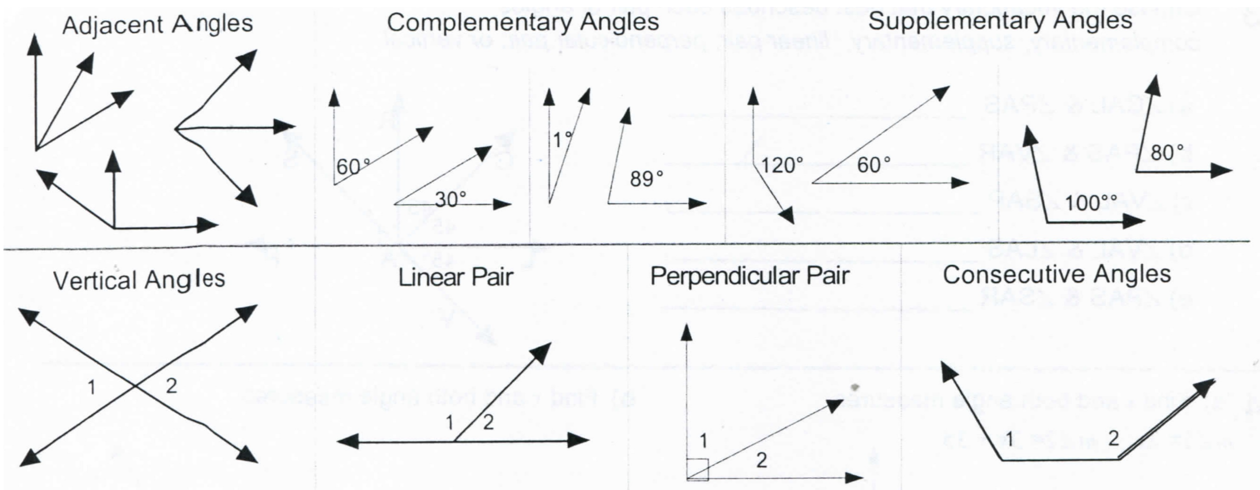
DAY23

GOAL:	**Use Definitions, Postulates, Properties and Theorems to prove other shortcuts for measuring.**

GEOMETRIC POSTULATES;	Basic rules for measuring
Ruler Postulate	Distance = | a – b |
Segment Addition Postulate	If B is between A and C then AB + BC = AC
Protractor Postulate	Angle Measure = |a – b|
Angle Addition Postulate	If B is in the interior of $\angle$AOC, then m$\angle$AOB + m$\angle$BOC = m$\angle$AOC
ALGEBRAIC PROPERTIES	Addition, Subtraction, Multiplication, Division, Reflexive, Symmetric, Transitive.
CONGRUENCE PROPERTIES	Reflexive, Symmetric, Transitive



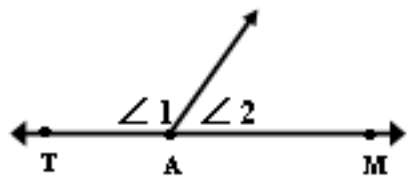
DEFINITIONS	**USED IN PROOFS**
Straight Angle Definition:	An angle is a straight angle iff its measure is 180
Linear Pair Definition:	Two angles form a linear pair iff non-shared sides form a straight angle.
Perpendicular Pair	Two angles form a perpendicular pair iff non-shared sides form a right angle.
Supplementary Angles Definition:	The measure of two angles adds up to 180 iff the angles are supplementary.
Complementary Angles Definition:	The measure of two angles adds up to 90 iff the angles are complementary.
Vertical Angles	Two angles are vertical angles iff their sides form two pairs of opposite rays.

THEOREMS: Have to be proven before being used

TO PROVE THEOREMS

1. Start with the given information.
2. Use a Definition to explain the given information.
3. Reason back from what you would like to prove using Definitions, Properties, Postulates and Theorems that have already been proven.
4. Conclude with what needs to be proven.

LINEAR PAIR THEOREM: If two angles form a linear pair, then the angles are supplementary.



GIVEN: $\angle 1$ and $\angle 2$ form a linear pair

PROVE: $\angle 1$ and $\angle 2$ are supplementary

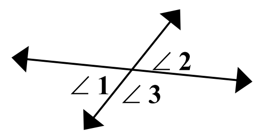
STATEMENT	REASONS
1. $\angle 1$ and $\angle 2$ form a linear pair.	Given
2. $\angle TAM$ is a straight angle.	Linear Pair Definition (Two angles form a linear pair iff their non-shared sides form a straight angle)
3. $m\angle TAM = 180^\circ$	Straight Angle Definition (An angle is a straight angle iff its measure is 180)
4. $m\angle 1 + m\angle 2 = m\angle TAM$	Angle Addition Postulate
5. $m\angle 1 + m\angle 2 = 180^\circ$	Substitution
6. $\angle 1$ and $\angle 2$ are supplementary angles	Supplementary Angle Definition (The measure of two angles is 180 iff the angles are supplementary)

TO PROVE THEOREMS

1. Start with the given information.
2. Use a Definition to explain the given information.
3. Reason back from what you would like to prove using Definitions, Properties, Postulates and Theorems that have already been proven.
4. Conclude with what needs to be proven

LINEAR PAIR THEOREM: If two angles form a linear pair, then the angles are supplementary.

VERTICAL ANGLES THEOREM: If two angles are vertical angles, then the angles have equal measures.



GIVEN: $\angle 1$ and $\angle 2$ are vertical angles
PROVE: $\angle 1$ and $\angle 2$ have equal measures

STATEMENT	REASONS
1. $\angle 1$ and $\angle 2$ are vertical angles	Given
2. $\angle 1$ and $\angle 3$ form a linear pair $\angle 2$ and $\angle 3$ form a linear pair	Linear Pair Definition (Two angles form a linear pair iff their non-shared sides form a straight angle)
3. $\angle 1$ and $\angle 3$ are supplementary $\angle 2$ and $\angle 3$ are supplementary	Linear Pair Theorem (If two angles form a linear pair then they are supplementary)
4. $m\angle 1 + m\angle 3 = 180^\circ$ $m\angle 2 + m\angle 3 = 180^\circ$	Supplementary Angle Definition (The measure of two angles is 180 iff the angles are supplementary)
5. $m\angle 1 = 180^\circ - m\angle 3$ $m\angle 2 = 180^\circ - m\angle 3$	Subtraction Prop. of Equality
6. $m\angle 1 = m\angle 2$	Substitution

LINEAR PAIR THEOREM: If two angles form a linear pair, then the angles are supplementary

VERTICAL ANGLES THEOREM: If two angles are vertical angles, they have equal measures

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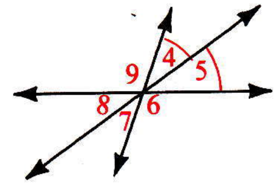
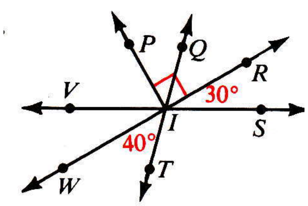
Class Discussion



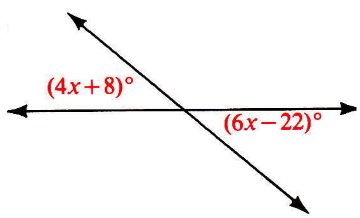
1. In the diagram, $\angle 4 \cong \angle 5$. Name two other angles congruent to $\angle 5$

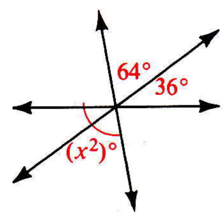
2.



a. $m\angle QIR =$ ___?___
b. $m\angle PIQ =$ ___?___
c. $m\angle VIT =$ ___?___
d. $m\angle VIQ =$ ___?___
e. $m\angle SIT =$ ___?___

3. Find the value of X



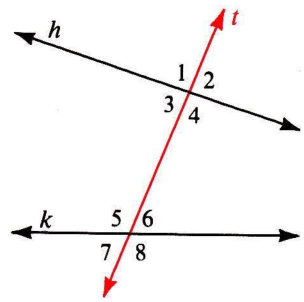


Corresponding Angles, Alternate Interior Angles, Alternate Exterior Angles, Same Side Interior Angles, Same Side Exterior Angles

Angles formed by a transversal line and two coplanar lines.

A **transversal** is a line that intersects two or more coplanar lines in different points. In the next diagram, *t* is a transversal of *h* and *k*. The angles formed have special names.

Interior angles: angles 3, 4, 5, 6 *Exterior angles:* angles 1, 2, 7, 8



Alternate interior angles (alt. int. ∠s) are two nonadjacent interior angles on opposite sides of the transversal.

∠3 and ∠6 ∠4 and ∠5

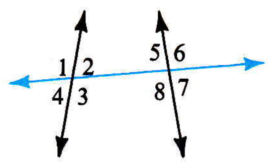
Same-side interior angles (s-s. int. ∠s) are two interior angles on the same side of the transversal.

∠3 and ∠5 ∠4 and ∠6

Corresponding angles (corr. ∠s) are two angles in corresponding positions relative to the two lines.

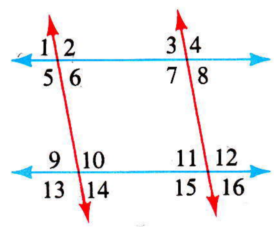
∠1 and ∠5 ∠2 and ∠6 ∠3 and ∠7 ∠4 and ∠8

Classroom Exercises



1. The blue line is a transversal.
  a. Name four pairs of corresponding angles.
  b. Name two pairs of alternate interior angles.
  c. Name two pairs of same-side interior angles.

Classify each pair of angles as alternate interior angles, same-side interior angles, corresponding angles, or none of these.



2. ∠2 and ∠4
3. ∠6 and ∠10
4. ∠7 and ∠15
5. ∠7 and ∠12
6. ∠7 and ∠10
7. ∠14 and ∠15
8. ∠11 and ∠14
9. ∠1 and ∠11

10. Name alternate exterior angles.

11. Name same side exterior angles.

CORRESPONDING ANGLES POSTULATE

IF TWO PARALLEL LINES ARE CUT BY A TRANSVERSAL

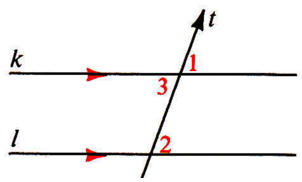
THEN CORRESPONDING ANGLES ARE CONGRUENT

Given: Parallel Lines cut by a Transversal

If k || l, then $\angle 1 \cong \angle 2$

Conclude: Alternate Interior Angles are Congruent

(Corresponding Angles Postulate)



ALTERNATE INTERIOR ANGLE THEOREM

IF TWO PARALLEL LINES ARE CUT BY A TRANSVERSAL

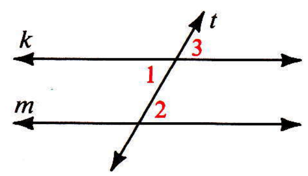
THEN ALTERNATE INTERIOR ANGLES ARE CONGRUENT

Given: Parallel Lines cut by a Transversal

If k || l, then $\angle 1 \cong \angle 2$

Conclude: Alternate Interior Angles are Congruent

(Alternate Interior Angle Theorem)



ALTERNATE EXTERIOR ANGLE THEOREM

IF TWO PARALLEL LINES ARE CUT BY A TRANSVERSAL

THEN ALTERNATE INTERIOR ANGLES ARE CONGRUENT

Given: Parallel Lines cut by a Transversal

Conclude: Alternate Exterior Angles are Congruent

SAME SIDE INTERIOR ANGLE THEOREM

IF TWO PARALLEL LINES ARE CUT BY A TRANSVERSAL

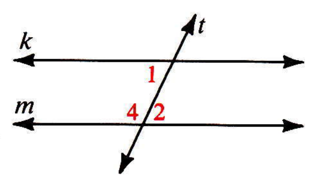
THEN SAME SIDE INTERIOR ANGLES ARE CONGRUENT

Given: Parallel Lines cut by a Transversal

If k || l, then $\angle 1 \cong \angle 4$

Conclude: Same Side Interior Angles are Supplementary

(Same Side Interior Angle Theorem)



SAME SIDE EXTERIOR ANGLE THEOREM

IF TWO PARALLEL LINES ARE CUT BY A TRANSVERSAL

THEN SAME SIDE INTERIOR ANGLES ARE CONGRUENT

Given: Parallel Lines cut by a Transversal

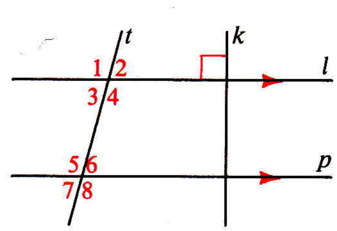
Conclude: Same Side Exterior Angles are Supplementary

CW#23

If l || p cut by transversal t, which angle pairs are Corresponding Angles, Alternate Interior Angles, Alternate Exterior Angles, Same Side Interior Angles, Same Side Exterior Angles?

Which angle pairs are congruent?

Which angle pairs are supplementary?



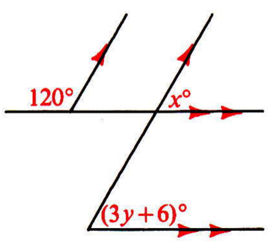
Exs. 1–11

1. What do the arrowheads in the diagram tell you?
2. a. How are lines k and l related?
   b. How are lines k and p related? Why?

State the postulate or theorem that justifies each statement.

3. $\angle 1 \cong \angle 5$
4. $\angle 3 \cong \angle 6$
5. $m\angle 4 + m\angle 6 = 180$
6. $m\angle 4 = m\angle 8$
7. $m\angle 4 = m\angle 5$
8. $\angle 6 \cong \angle 7$
9. $k \perp p$
10. $\angle 3$ is supplementary to $\angle 5$.
11. If $m\angle 1 = 130$, what are the measures of the other numbered angles?

12. Find the values of x and y.



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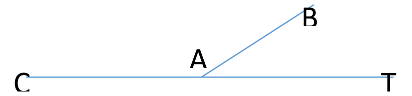


PIL 03Linear Pair Theorem Proof

If two angles form a linear pair,

Then the angles are supplementary.

Given: **∠CAB and ∠BAT form a linear pair.**
& ∠CAT forms a straight angle
Prove: **∠CAB and ∠BAT are supplementary.**

∠ CAB and∠BAT are supplementary
Given
∠ CAT is a straight angle.
Definition of Supplementary The measure of two angles sums to 180° iff the angles are supplementary.
m∠CAB + m ∠BAT = 180°
Definition of Straight Angle If an angle is a straight angle, then its measure is 180°.
Angle Addition Postulate If two angles are adjacent, then the sum of their individual measures equals the measure of the angle formed by their non-shared sides
∠CAB and ∠BAT form linear pair
Given
m∠CAB + m ∠BAT = m∠ CAT
m∠ CAT = 180°
Substitution Property of Equality If a + b = c and c = d then a+b = d

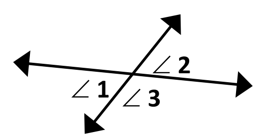
Statements	Reasons

PIL04

∠1 and ∠ 3 form a linear pair ∠2 and ∠ 3 form a linear pair
m∠ 1 + m ∠ 3 = 180° m∠ 2 + m ∠ 3 = 180°
Linear Pair Theorem If two angles form a linear pair, then they are supplementary.
m∠1 = 180° - m ∠ 3 m∠ 2 = 180° - m ∠ 3
Given
m∠ 1 = m∠ 2 (∠ 1 and ∠ 2 have equal measures)
Definition of Linear Pair Two angles form a linear pair iff their non-shared sides form a straight angle
∠ 1 and ∠ 3 are supplementary ∠ 2 and ∠ 3 are supplementary
Subtraction Property of Equality If the same number is subtracted from both sides of an equation, Then the new equation is equivalent to the original.
∠1 and ∠ 2 are vertical angles
Definition of Supplementary The measure of two angles sums to 180° iff the angles are supplementary.

Vertical Angles Theorem

If two angles are vertical angles
Then they have equal measures,



Given ∠ 1 and ∠ 2 are vertical Angles
Prove that ∠ 1 and ∠ 2 have equal measures.

Statements	Reasons

Substitution Property of Equality
Substitute (m∠ 1) for (180° - m ∠ 3)
in m∠ 2 = (180° - m ∠ 3)

HW#23

If c || d cut by transversal a, which angle pairs are Corresponding Angles, Alternate Interior Angles, Alternate Exterior Angles, Same Side Interior Angles, Same Side Exterior Angles?

Which angle pairs are congruent?

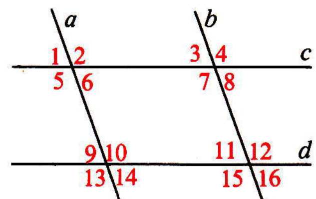
Which angle pairs are supplementary?

Show your work.

A

1. If $a \parallel b$, name all angles that must be congruent to $\angle 1$.

2. If $c \parallel d$, name all angles that must be congruent to $\angle 1$.



Exs. 1–6

Assume that $a \parallel b$ and $c \parallel d$.

3. Name all angles congruent to $\angle 4$.

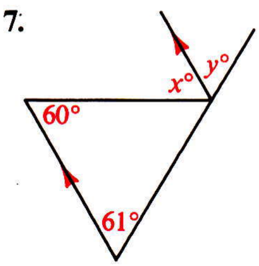
4. Name all angles supplementary to $\angle 4$.

5. If $m\angle 16 = 50$, then $m\angle 14 =$ __?__ and $m\angle 2 =$ __?__.

6. If $m\angle 9 = x$, then $m\angle 12 =$ __?__ and $m\angle 7 =$ __?__.

Find the values of x and y.

7.



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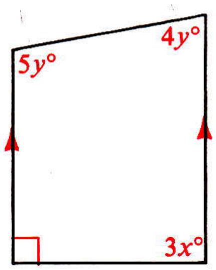

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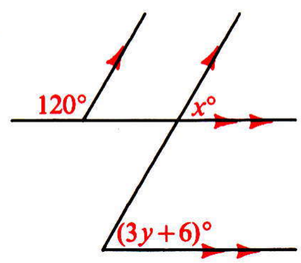

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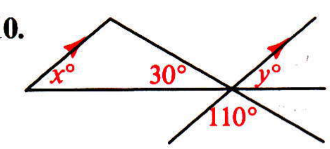

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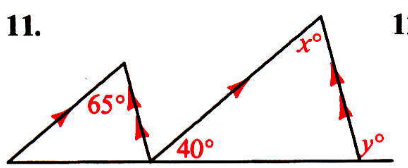

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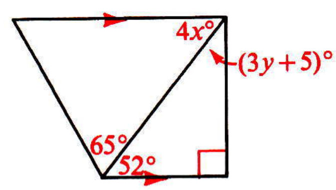

13.