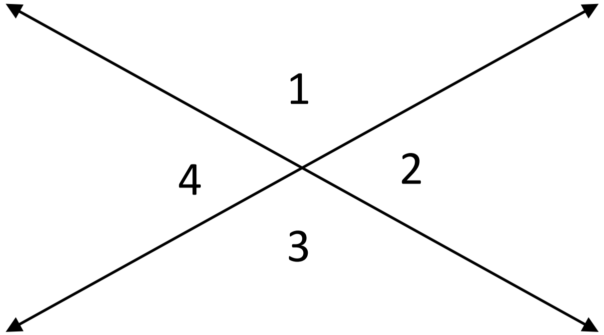
Chapter 1
Basics of Geometry

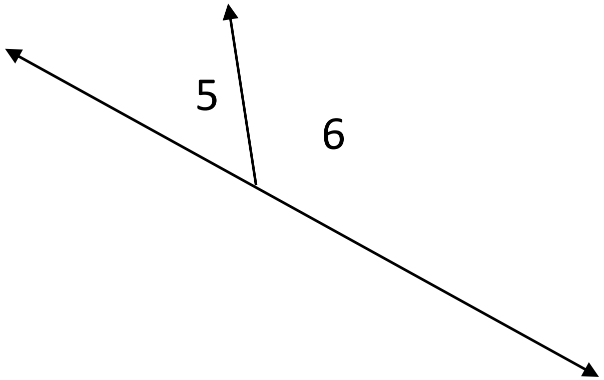
Section 6
Angle Pair Relationships

Two angles are __vertical angles__ if their sides form two pairs of opposite rays. (PERFECT X)

Two adjacent angles are a __linear pair__ if their noncommon sides are opposite rays.



<1 and <3 are vertical angles.
<2 and <4 are vertical angles.

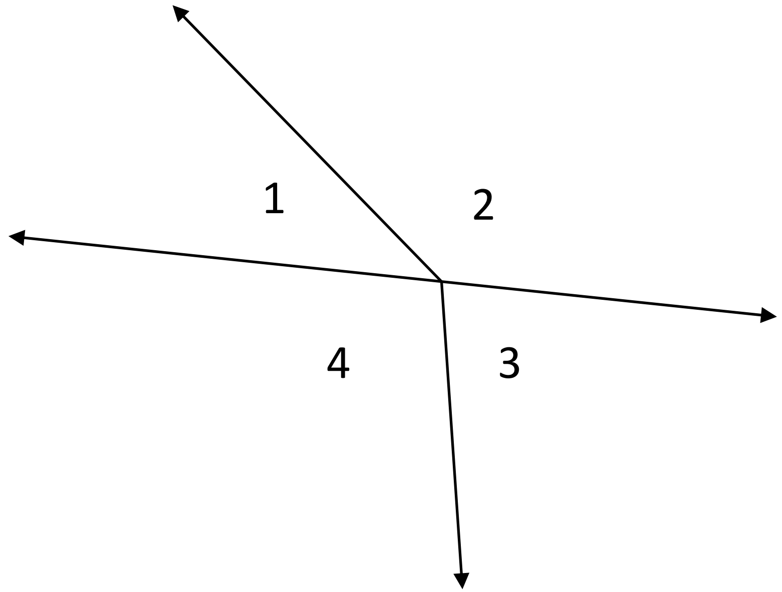


< 5 and <6 are a linear pair.

In this book, you can assume from a diagram that two adjacent angles form a linear pair if the noncommon sides appear to lie on the same line.

Example 1: Identifying Vertical Angles and Linear Pairs

a. Are <2 and <3 a linear pair?
   no



a. Are <3 and <4 a linear pair?
   yes

a. Are <1 and <3 vertical angles?
   no (no perfect X)

a. Are <2 and <4 vertical angles?
   no (no perfect X)

Note:

1) Vertical angles are congruent

2) The sum of the measures of angles that form a linear pair is 180°.

We will discuss this more in Chapter 2.

Example 2: Finding Angle Measures

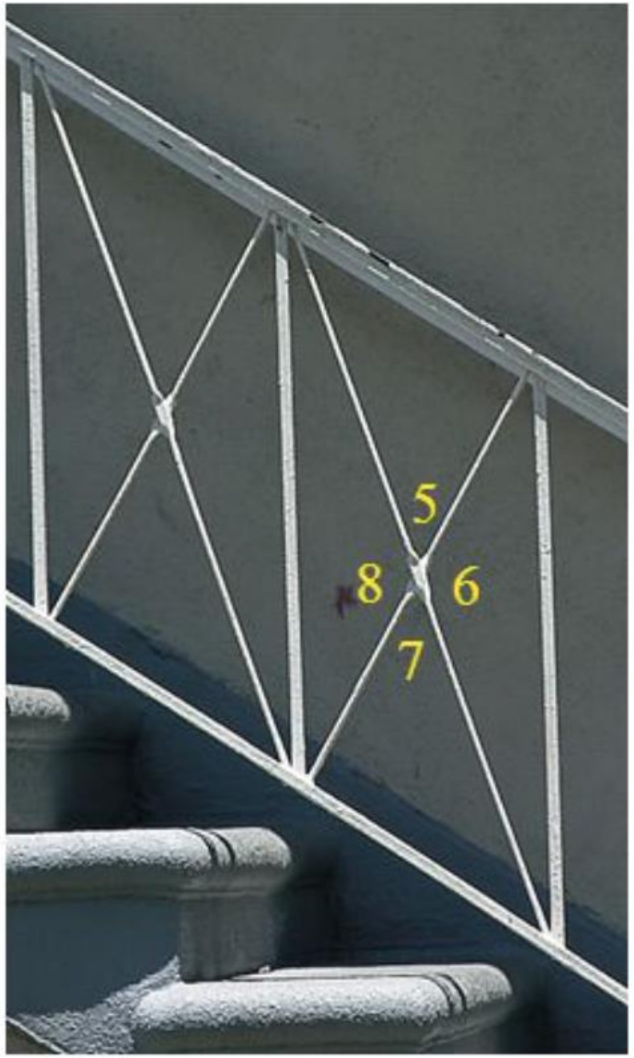
In the stair railing shown at the right, <6 has a measure of 130°. Find the measures of the other three angles.

m<7 → 50*　　(linear pair w/ <6 → 180 – 130)

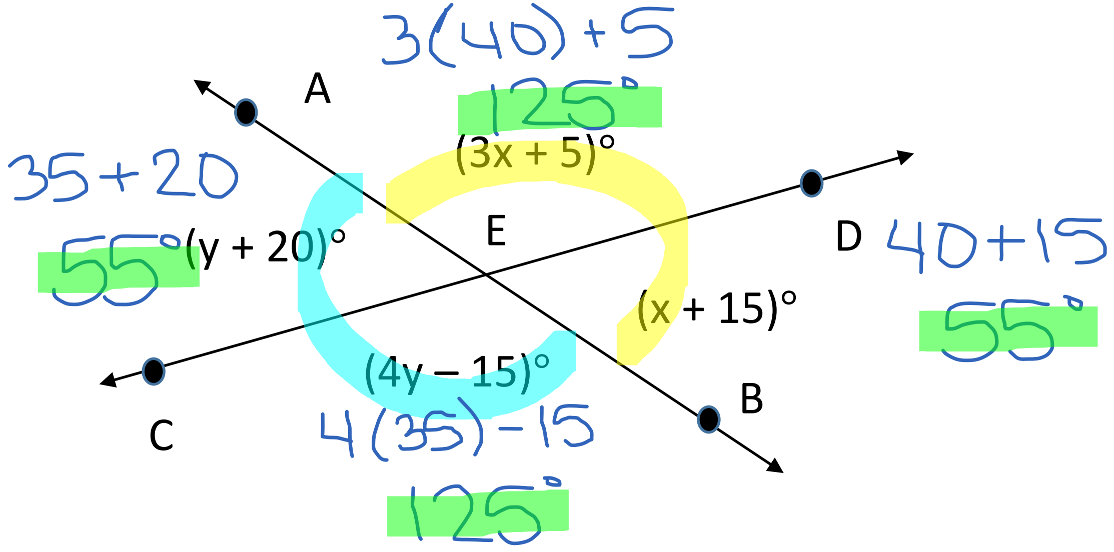
m<8 → 130*　　(vertical angle w/ <6)

m<5 → 50*　　(vertical angle w/ <7)

OR (linear pair w/ <6 → 180 – 130)



Example 3: Finding Angle Measures



Solve for x and y. Then find the angle measures.

$3x + 5 + x + 15 = 180$

$4x + 20 = 180$

$\quad -20 \quad -20$

$\frac{\cancel{4}x}{\cancel{4}} = \frac{160}{4}$

$x = 40$

$y + 20 + 4y – 15 = 180$

$5y + 5 = 180$

$\quad -5 \quad -5$

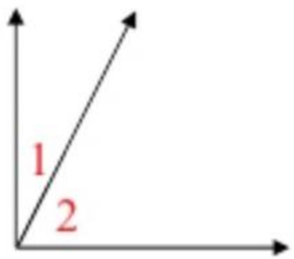
$\frac{\cancel{5}y}{\cancel{5}} = \frac{175}{5}$

$y = 35$

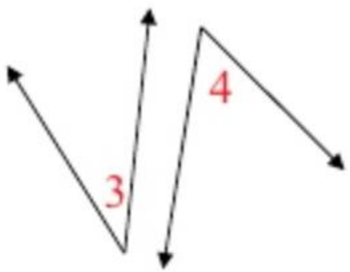
GOAL 2: Complementary and Supplementary Angles

Two angles are ___complementary___ if the sum of their measures is 90°. Each angle is the __complement__ of the other. Complementary angles can be adjacent or nonadjacent.

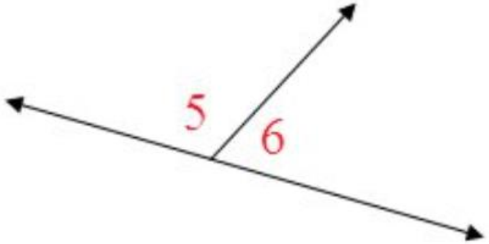
Two angles are __supplementary__ if the sum of their measures is 180°. Each angle is the __supplement__ of the other. Supplementary angles can be adjacent or nonadjacent.



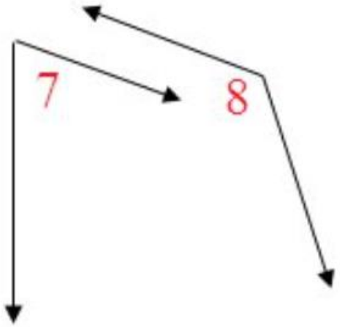
complementary
adjacent



complementary
nonadjacent



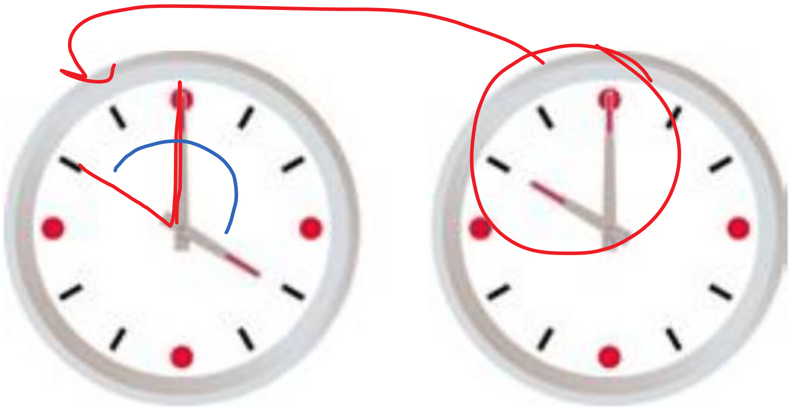
supplementary
adjacent



supplementary
nonadjacent

Example 4: Identifying Angles

State whether the two angles are complementary, supplementary, or neither.



Supplementary

Example 5: Finding Measures of Complements and Supplements

a. Given that <A is a complement of <C and m<A = 47°, find m<C.

90 – 47 = 43

m<C = 43*

b. Given that <P is a supplement of <R and m<R = 36°, find m<P.

180 – 36 = 144

m<P = 144*

Example 6: Finding the Measure of a Complement

<W and <Z are complementary. The measure of <Z is five times the measure of <W. Find m<W.

$$w + z = 90 \qquad z = 5w$$

$$w + 5w = 90$$

$$\frac{6w}{6} = \frac{90}{6}$$

$$w = 15$$

$$m\angle W = 15^\circ$$

$$m\angle Z = 75^\circ$$