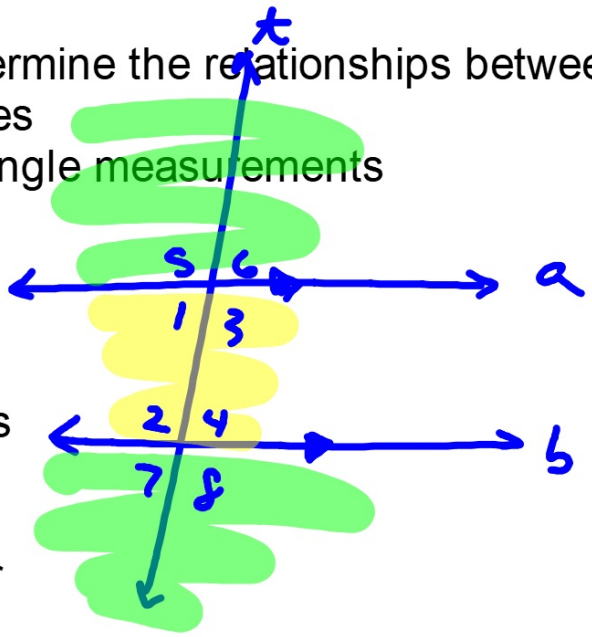
Geometry 3.2

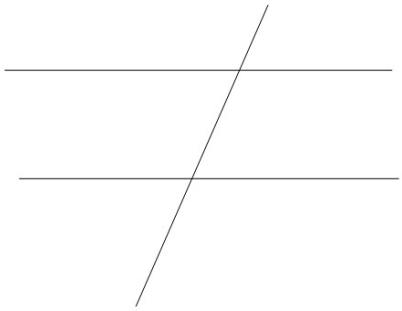
Use theorems to determine the relationships between specific pairs of angles

Use algebra to find angle measurements

transversal
interior angles
exterior angles
corresponding angles
parallel
perpendicular
activity: tracing paper



Each person will need two pieces of tracing paper.
(pencil will work best for this activity)
One one of the pieces:
1. Trace the two sides of your ruler to form two parallel lines
2. Use a straight edge to draw a transversal. (draw the transversal so it is not perpendicular)
3. Number the angles 1-8 as shown

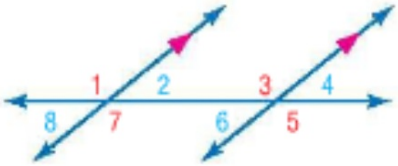


On the other piece of tracing paper:

Postulate 3.1 Corresponding Angles Postulate

If two parallel lines are cut by a transversal, then each pair of corresponding angles is congruent.

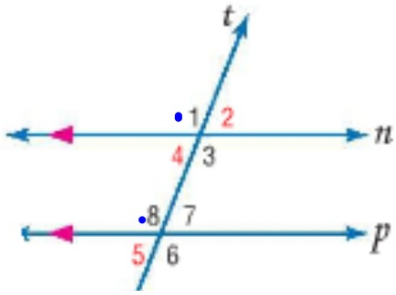
Examples $\angle 1 \cong \angle 3$, $\angle 2 \cong \angle 4$, $\angle 5 \cong \angle 7$, $\angle 6 \cong \angle 8$



Not using a protractor to measure...
Are the lines parallel?
Which angle pairs?

Example 1 Use Corresponding Angles Postulate

In the figure, $m\angle 5 = 72$. Find the measure of each angle. Tell which postulate(s) or theorem(s) you used.



a. $\angle 4$ 72° CA

b. $\angle 2$ 72° VA w. $\angle 4$

$\angle 1$ 108° LP w. $\angle 2$

Guided Practice

In the figure, suppose that $m\angle 8 = 105$. Find the measure of each angle. Tell whi
postulate(s) or theorem(s) you used.

1A. $\angle 1$ 105° CA

1B. $\angle 2$ 75° LP w $\angle 1$

1C. $\angle 3$ 105° VA

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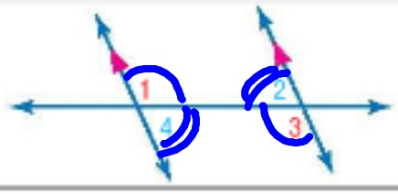
Theorems Parallel Lines and Angle Pairs

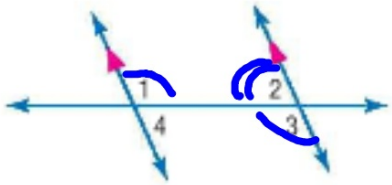
3.1 Alternate Interior Angles Theorem If two parallel lines are cut by a transversal, then each pair of alternate interior angles is congruent.

Examples $\angle 1 \cong \angle 3$ and $\angle 2 \cong \angle 4$



3.2 Consecutive Interior Angles Theorem If two parallel lines are cut by a transversal, then each pair of consecutive interior angles is supplementary.

Examples $\angle 1$ and $\angle 2$ are supplementary.
$\angle 3$ and $\angle 4$ are supplementary.



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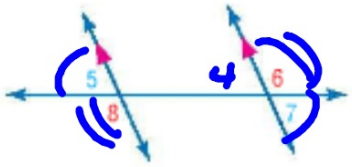
3.3 Alternate Exterior Angles Theorem If two parallel lines are cut by a transversal, then each pair of alternate exterior angles is congruent.

Examples $\angle 5 \cong \angle 7$ and $\angle 6 \cong \angle 8$



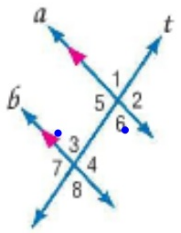
You will prove Theorems 3.2 and 3.3 in Exercises 30 and 35, respectively.

CA → post.

Proof Alternate Interior Angles Theorem

Given: $a \parallel b$
t is a transversal of a and b.

Prove: $\angle 4 \cong \angle 5$, $\angle 3 \cong \angle 6$

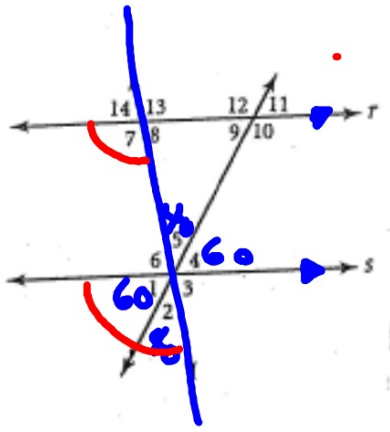


1. a // b	1. given
2. ∠2 ≅ ∠4	2. CA
3. ∠2 ≅ ∠5	3. VA
4. ∠4 ≅ ∠5	4. subs

5. ∠1 ≅ ∠3	5. CA
6. ∠1 ≅ ∠6	6. VA
7. ∠3 ≅ ∠6	7. subs.

Angle chase: handout

In the figure at the right, $r \parallel s$, $m\angle 2 = 40°$, and $m\angle 4 = 60°$. Find the indicated measures.



6. $m\angle 1$ _____ 7. $m\angle 3$ _____

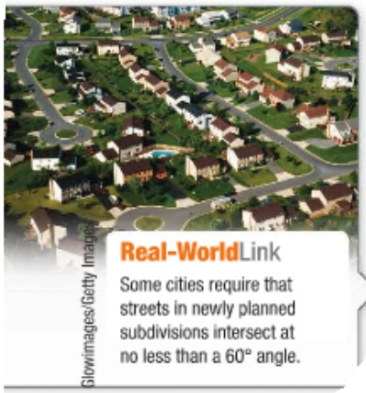
8. $m\angle 5$ _____ 9. $m\angle 6$ _____

10. $m\angle 7$ _____ 11. $m\angle 8$ _____

12. $m\angle 9$ _____ 13. $m\angle 10$ _____

14. $m\angle 11$ _____ 15. $m\angle 12$ _____

16. $m\angle 13$ _____ 17. $m\angle 14$ _____



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Real-WorldLink

Some cities require that streets in newly planned subdivisions intersect at no less than a 60° angle.

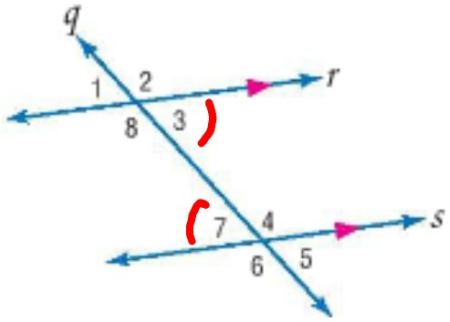
Real-World Example 2 Use Theorems about Parallel Lines

COMMUNITY PLANNING Redding Lane and Creek Road are parallel streets that intersect Park Road along the west side of Wendell Park. If $m\angle 1 = 118$, find $m\angle 2$.

What is the angle relationship???? (decide that first!)

Example 3 Find Values of Variables

ALGEBRA Use the figure at the right to find the indicated variable. Explain your reasoning.



a. If $m\angle 4 = 2x - 17$ and $m\angle 1 = 85$, find x.

$2x - 17 = 95$

$+17 \quad +17$

$2x = 112$

$x = 56$

b. Find y if $m\angle 3 = 4y + 30$ and $m\angle 7 = 7y + 6$.

$4y + 30 = 7y + 6$

$-4y - 6 \quad -4y - 6$

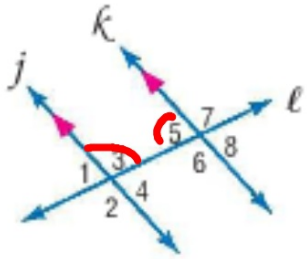
$-24 = 3y$

$\frac{-24}{3} = \frac{3y}{3}$

$y = -8$

3A. If $m\angle 2 = 4x + 7$ and $m\angle 7 = 5x - 13$, find x.

3B. Find y if $m\angle 5 = 68$ and $m\angle 3 = 3y - 2$.



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Theorem 3.4 Perpendicular Transversal Theorem

In a plane, if a line is perpendicular to one of two parallel lines, then it is perpendicular to the other.

Examples If line $a \parallel$ line b and line $a \perp$ line t, then line $b \perp$ line t.