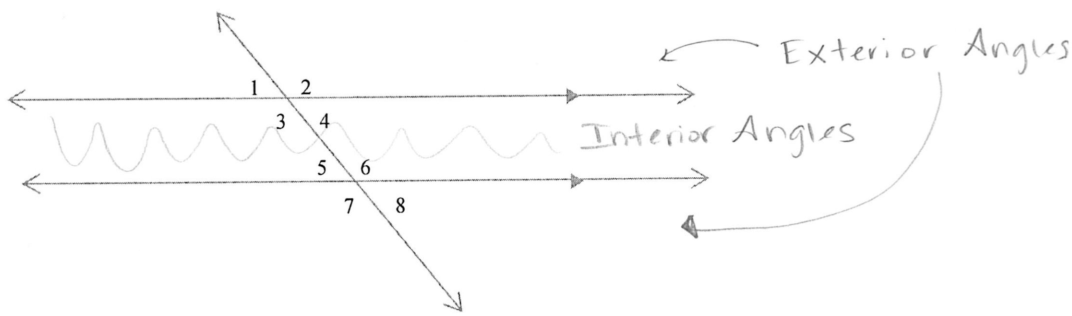


1. Parallel to $\overleftrightarrow{MN}$ and contains J $\overleftrightarrow{JL}$
2. Skew to $\overleftrightarrow{MN}$ and contain J $\overleftrightarrow{JK}$
3. Perpendicular to $\overleftrightarrow{MN}$ and contains J $\overleftrightarrow{JN}$
4. Name the plane that contains J and appears to be parallel to plane MNO

   Plane JKL
5. Name the plane that contains J and appears to be perpendicular to plane MNO

   Plane JNO, Plane JNM

Transversal: a line that intersects two or more coplanar line at different points



Corresponding Angles: two angles in the Same location, matching corners.

Examples: $\angle 1$ and $\angle 5$, $\angle 3$ and $\angle 7$, $\angle 2$ and $\angle 6$, $\angle 4$ and $\angle 8$

Corresponding Angles Postulate 15:

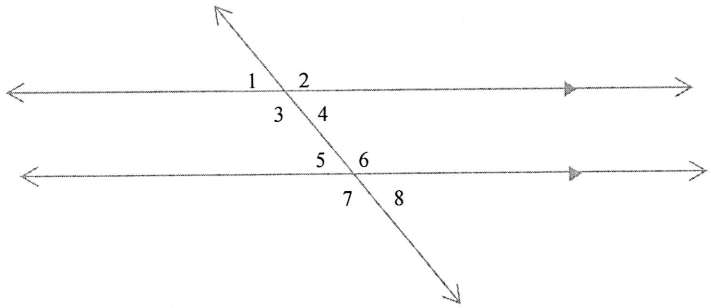
If two parallel lines are cut by a transversal, then the pairs of **corresponding angles** are congruent. $\angle 1 \cong \angle 5$, $\angle 3 \cong \angle 7$, $\angle 2 \cong \angle 6$, $\angle 4 \cong \angle 8$

Alternate Interior Angles: two angles that lie on either side of the transversal in between the other two lines

Examples: $\angle 3$ and $\angle 6$, $\angle 4$ and $\angle 5$

Alternate Interior Angles Theorem 3.1:

If two parallel are cut by a transversal, then the pairs of **alternate interior angles** are congruent. $\angle 3 \cong \angle 6$, $\angle 4 \cong \angle 5$



Alternate Exterior Angles: two angles that lie on either side of the transversal on the outside of the other two lines.

Examples: ∠1 and ∠8, ∠2 and ∠7

Alternate Exterior Angles Theorem 3.2:

If two parallel lines are cut by a transversal, then the pairs of **alternate exterior angles** are congruent. ∠1 ≅ ∠8, ∠2 and ∠7

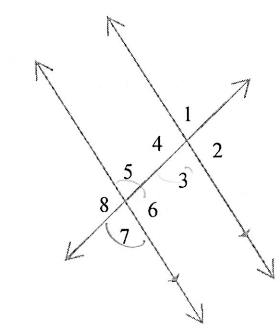
Consecutive Interior Angles: two angles on the Same side of the transversal in between the other two line.

Examples: ∠3 and ∠5, ∠4 and ∠6

Consecutive Interior Angles Theorem 3.3:

If two parallel lines are cut by a transversal, then the pairs of **consecutive interior angles** are Supplementary. $m\angle 3 + m\angle 5 = 180°$, $m\angle 4 + m\angle 6 = 180°$

Example #2: If $m\angle 7 = 75°$, identify three other angles that also are 75°. Tell which postulate or theorem you use in each case.



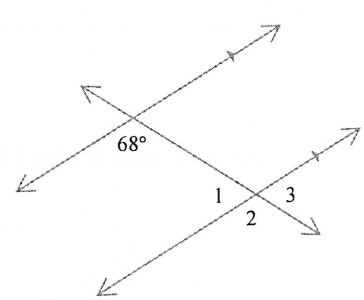
$m\angle 5 = 75°$ (Vertical Angles)

$m\angle 3 = 75°$ (Corresponding Angles)

$m\angle 1 = 75°$ (Alt. Exterior Angles)

Example #2: Find m∠1 and m ∠2. Explain your reasoning.

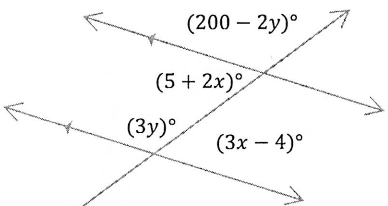
$m\angle 1 = 180 - 68°$
$= 112°$ (Consecutive Interior Angles)

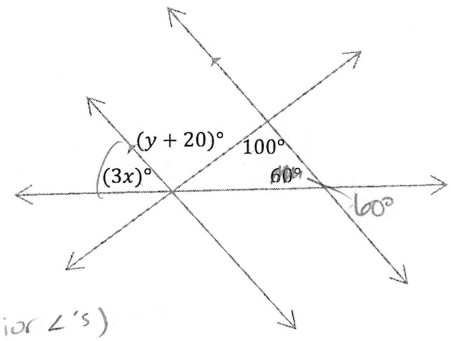


$m\angle 2 = 68°$ (Corresponding Angles

Example #3: Find the values of x and y.

a.)





(Corresponding ∠'s)

$200-2y=3y$

$+2y \quad +2y$

$200=5y$

$\frac{200}{5}=\frac{5y}{5}$

$40=y$

(Alt. Interior ∠'s)

$5+2x=3x-4$

$-2x \quad -2x$

$5=x-4$

$+4 \quad +4$

$9=x$

(Alt. Exterior ∠'s)

$3x=60$

$\frac{3x}{3}=\frac{60}{3}$

$x=20$

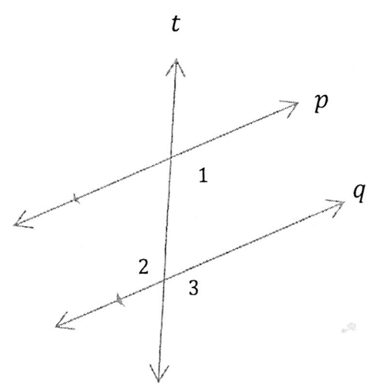
(Alt. Interior ∠'s)

$y+20=100$

$-20 \quad -20$

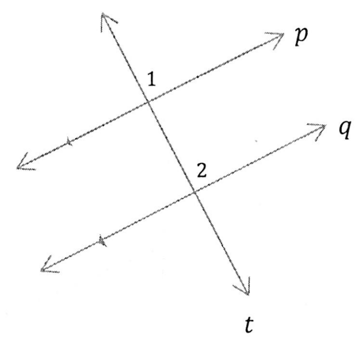
$y=80$

Example #4: **Given:** Two parallel lines $p \parallel q$ are cut by a transversal, t.
Prove: The Alternate Interior Angles Theorem: $\angle 1 \cong \angle 2$



Statement	Reason
1. p ∥ q cut by a transversal t	1. Given
2. $\angle 1 \cong \angle 3$	2. Corresponding Angles Postulate
3. $\angle 3 \cong \angle 2$	3. Vertical Angles
4. $\angle 1 \cong \angle 2$	4. Transitive Property
~~5.~~	~~5.~~

Example #5: **Given:** $p \perp t$ and $p \parallel q$
Given: $q \perp t$



Statement	Reason
1. $p \perp t$	1. Given
2. $\angle 1$ is a right angle	2. Def^n of ⊥ lines
3. $m\angle 1 = 90°$	3. Definition of a Right Angle
4. $p \parallel q$	4. Given
5. $\angle 1 \cong \angle 2$	5. Corresponding Angles
6. $m\angle 1 = m\angle 2$	6. Definition of Congruent Angles
7. $m\angle 2 = 90°$	7. Transitive Property of Equality
8. $\angle$ ~~1~~ 2 is a right angle	8. Def^n of a Right Angle
9. $q \perp t$	9. Def^n of ⊥ lines