

Geometry 3.2

Watch videos (?) TBA

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/ angle chase

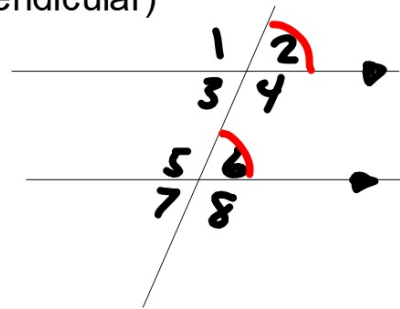
$\begin{matrix} \angle 1 \angle 8 \approx \\ \angle 4 \angle 5 \approx \\ \approx \end{matrix} \left. \vphantom{\begin{matrix} \angle 1 \angle 8 \approx \\ \angle 4 \angle 5 \approx \\ \approx \end{matrix}} \right\} \text{if lines } \parallel$

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

If 2 lines are $//$
then $\text{Corresp } \angle s \cong$

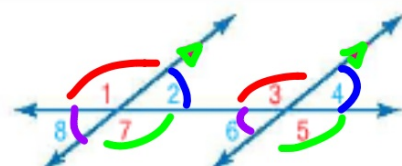


On the other piece of tracing paper:

Postulate 3.1 Corresponding Angles Postulate

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

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

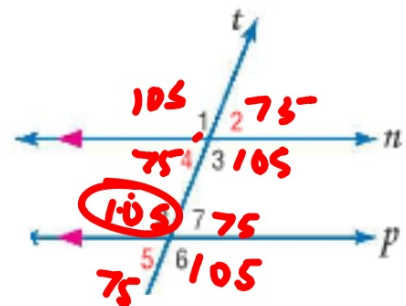


Not using a protractor to measure...
Are the lines parallel?
Which angle pairs?

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. $\angle 4 = 72$ C.A. $n \parallel p$
b. $\angle 2 = 72$ A.E.A.



Guided Practice

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

- 1A. $\angle 1 = 105$ CA
1B. $\angle 2 = 75$ LP $\angle 2 \cong \angle 7$
1C. $\angle 3 = 105$ A.I.A.

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Theorems: Parallel Lines and Angle Pairs

A.I.A.

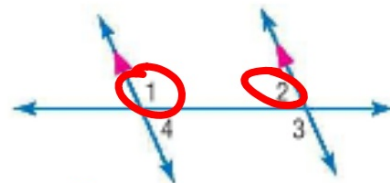
3.1 Alternate Interior Angles Theorem If two parallel lines are cut by a transversal, then each pair of alternate interior angles is **congruent**.

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.

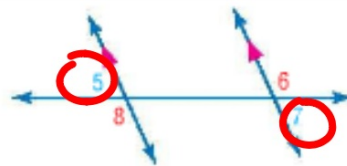


$$\begin{aligned}\angle 2 + \angle 3 &= 180 \\ \angle 2 + \angle 1 &= 180\end{aligned}$$

AeA

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 $\angle 6 \cong \angle 8$

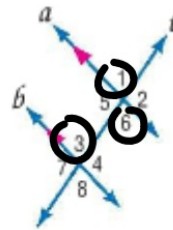


You will prove Theorems 3.2 and 3.3 in Exercises 30 and 35, respectively.

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. $a \parallel b$ t is transv | 1. given |
| 2. $\angle 4 \cong \angle 2$ | 2. CA |
| 3. $\angle 2 \cong \angle 5$ | 3. VA |
| 4. $\angle 4 \cong \angle 5$ | 4. trans |
| 5. $\angle 3 \cong \angle 1$ | 5. CA |
| 6. $\angle 1 \cong \angle 6$ | 6. VA |
| 7. $\angle 3 \cong \angle 6$ | 7. trans |

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3.2

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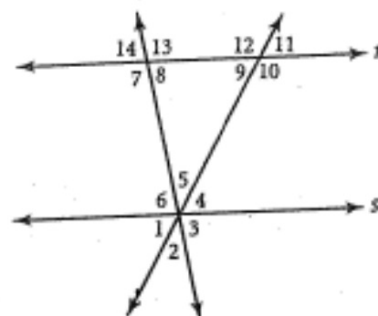
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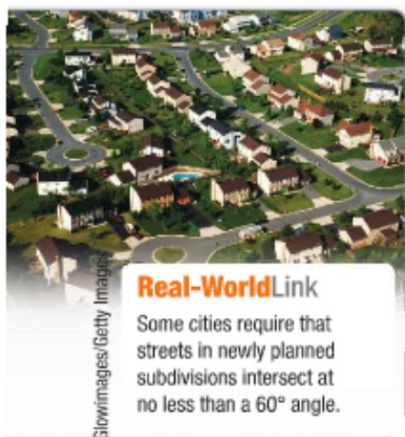
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Angle chase: handout

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

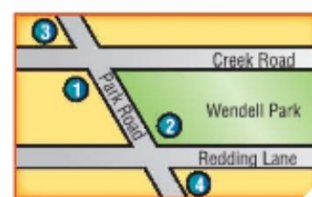
- | | |
|------------------------|------------------------|
| 6. $m\angle 1$ _____ | 7. $m\angle 3$ _____ |
| 8. $m\angle 5$ _____ | 9. $m\angle 6$ _____ |
| 10. $m\angle 7$ _____ | 11. $m\angle 8$ _____ |
| 12. $m\angle 9$ _____ | 13. $m\angle 10$ _____ |
| 14. $m\angle 11$ _____ | 15. $m\angle 12$ _____ |
| 16. $m\angle 13$ _____ | 17. $m\angle 14$ _____ |





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 $m\angle 2$.



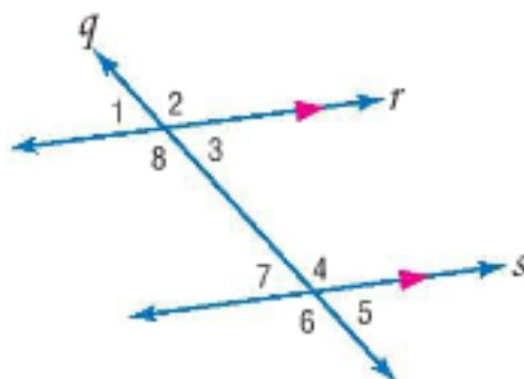
What is the angle relationship???? (decide that first!)

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 .

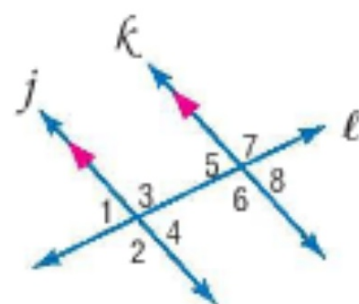
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b. Find y if $m\angle 3 = 4y + 30$ and $m\angle 7 = 7y + 6$.

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

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



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 .

