Geometry 3.5

Recognize angle pairs that occur with parallel lines

Prove that two lines are parallel

converse

corresponding angles

alternate interior angles

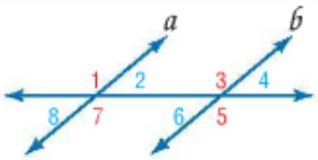
alternate exterior angles

consecutive interior angles

construction: parallel line through a point (you need a compass & straight edge)

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 $a \parallel b$.

if // → ∠A T

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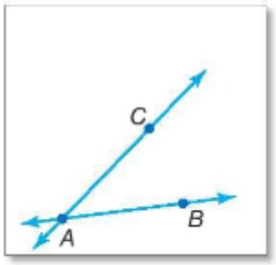
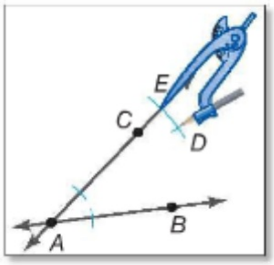
Uses corresponding angles post.

Construction Parallel Line Through a Point Not on the Line

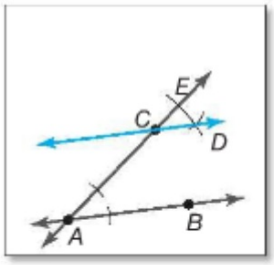
Step 1 Use a straightedge to draw $\overleftrightarrow{AB}$. Draw a point C that is not on $\overleftrightarrow{AB}$. Draw $\overleftrightarrow{CA}$.



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



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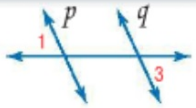
Postulate 3.5 Parallel Postulate

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.

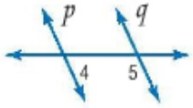
Theorems Proving Lines Parallel

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.



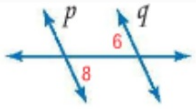
If $\angle 1 \cong \angle 3$, then $p \parallel q$.

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.



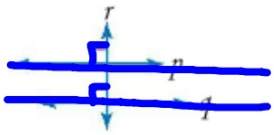
If $m\angle 4 + m\angle 5 = 180$, then $p \parallel q$.

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.



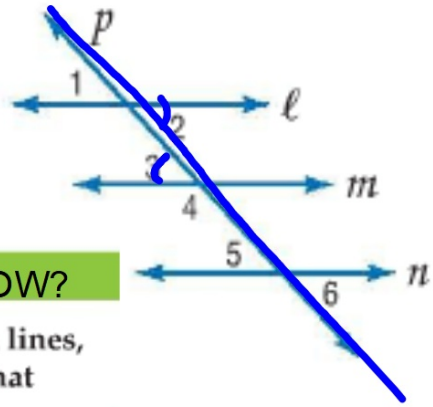
If $\angle 6 \cong \angle 8$, then $p \parallel q$.

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.



Example 1 Identify Parallel Lines How do you KNOW?

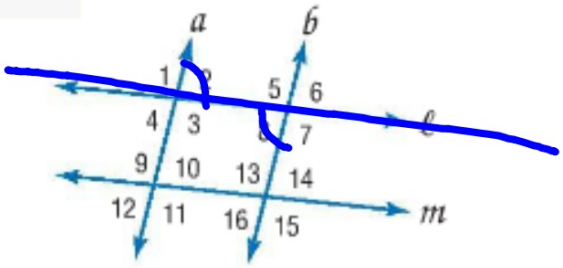
Given the following information, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.

a. $\angle 1 \cong \angle 6$ AeA $\ell \parallel n$

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

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

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



GuidedPractice

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

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

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

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

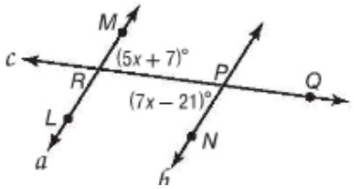
1E. $m\angle 8 + m\angle 13 = 180$

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

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.



GuidedPractice

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