

Proof Alternate Interior Angles Theorem

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

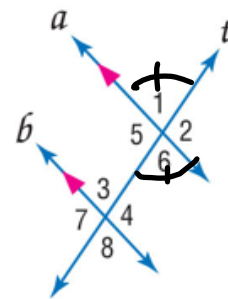
Prove: $\angle 4 \cong \angle 5$, $\angle 3 \cong \angle 6$

Statement

1. $a \parallel b$
2. $\angle 1 \cong \angle 6$
3. $\angle 1 \cong \angle 3$
4. $\angle 3 \cong \angle 6$

Justify

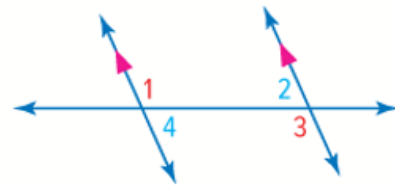
1. given
2. Vert. \angle Thm
3. Corr \angle Post.
4. Trans. Prop.



Theorems Parallel Lines and Angle Pairs

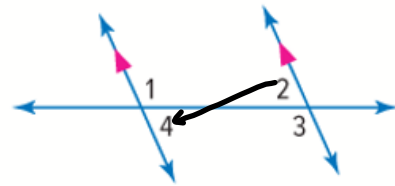
2.14 Alternate Interior Angles Theorem If two parallel lines are cut by a transversal, then each pair of alternate interior angles is congruent.

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



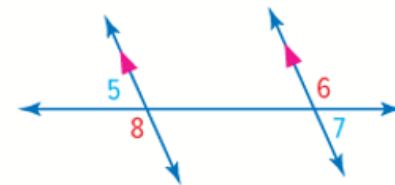
2.15 ~~Consecutive Interior Angles Theorem~~ If two parallel lines are cut by a transversal, then each pair of consecutive interior angles is supplementary.

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



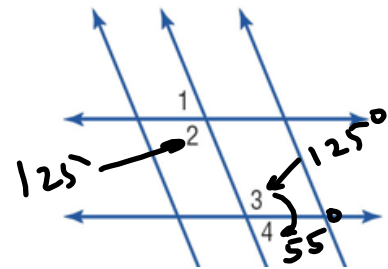
2.16 Alternate Exterior Angles Theorem If two parallel lines are cut by a transversal, then each pair of alternate exterior angles is congruent.

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



Real-World Example 3

FLOOR TILES The diagram represents the floor tiles in Michelle's house. If $m\angle 2 = 125$, find $m\angle 4$.

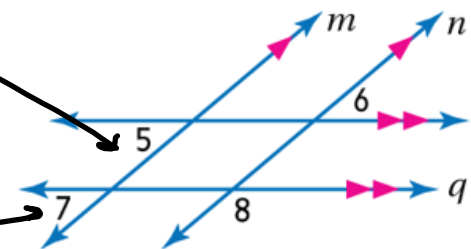


Guided Practice

Example 4

Find Values of Variables

ALGEBRA If $m\angle 5 = 2x - 10$, and $m\angle 7 = x + 15$, find x . Explain your reasoning.



$$2x - 10 = x + 15$$

$$x = 25$$

Example 4

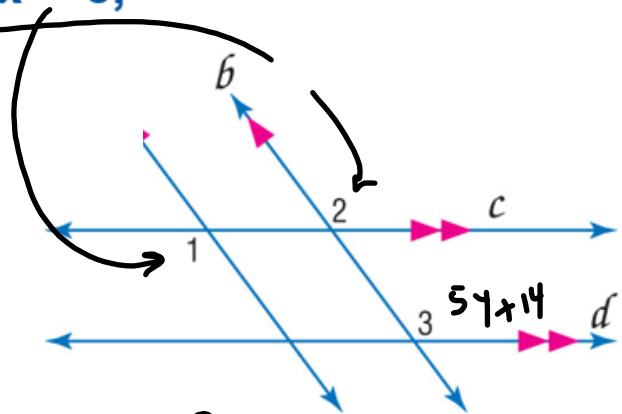
A. ALGEBRA If $m\angle 1 = 9x + 6$,
 $m\angle 2 = 2(5x - 3)$, and
 $m\angle 3 = 5y + 14$, find x .

$$9x + 6 = 2(5x - 3)$$

$$9x + 6 = 10x - 6$$

$$\begin{array}{r} 9x + 12 = 10x \\ -9x \quad -9x \end{array}$$

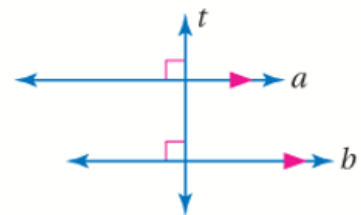
$$x = 12$$



Theorem 2.17 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 .



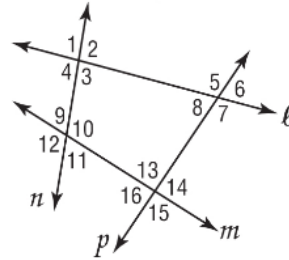
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2-7 Practice

Parallel Lines and Transversals

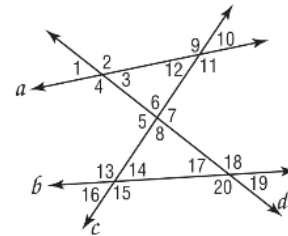
Classify the relationship between each pair of angles as *alternate interior*, *alternate exterior*, *corresponding*, or *consecutive interior* angles.

1. $\angle 2$ and $\angle 10$
2. $\angle 7$ and $\angle 13$
3. $\angle 9$ and $\angle 13$
4. $\angle 6$ and $\angle 16$
5. $\angle 3$ and $\angle 10$
6. $\angle 8$ and $\angle 14$



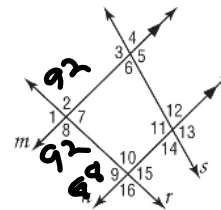
Name the transversal that forms each pair of angles. Then identify the special name for the angle pair.

7. $\angle 2$ and $\angle 12$
8. $\angle 6$ and $\angle 18$
9. $\angle 13$ and $\angle 19$
10. $\angle 11$ and $\angle 7$



In the figure, $m\angle 2 = 92$ and $m\angle 12 = 74$. Find the measure of each angle. Tell which postulate(s) or theorem(s) you used.

11. $\angle 10$
12. $\angle 8$
13. $\angle 9$
14. $\angle 5$
15. $\angle 11$
16. $\angle 13$



Find the value of the variable(s) in each figure. Explain your reasoning.

17.
 $9x + 12 + 3x = 180$

18.
 $(5y - 4) + 3y = 180$
 $3y + (2x + 13) = 180$

19. **FENCING** A diagonal brace strengthens the wire fence and prevents it from sagging. The brace makes a 50° angle with the wire as shown. Find the value of the variable.

