Bellwork

Simplify each expression.

1. $90 - (x + 20)$ $70 - x$

2. $180 - (3x - 10)$ $190 - 3x$

3. Ray BD bisects angle ABC, the measure of angle ABC equals 4x + 5, and the measure of angle ABD equals 3x – 1. What is the value of x?

Objectives

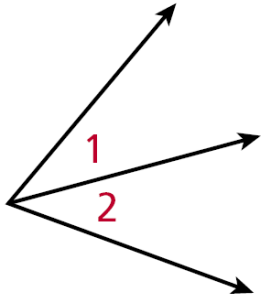
Identify adjacent, vertical, complementary, and supplementary angles.

Find measures of pairs of angles.

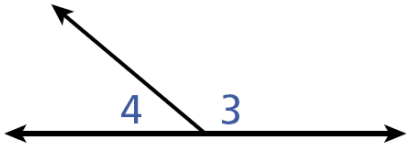
1-4 Pairs of Angles

Pairs of Angles

Adjacent angles are two angles in the same plane with a common vertex and a common side, but no common interior points. ∠1 and ∠2 are adjacent angles.



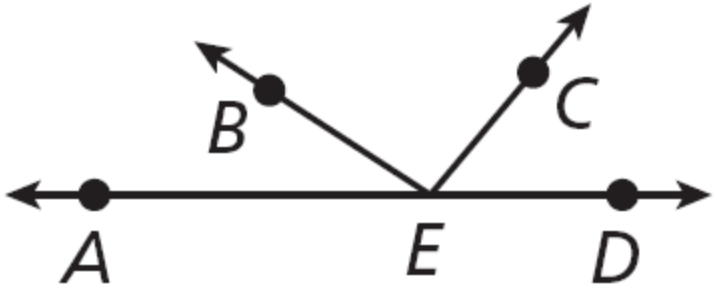
A **linear pair** of angles is a pair of adjacent angles whose noncommon sides are opposite rays. ∠3 and ∠4 form a linear pair.



Example 1A: Identifying Angle Pairs

Tell whether the angles are only adjacent, adjacent and form a linear pair, or not adjacent.

∠AEB* and *∠BED

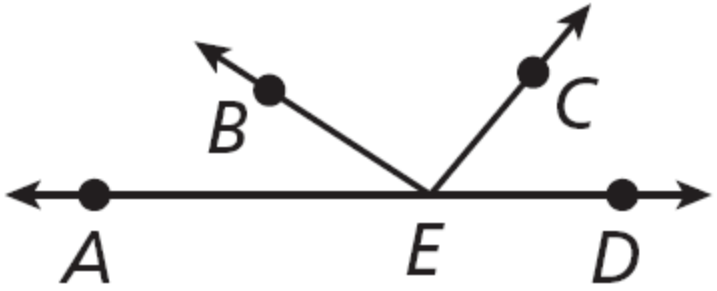


∠AEB and *∠BED* have a common vertex, *E*, a common side, $\overrightarrow{EB}$, and no common interior points. Their noncommon sides, $\overrightarrow{EA}$ and $\overrightarrow{ED}$, are opposite rays. Therefore, *∠AEB* and *∠BED* are adjacent angles and form a linear pair.

Example 1B: Identifying Angle Pairs

Tell whether the angles are only adjacent, adjacent and form a linear pair, or not adjacent.

$\angle AEB$ and $\angle BEC$

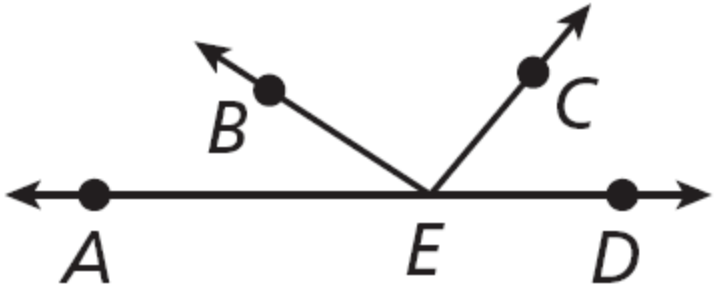


$\angle AEB$ and $\angle BEC$ have a common vertex, E, a common side, $\overrightarrow{EB}$, and no common interior points. Therefore, $\angle AEB$ and $\angle BEC$ are only adjacent angles.

Example 1C: Identifying Angle Pairs

Tell whether the angles are only adjacent, adjacent and form a linear pair, or not adjacent.

$\angle DEC$ and $\angle AEB$

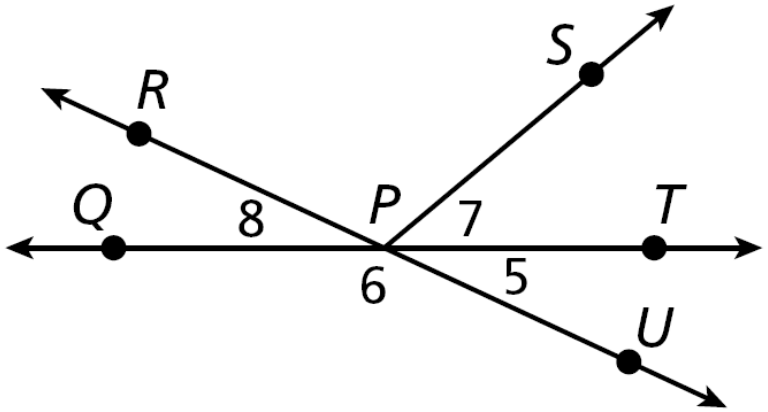


$\angle DEC$ and $\angle AEB$ share E but do not have a common side, so $\angle DEC$ and $\angle AEB$ are not adjacent angles.

Check It Out! Example 1a

Tell whether the angles are only adjacent, adjacent and form a linear pair, or not adjacent.

∠5 and ∠6

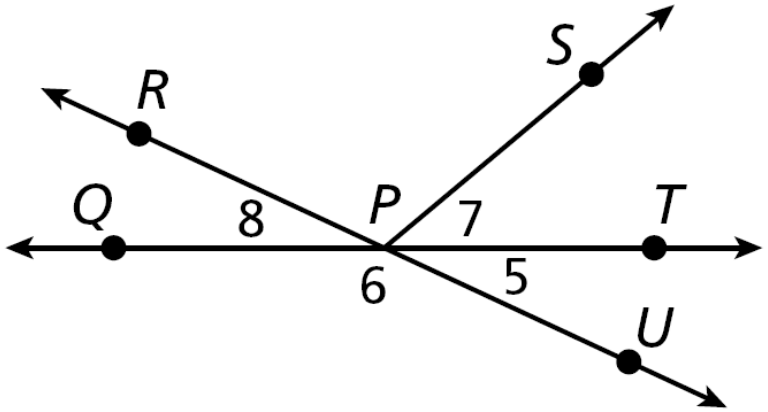


∠5 and ∠6 are adjacent angles. Their noncommon sides, $\overrightarrow{EA}$ and $\overrightarrow{ED}$, are opposite rays, so ∠5 and ∠6 also form a linear pair.

Check It Out! Example 1b

Tell whether the angles are only adjacent, adjacent and form a linear pair, or not adjacent.

∠7 and ∠*SPU*

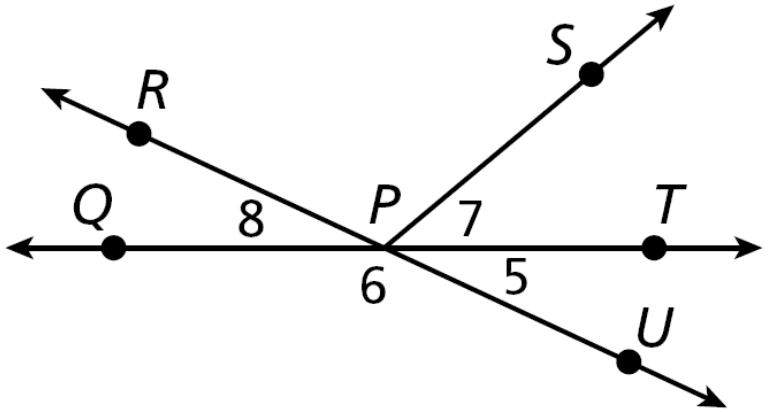


∠7 and ∠*SPU* have a common vertex, *P*, but do not have a common side. So ∠7 and ∠*SPU* are not adjacent angles.

Check It Out! Example 1c

Tell whether the angles are only adjacent, adjacent and form a linear pair, or not adjacent.

∠7 and ∠8



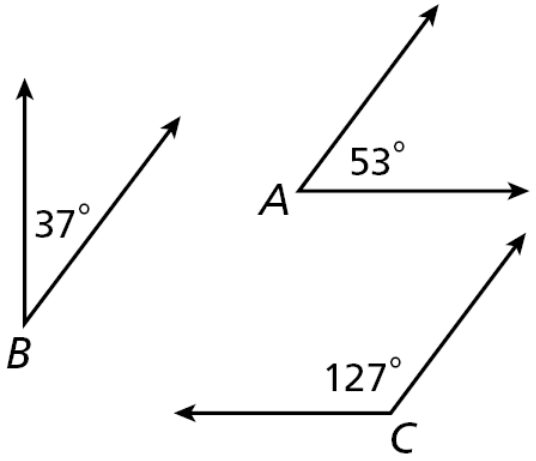
∠7 and ∠8 have a common vertex, *P*, but do not have a common side. So ∠7 and ∠8 are not adjacent angles.

1-4 Pairs of Angles

Complementary and Supplementary Angles

Complementary angles are two angles whose measures have a sum of 90°.
$\angle A$ and $\angle B$ are complementary.

Supplementary angles are two angles whose measures have a sum of 180°.
$\angle A$ and $\angle C$ are supplementary.



You can find the complement of an angle that measures $x°$ by subtracting its measure from 90°, or $(90 - x)°$.

You can find the supplement of an angle that measures $x°$ by subtracting its measure from 180°, or $(180 - x)°$.

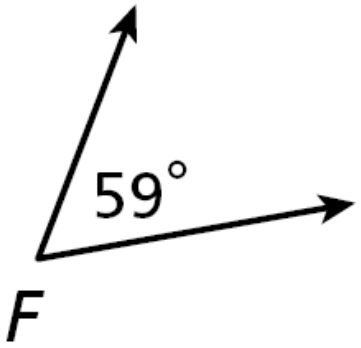
Example 2: Finding the Measures of Complements and Supplements

Find the measure of each of the following.

A. complement of $\angle F$

$(90 - x)°$

$90° - 59° = 31°$

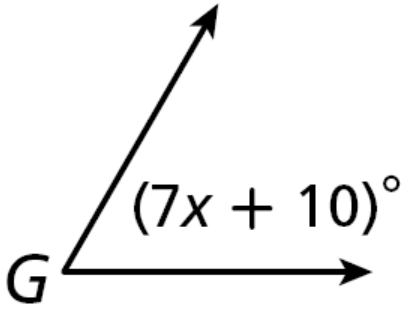


B. supplement of $\angle G$

$(180 - x)°$

$180 - (7x+10)° = 180° - 7x - 10$

$= (170 - 7x)°$



Check It Out! Example 2

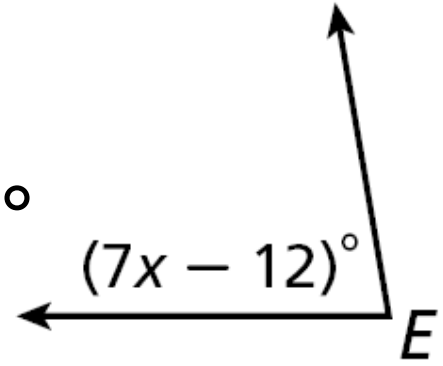
Find the measure of each of the following.

a. complement of $\angle E$

$(90 - x)°$

$90° - (7x - 12)° = 90° - 7x° + 12°$

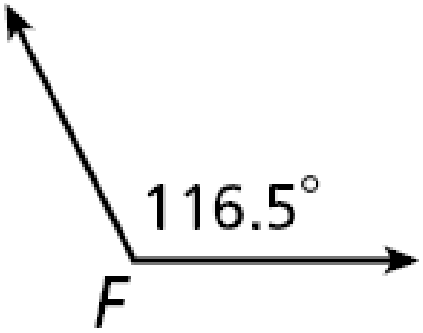
$= (102 - 7x)°$



b. supplement of $\angle F$

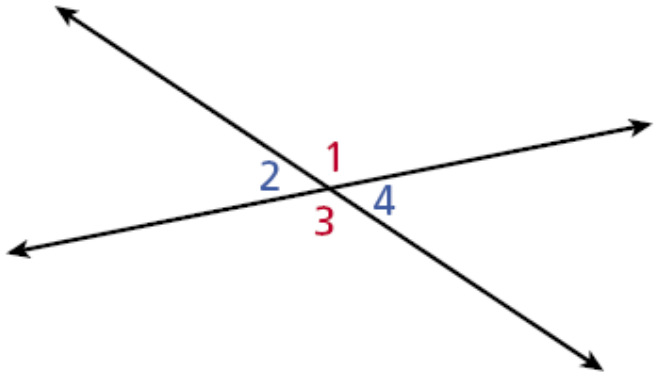
$(180 - x)°$

$180° - 116.5° = 63\frac{1}{2}°$



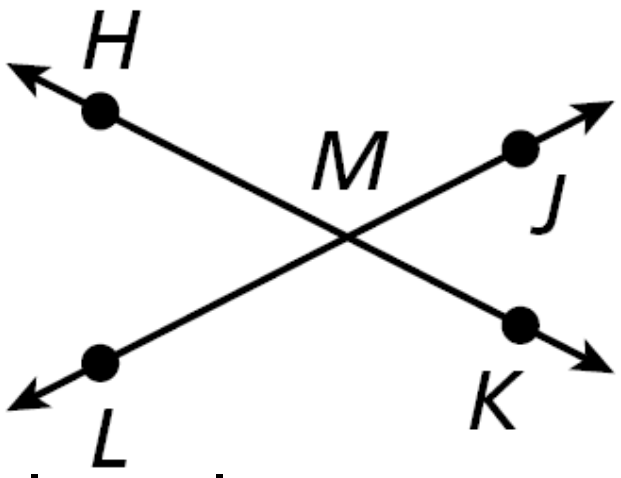
1-4 Pairs of Angles

Another angle pair relationship exists between two angles whose sides form two pairs of opposite rays. **Vertical angles** are two nonadjacent angles formed by two intersecting lines. ∠**1** and ∠**3** are vertical angles, as are ∠**2** and ∠**4**.



Example 5: Identifying Vertical Angles

Name the pairs of vertical angles.



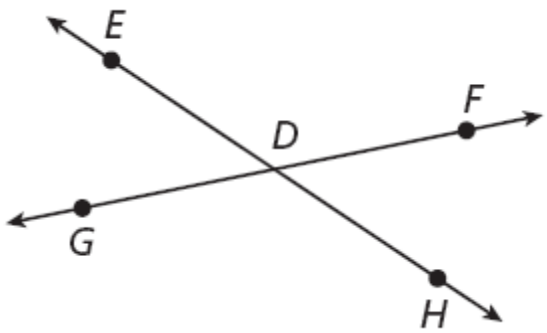
$\angle HML$ and $\angle JMK$ are vertical angles.
$\angle HMJ$ and $\angle LMK$ are vertical angles.

Check $m\angle HML \approx m\angle JMK \approx 60°$.
$m\angle HMJ \approx m\angle LMK \approx 120°$.

Check It Out! Example 5

Name a pair of vertical angles. Do they appear to have the same measure? Check by measuring with a protractor.

$\angle EDG$ and $\angle FDH$ are vertical angles and appear to have the same measure.



Check $m\angle EDG \approx m\angle FDH \approx 45°$

Lesson Quiz: Part I

m∠*A* = 64.1°, and m∠*B* =(4*x* – 30)°. Find the measure of each of the following.

1. supplement of ∠A 115.9°

2. complement of ∠*B* (120 – 4*x*) °

3. Determine whether this statement is true or false. If false, explain why. *If two angles are complementary and congruent, then the measure of each is 90°.*

False; each is 45°.

Lesson Quiz: Part II

m∠*XYZ* = 2*x*° and m∠*PQR* = (8*x* - 20)°.

4. If ∠*XYZ* and ∠*PQR* are supplementary, find the measure of each angle.

40°; 140°

5. If ∠*XYZ* and ∠*PQR* are complementary, find the measure of each angle.

22°; 68°

HOMEWORK

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