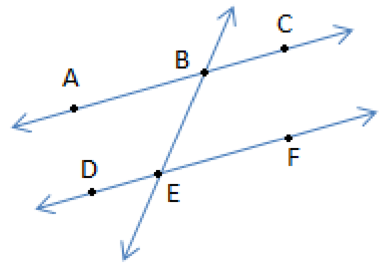
Lesson 3-1: Parallel Lines and Transversals

**Parallel Lines:**
Two coplanar lines that never intersect.

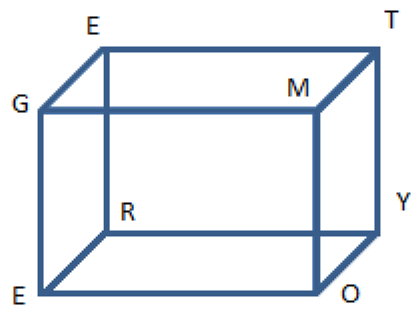
*

* We label parallel lines with small triangles




**Transversal:**
A Line that intersects two or more lines in a plane.

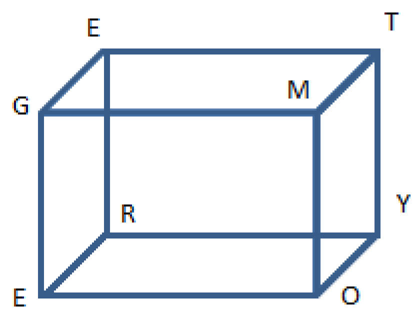
**Parallel Planes:**
two planes that never intersect.




**Skew Lines:**
lines that do <u>not</u> intersect and are <u>not</u> coplanar.

Ex1) Refer to the figure

a) Name all segments parallel to $\overline{GE}$

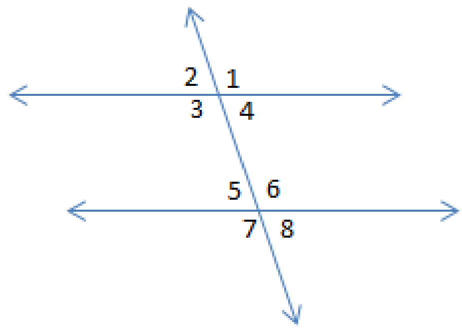



b) Name all planes intersecting plane MTY

c) Name all segments skew to $\overline{EO}$

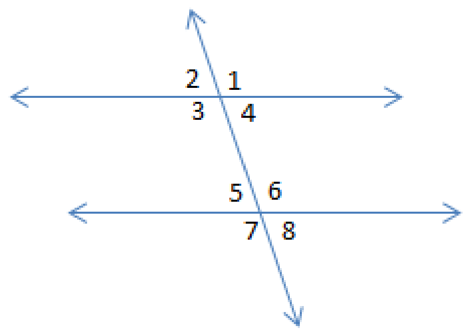
Some special angles…

(1) Exterior angles



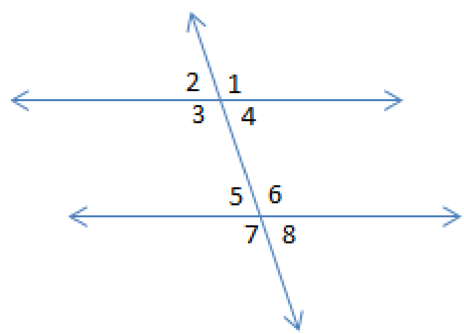

(2) Interior angles

(3) Alternate interior angles




(4) alternate exterior angles

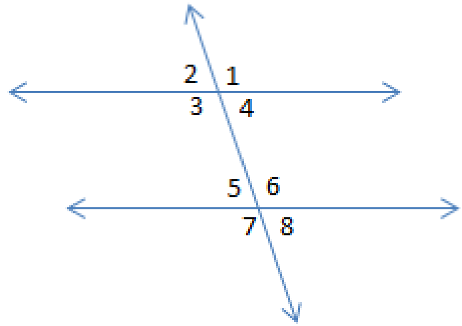
(5) corresponding angles



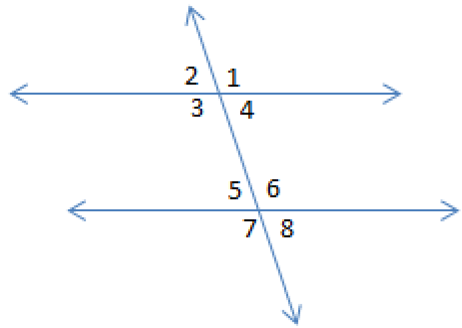

(6) consecutive interior angles

Lesson 3-2 Angles and Parallel Lines

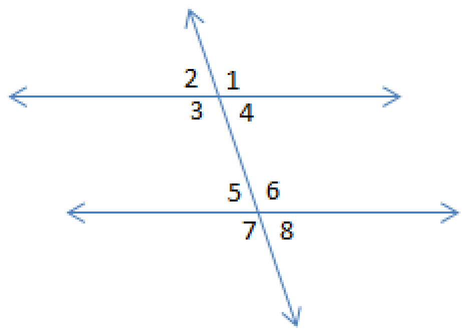
**Corresponding Angle Postulate:**
If two parallel lines are cut by a transversal, then each pair of corresponding angles is _________________.



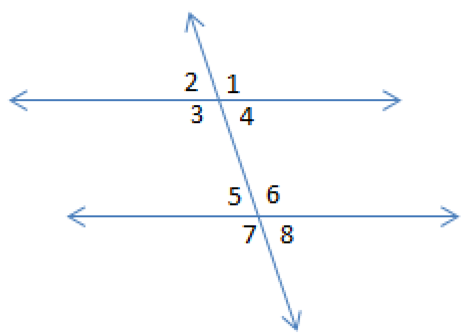

**Alternate Interior Angles Theorem:**
If two parallel lines are cut by a transversal, then each pair of alternate interior angles is _________________.



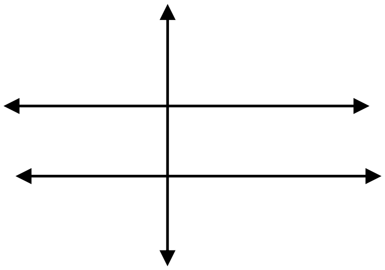

**Alternate Exterior Angles Theorem:**
If two parallel lines are cut by a transversal, then each pair of alternate exterior angles is _________________.



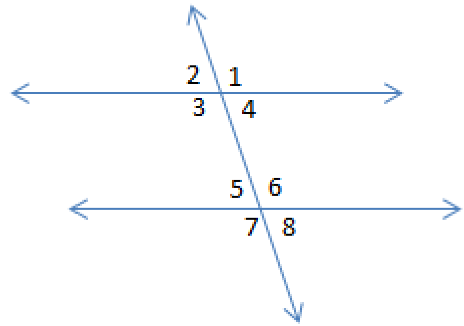

**Consecutive Interior Angles Theorem:**
If two parallel lines are cut by a transversal, then each pair of consecutive interior angles is _________________.



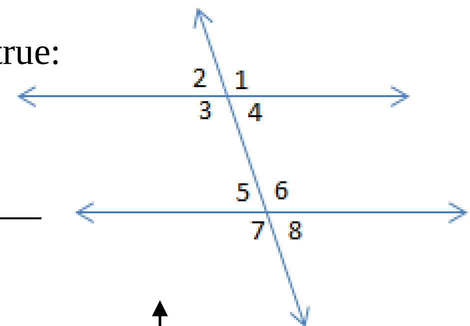

**Perpendicular Transversal Theorem:** In a plane, if a line is perpendicular to one of two parallel lines, then it is perpendicular to the other.



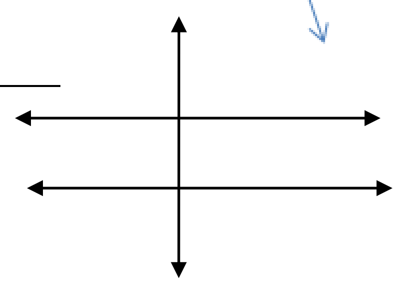
Ex1: $m\angle 1 = 30.$ *Find the measures of the remaining angles.*



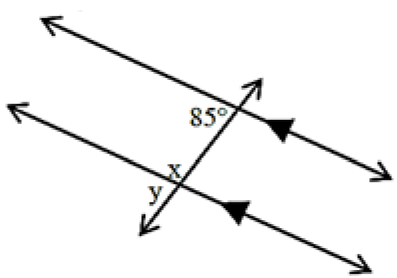

Ex2: Identify the postulate or theorem that makes each statement true:

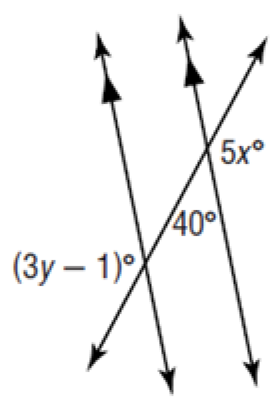


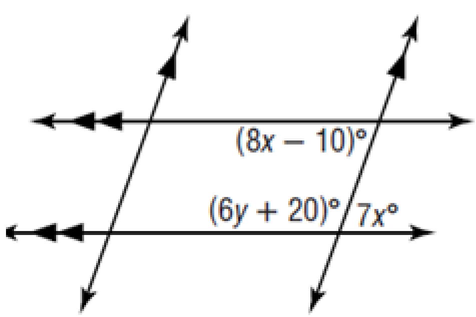

a) $\angle 1 \cong \angle 6$ ______________________________
b) $\angle 2 \cong \angle 8$______________________________
c) $\angle 1$ *is supplementary to* $\angle 2$______________________________
d) $\angle 4 \cong \angle 5$______________________________
e) $\angle 2 \cong \angle 4$______________________________
f) $\angle 3$ *is supplementary to* $\angle 5$______________________________
g) *if line* $m$ *and line* $n$ *are* $\parallel$ *and* $l \perp m$, *then* $l \perp n$
______________________________________.



Ex3:



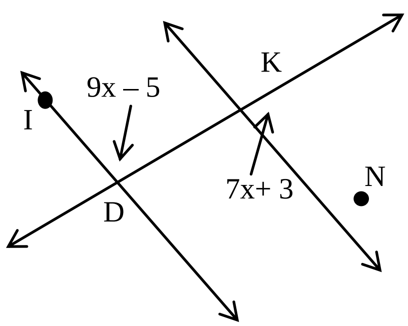
# 3-5 **PROVING** Lines Parallel

**Parallel Line Theorems**

(1) If alternate interior angles are congruent, then lines are parallel
   a. **Converse** of alternate interior angle theorem
   b. If alt. Int. $\angle s$ are $\cong$ then lines ∥
(2) If alternate exterior angles are congruent, then lines are parallel
   a. **Converse** of alternate exterior angle theorem
   b. If alt. Ext. $\angle s$ are $\cong$ then lines ∥
(3) If corresponding angles are congruent then lines are parallel
   a. **Converse** of corresponding angle postulate
   b. If Corr. $\angle s$ are $\cong$ then lines ∥
(4) If consecutive interior angles are supplementary then lines are parallel.
   a. **Converse** of consecutive interior angles theorem
   b. If Cons. Int. $\angle s$ are supp then lines ∥
(5) If two lines are perpendicular to the same line, then the lines are parallel.
   a. If two lines ⊥ to the same line then lines ∥

Example 1:

a. Find x so that ID ∥ KN




b. Find m∠IDK

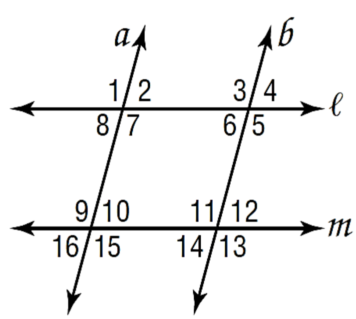
Example 2: Given the following information, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.

a) $\angle 3 \cong \angle 7$

b) $\angle 9 \cong \angle 11$

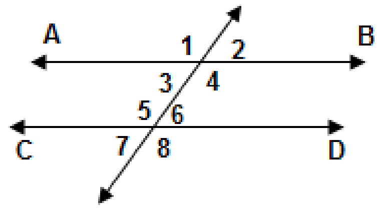
c) $\angle 2 \cong \angle 16$

d) $m\angle 5 + m\angle 12 = 180$

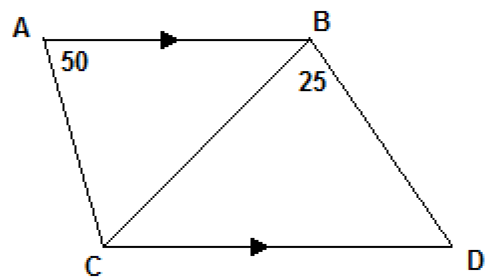


**Proof time!!!**

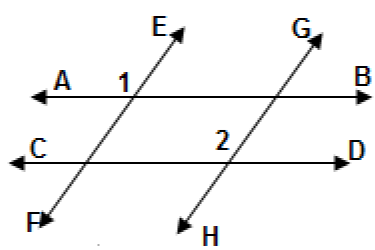
Given: $m\angle 1 = 30$, AB||CD
Prove: $m\angle 6 = 150$




Given: $m\angle BAC = 50$, $m\angle CBD = 25$, AB||CD
Prove: $m\angle CBA = 105$



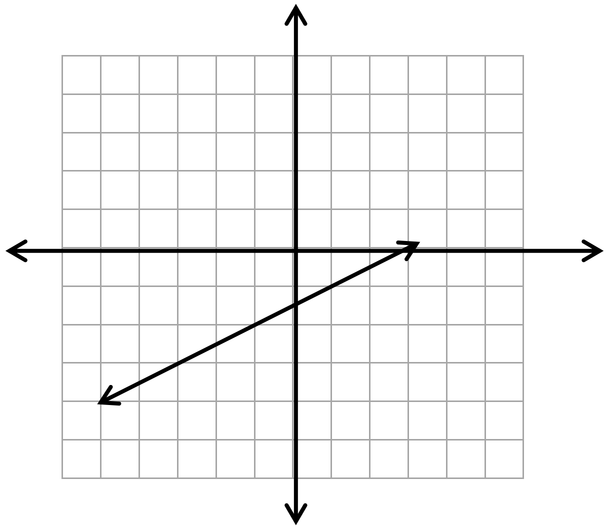

Given: Given: $m\angle 1 = 70$, AB||CD, EF||GH
Prove: $m\angle 2 = 70$



**3-3 Slopes of Lines**

Slope: $\frac{Vertical\ Rise}{Horizontal\ Run}$

Example 1: Find the slope of the line



Slope: $\frac{Vertical\ Rise}{Horizontal\ Run} =$ ____________

Ex 1: Find the slope of the line containing the points (-3, -2) (-1, 2)

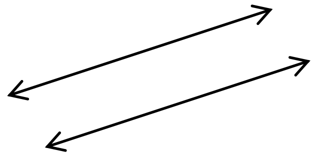
Ex2: Find the slope of the line containing the points (-4, 0) (0, -1)

Ex 3: Find the slope of the line containing the points (-3, 5) (1, 5)

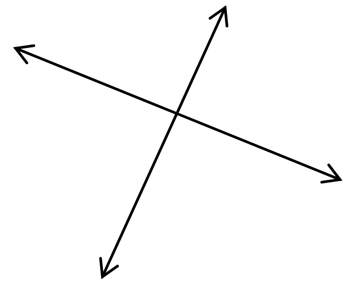
Ex 4: Find the slope of the line containing the points (6,3) (6,-1)

Slopes of Parallel and Perpendicular Lines:

Parallel Lines:



Perpendicular Lines:



Example 5: Determine whether AB and CD are parallel, perpendicular, or neither

a) y = ½ x – 5 and y = ½ x + 7

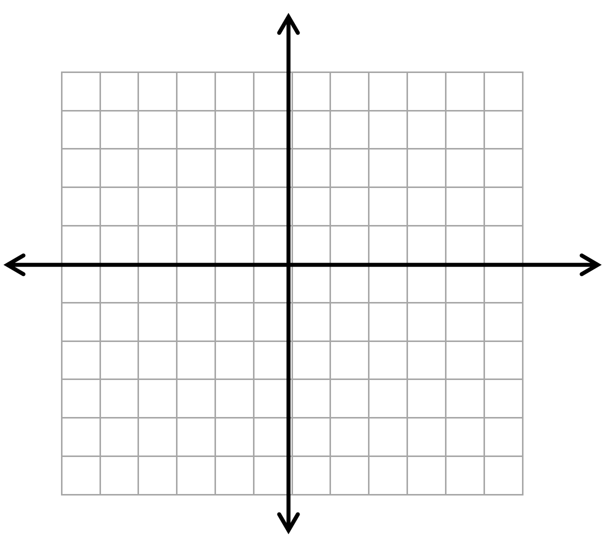
b) y = -3x + 5 and y = 3x + 5

c) y = $\frac{2}{3}x - 2$ and $y = -\frac{3}{4}x - 9$

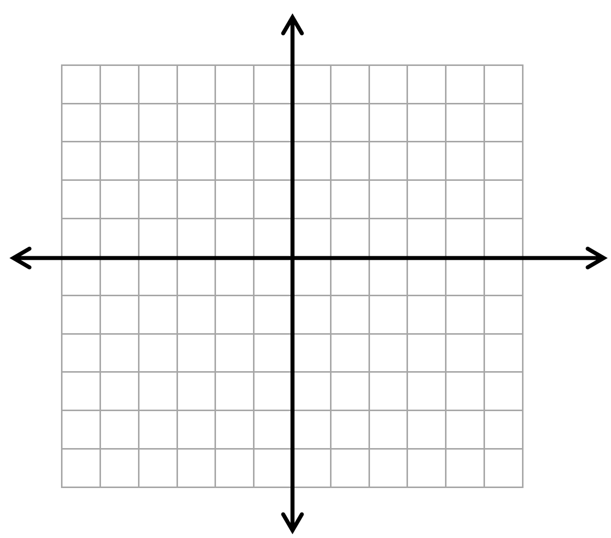
d) A(-2, -5), B(4, 7), C(0, 2), D(8, -2)

Graph the line that satisfies the condition.

Example 6: Slope = -1/2, contains U(2, -2)



Example 7: contains A(-2, 3) and is perpendicular to KS with K(0, 4) and S(-3, 2)



3-4 Equations of Lines

**Equation of a line: $y = mx + b$** **m=**

**b=**

**This equation of a line is written in *slope-intercept form*.**

Example 1: Write an equation of a line in slope-intercept form with m = -2 and b = -5

**Equation of a line: $y - y_1 = m(x - x_1)$** **m =**

**$(x_1, y_1)$ =**

**This equation of a line is written in *point-slope form*.**

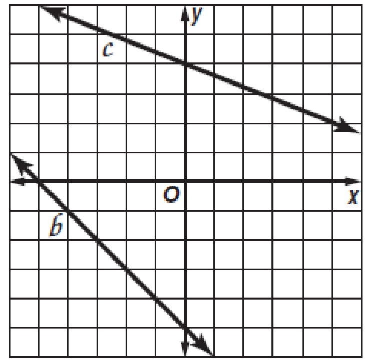
Example 2: Write an equation of a line in slope-intercept form with m = -2 and contains (-3, 2)

Example 3: Write an equation of a line parallel to $y = 3x - 4$ that contains (1, 2)

Example 4: Write an equation of a line perpendicular to $y = 3x - 4$ that contains (6, 2)

Example 5: Write an equation in slope-intercept form for each line.

a. Line *b*




b. A line parallel to line *c*, containing (-2, -4)

Example 6: Write an equation in slope-intercept form for the line that satisfies the given conditions.

a. x – intercept is -6, y intercept is 2

b. passes through (2, -4) and (5, 8)