# 3.2 Angles and Parallel Lines

> G.LP.2 Know precise definitions for angle, circle, perpendicular line, parallel line, and line segment, based on
> the undefined notions of point, line, and plane.  Use standard geometric notation.
> G.PL.3 Prove theorems about lines and angles.

*Parallel Lines and Angle Pairs*

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**Corresponding Angles Postulate**

If two ___parallel___ lines are cut by a transversal, then each pair of

___corresponding___ ___angles___ is *congruent*.

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**Ex 1:** Which pairs of angles are congruent according to the **Corresponding Angles Postulate?**

a. ___$\angle 2$ & $\angle 6$___      b. ___$\angle 1$ & $\angle 5$___

c. ___$\angle 3$ & $\angle 7$___      d. ___$\angle 4$ & $\angle 8$___
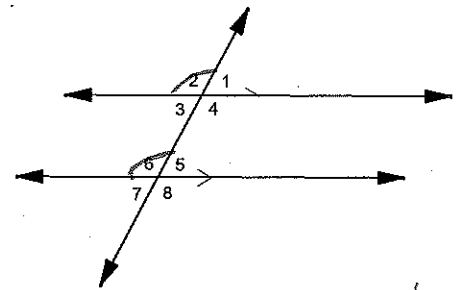
**Ex 2:** Use the figure to the right.  If m$\angle 1$ = 51, find the m$\angle 8$.

$m\angle 1 = 58°$        $m\angle 1 + m\angle 4 = 180$      $m\angle 4 = 129°$

$\qquad\qquad$ $51 + m\angle 4 = 180$         $m\angle 8 = 129°$

$m\angle 8 = m\angle 4$

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**Alternate Interior Angles Theorem**                    **Ex:**

If two parallel lines are cut by a ___transversal___,

then each pair of alternate interior angles is *congruent*.
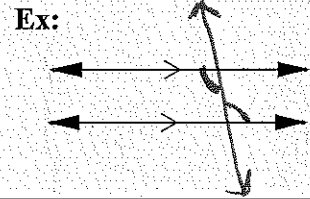
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**Consecutive Interior Angles Theorem**              **Ex:** $m\angle 1 + m\angle 2 = 180°$

If two ___parallel___ ___lines___ are cut by a transversal,

then each pair of consecutive ___interior___ angles is *supplementary*.

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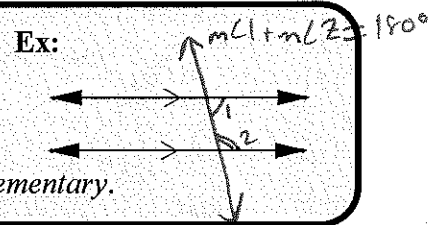
**Alternate Exterior Angles Theorem**                 **Ex:**

If two parallel lines are cut by a transversal, then each

pair of ___alternate___ ___exterior___ angles is *congruent*.

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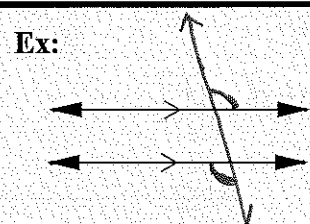
**Perpendicular Transversal Theorem**                **Ex:**

In a plane, if a line is perpendicular to one of two parallel lines,

then it is ___perpendicular___ to the others.
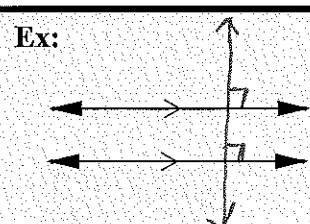
**Ex 2:** (Hint: try an auxiliary line.)
What is the measure of ∠ABC?

∠BJE ≅ ∠BJF [Alternate Interior ∠]

m∠BJF = 45°

Triangle sum is 180°

75 + 45 + m∠FBJ = 180
−120        −120
m∠FBJ = 60°

m∠FBJ + m∠ABC = 180°
60° + m∠ABC = 180°
−60              −60
m∠ABC = 120°
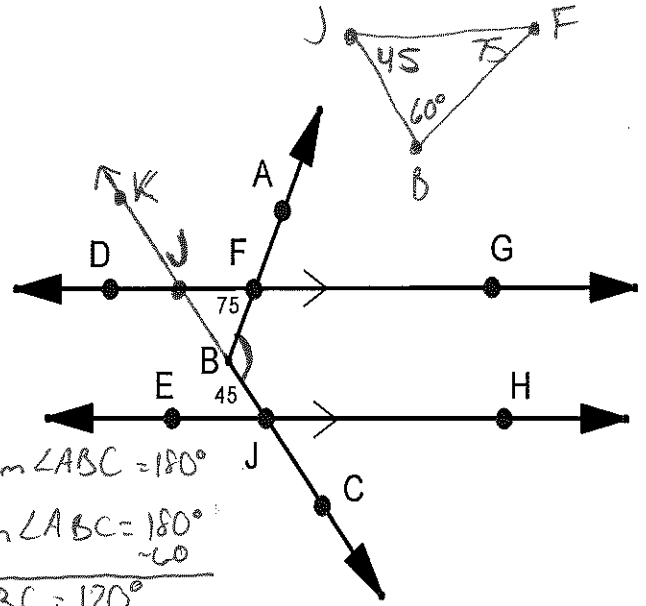
**Ex 3:**
If m∠1 = 16x − 8, m∠2 = 4(y + 8), and m∠3 = 14x + 2, find x and y.

m∠1 = m∠3 [Corresponding ∠]
m∠1 = m∠2 [Alternate Exterior ∠]
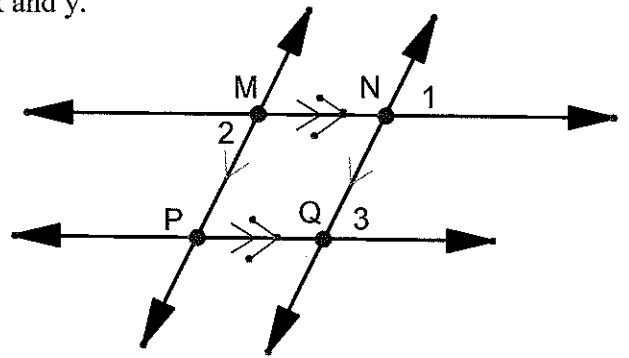
16x − 8 = 14x + 2
−14x        −14x

2x − 8 = 2
    +8  +8

$\frac{2x}{2} = \frac{10}{2}$     x = 5

16x − 8 = 4(y + 8)
16(5) − 8 = 4(y + 8)
$\frac{72}{4} = \frac{4(y+8)}{4}$

18 = y + 8
−8       −8
y = 10

**Ex 4:**
Given the following information and picture, find the measures of all labeled angles.

m∠8 = 25
m∠13 = 50

m∠8 = m∠10 [Vertical]

m∠8 + m∠9 = 180
25 + m∠9 = 180
−25         −25
m∠9 = 155°

m∠9 = m∠7 [Vertical]

m∠11 = m∠13 [Vertical]
m∠12 + m∠13 = 180
m∠12 + 50 = 180
−50   −50
m∠12 = 130°

[Vertical]
m∠12 = m∠14
m∠14 = 130°

m∠4 = m∠11 [Alternate Interior]

m∠6 = m∠10 [Alternate Interior]

m∠5 + m∠6 = 130° [Alt. Int.]
m∠5 + 25 = 130°
m∠5 = 105°

25°  8  155°  9      130°  12  13  50°

7  10  25°   50°  11  14  130°
155°

105°
5
25°  6   4  50°

50°  1   2   3  25°
105°
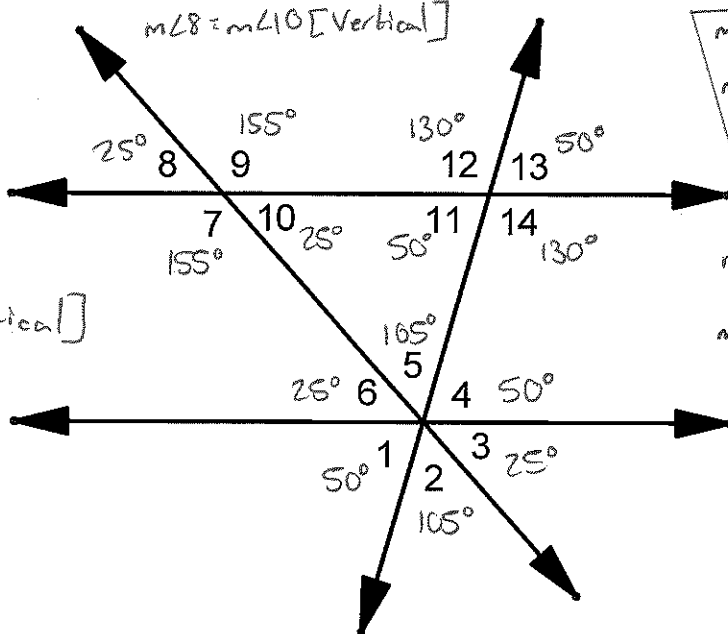
m∠1 = m∠4 [Vertical]

m∠6 = m∠3 [Vertical]

m∠2 = m∠5 [Vertical]