

Geometry 3.5

Recognize angle pairs that occur with parallel lines

Prove that two lines are parallel

converse *if $\cong$ then $\parallel$*

corresponding angles
alternate interior angles
alternate exterior angles

$\cong$ pairs

consecutive interior angles *supp.*

construction: parallel line through a point

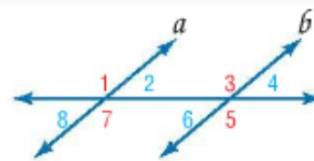
(you need a compass & straight edge)

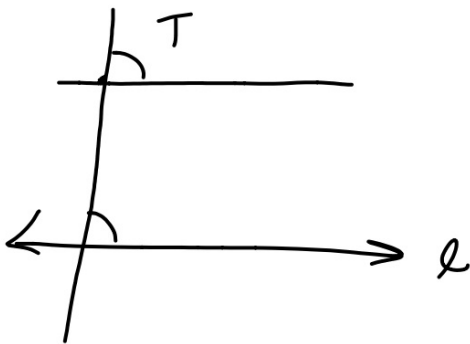
copy angle p. 39

Postulate 3.4 Converse of Corresponding Angles Postulate

If two lines are cut by a transversal so that corresponding angles are congruent, then the lines are parallel.

Examples If $\angle 1 \cong \angle 3$, $\angle 2 \cong \angle 4$, $\angle 5 \cong \angle 7$,
 $\angle 6 \cong \angle 8$, then $a \parallel b$.





Uses corresponding angles post.

Review: how to copy an angle

Construction Parallel Line Through a Point Not on the Line

Step 1 Use a straightedge to draw $\overleftrightarrow{AB}$. Draw a point C that is not on $\overleftrightarrow{AB}$. Draw $\overleftrightarrow{CA}$.

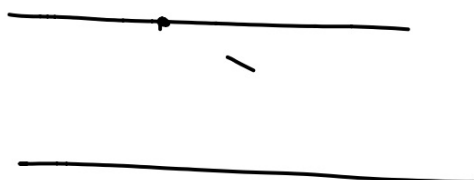
Step 2 Copy $\angle CAB$ so that C is the vertex of the new angle. Label the intersection points D and E .

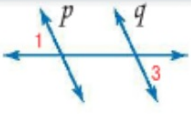
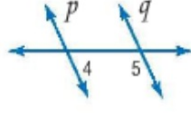
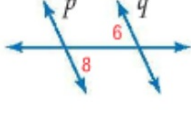
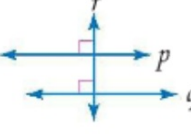
Step 3 Draw $\overleftrightarrow{CD}$. Because $\angle ECD \cong \angle CAB$ by construction and they are corresponding angles, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$.

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Postulate 3.5 Parallel Postulate

If given a line and a point not on the line, then there exists exactly one line through the point that is parallel to the given line.



Theorems Proving Lines Parallel	
3.5 Alternate Exterior Angles Converse If two lines in a plane are cut by a transversal so that a pair of alternate exterior angles is congruent, then the two lines are parallel.	 If $\angle 1 \cong \angle 3$, then $p \parallel q$.
3.6 Consecutive Interior Angles Converse If two lines in a plane are cut by a transversal so that a pair of consecutive interior angles is supplementary, then the lines are parallel.	 If $m\angle 4 + m\angle 5 = 180$, then $p \parallel q$.
3.7 Alternate Interior Angles Converse If two lines in a plane are cut by a transversal so that a pair of alternate interior angles is congruent, then the lines are parallel.	 If $\angle 6 \cong \angle 8$, then $p \parallel q$.
3.8 Perpendicular Transversal Converse In a plane, if two lines are perpendicular to the same line, then they are parallel.	 If $p \perp r$ and $q \perp r$, then $p \parallel q$.

Converses!
 If ... then lines are parallel.

1. Given,
 2. Prove
 3. Picture
 Proof

Example 1 Identify Parallel Lines

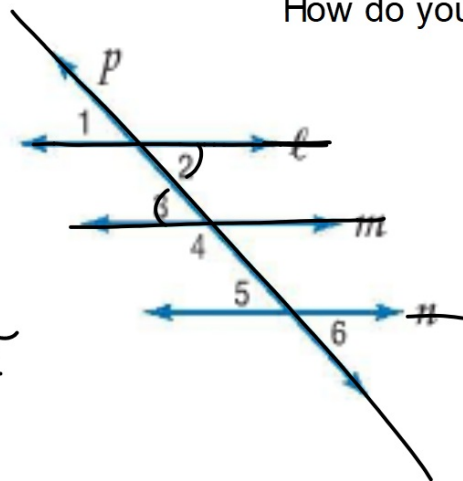
Given the following information, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.

a. $\angle 1 \cong \angle 6$

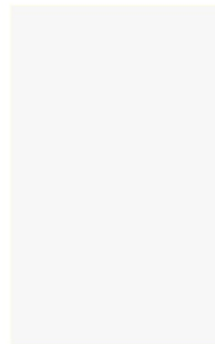
$\ell \parallel n$ AEA $\approx$

b. $\angle 2 \cong \angle 3$ $\ell \parallel m$ AIA $\approx$

How do you KNOW?



Make sure that you are using the same transversal...



Might help to cover up part of the diagram that doesn't apply...

Guided Practice

1A. $\angle 2 \cong \angle 8$

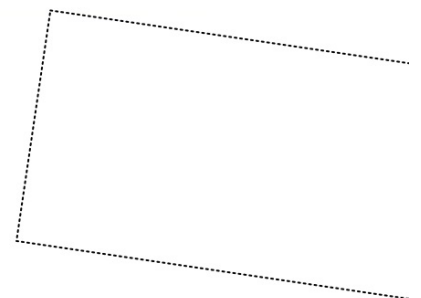
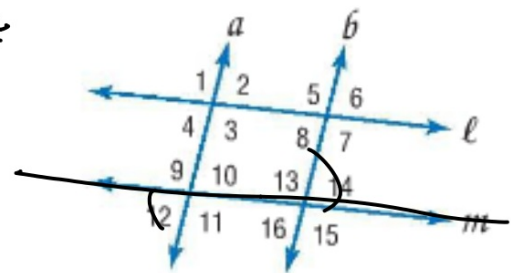
1C. $\angle 12 \cong \angle 14$

1E. $m\angle 8 + m\angle 13 = 180$

1B. $\angle 3 \cong \angle 11$

1D. $\angle 1 \cong \angle 15$

1F. $\angle 8 \cong \angle 6$



$$5x + 7$$

$$5 \cdot 14 + 7$$

$$70 + 7 = 77$$

What angle relationships might be helpful?



Standardized Test Example 2 Use Angle Relationships

OPEN ENDED Find $m\angle MRQ$ so that $a \parallel b$.
Show your work.

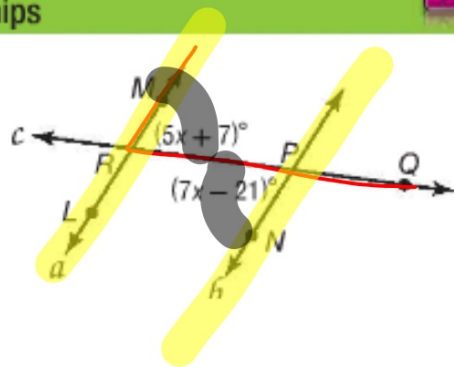
$$A \mid A \approx$$

$$5x + 7 = 7x - 21$$

$$-5x + 21 \quad -5x + 21$$

$$x = 14$$

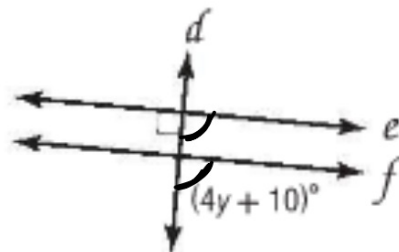
$$\frac{28}{2} = \frac{2x}{2}$$



Guided Practice

2. Find y so that $e \parallel f$. Show your work.

$$\begin{array}{r} 4y + 10 = 90 \\ -10 \quad -10 \\ \hline 4y = 80 \\ \underline{4} \quad \underline{4} \\ y = 20 \end{array}$$



3. S p. 211
9-350
45-570