12.3
ANGLE
RELATIONSHIPS

Special Types of Angles	Definition	Example
adjacent angles	angles in the same plane that have a common vertex and a common side, but no common interior points	∠2 & ∠3 ∠4 & ∠1 ∠3 & ∠4 ∠1 & ∠2
vertical angles	two nonadjacent angles formed by two intersecting lines	∠1 & ∠3 ∠2 & ∠4
linear pair	adjacent angles whose noncommon sides are opposite rays	∠1 & ∠2 ∠4 & ∠3 ∠1 & ∠4 ∠2 & ∠3
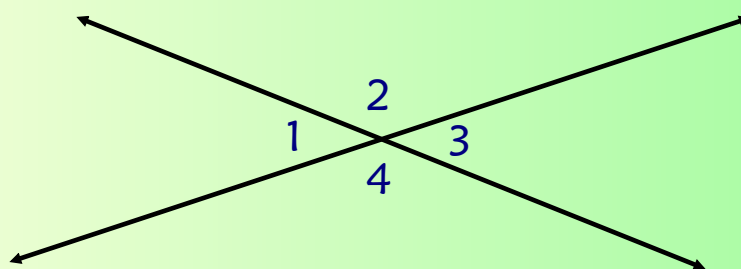
Example 1

2 angles that make a straight line
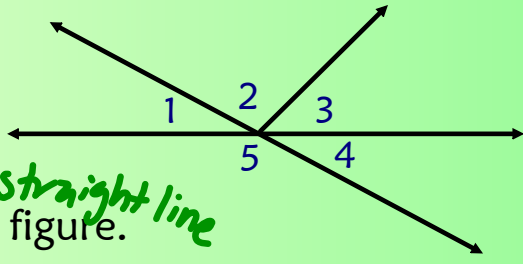
a) Identify all linear pairs in the figure.

$$\angle 4 \, \text{\&} \, \angle 5 \qquad \angle 1 \, \text{\&} \, \angle 5$$

b) Identify all pairs of vertical angles in the figure.

$$\angle 1 \, \text{\&} \, \angle 4$$

Example 2
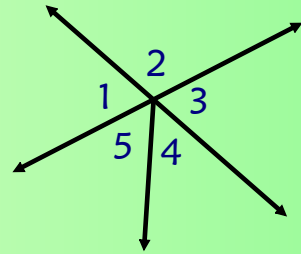
a) Identify all linear pairs in the figure.

$$\angle 1 \, \text{\&} \, \angle 2 \qquad \angle 2 \, \text{\&} \, \angle 3$$

b) Identify all pairs of vertical angles in the figure.

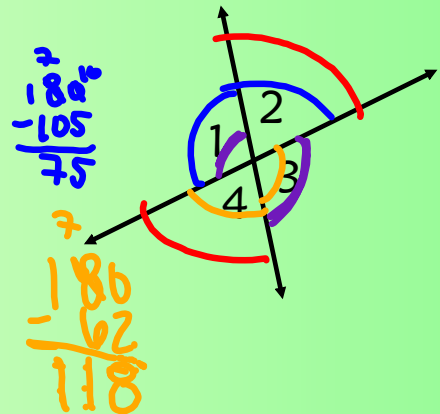$$\angle 1 \, \text{\&} \, \angle 3$$

Vertical angles are <u>congruent</u>. "equal"

add

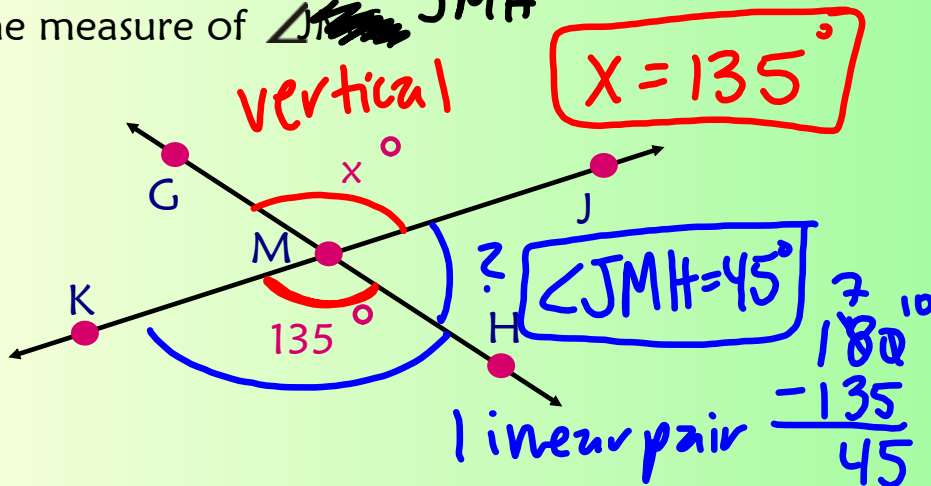The [sum] of the measures of the angles
in a linear pair is 180.

<u>Example 3</u>
Use the figure to the right to fill in the blanks.

a) If m∠2 = 40°, then m ∠4 = __40°__. *vertical*

b) If m∠1 = 105°, then m ∠2 = __75°__. *linear pair*
$$\begin{array}{r} 180 \\ -105 \\ \hline 75 \end{array}$$

c) If m∠3 = 97°, then m ∠1 = __97°__. *vertical*

d) If m∠4 = 62°, then m ∠3 = __118°__. *linear pair*
$$\begin{array}{r} 180 \\ -62 \\ \hline 118 \end{array}$$

<u>Example 4</u>
In the figure, GH and JK intersect at M. Find the value of x
and the measure of ∠ ~~JMH~~ JMH

vertical $\boxed{X = 135°}$

G

x°

M

K

135°

J

? $\boxed{∠JMH = 45°}$

H

linear pair
$$\begin{array}{r} 180 \\ -135 \\ \hline 45 \end{array}$$

Example 5
Suppose m∠GMJ = x and m ∠JMH = 76.
Find the value of x.

$x = 104°$

linear pair

180
$- 76$
104
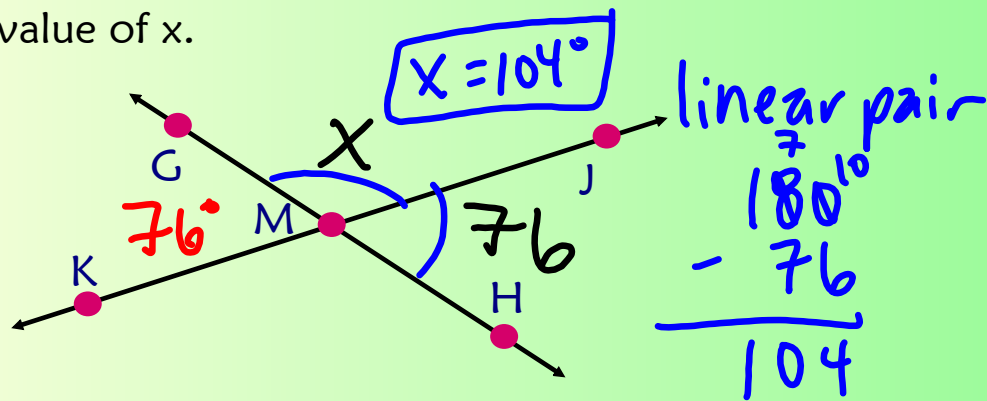
Two angles whose measures have a sum of 180 are called supplementary angles. If the sum of their measures is 90, they are called complementary angles.

Since we have learned that the sum of the measures of a linear pair is 180, we can now say that any two angles that form a linear pair must be supplementary angles .

Example 6

a) Name a pair of complementary angles.   *add to 90°*   ∠CAB & ∠RST
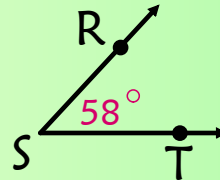
b) Name a pair of supplementary angles.   *add to 180°*   ∠CAD & ∠RST
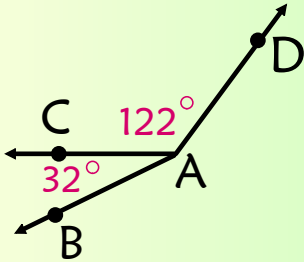
c) Name a pair of adjacent angles.   *side by side*

∠CAD & ∠CAB

Example 7

a) Given that ∠1 is a complement of ∠2   *add to 90°*
and m∠1 = 62°, find m∠2.

$$90 - 62 = \boxed{28°}$$

b) Given that ∠3 is a supplement of ∠4   *add to 180°*
and m∠4 = 114°, find m∠3.

$$180 - 114 = \boxed{66°}$$