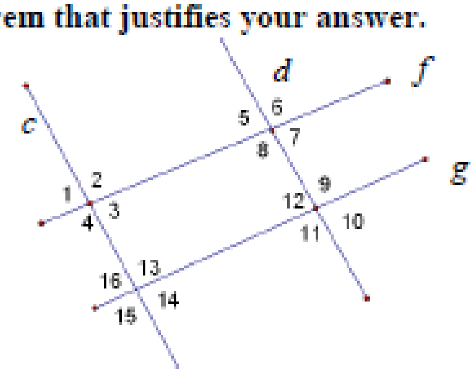
Proving Lines Parallel

SOL G.2a (2016)

Key Theorems for Proving Lines Parallel	
Converse of the Corresponding Angles Theorem	If two lines and a transversal form congruent corresponding angles, then the two lines are parallel.
Abbreviation: If corr. ∠s are ≅, then lines are ‖.	
Converse of the Alternate Exterior Angles Theorem	If two lines and a transversal form congruent alternate exterior angles, then the two lines are parallel.
Abbreviation: If alt. ext. ∠s are ≅, then lines are ‖.	
Converse of the Alternate Interior Angles Theorem	If two lines and a transversal form congruent alternate interior angles, then the two lines are parallel.
Abbreviation: If alt. int. ∠s are ≅, then lines are ‖.	
Converse of the Consecutive Interior Angles Theorem	If two lines and a transversal form consecutive interior angles that are supplementary, then the two lines are parallel
Abbreviation: If con. int. ∠s are suppl., then lines are ‖.	
Converse of the Same-Side Exterior Angles Theorem	If two lines and a transversal form same-side exterior angles that are supplementary, then the two lines are parallel
Abbreviation: If con. int. ∠s are suppl., then lines are ‖.	
Perpendicular Lines Theorem	If two or more lines are perpendicular to the same line (within the same plane), then the two lines are parallel.
Abbreviation: If 2 lines are ⊥ to the same line, then they are ‖.	

Example 1: Given the following information, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.



A) $\angle 5 \cong \angle 12$

f ‖ g; corr. ∠s are ≅

B) $m\angle 2 + m\angle 5 = 180$

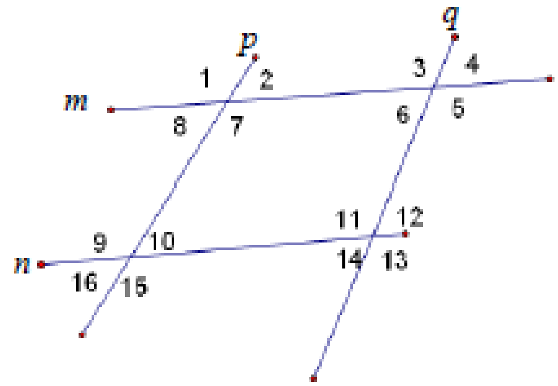
c ‖ d; con. int. ∠s are suppl.

C) $\angle 8 \cong \angle 10$

No parallel lines

Practice

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



1. $\angle 1 \cong \angle 9$

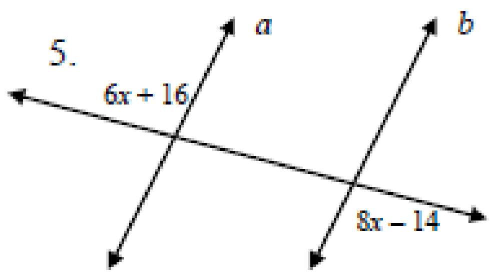
2. $\angle 3 \cong \angle 7$

3. $m\angle 15 + m\angle 14 = 180$

4. $\angle 9 \cong \angle 6$

Find x so that $a \parallel b$.

5.



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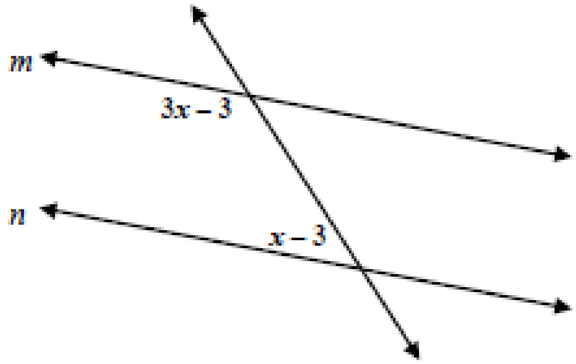
Example 2: Find x so that $m \parallel n$.

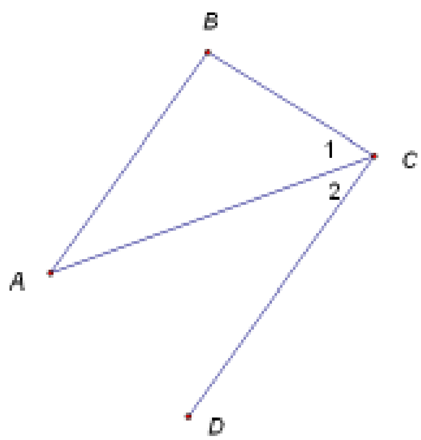


$(3x-3)+(x-3)=180$	**1. Con. int. angles are suppl.**
$4x-6=180$	**2. Substitution**
$4x=186$	**3. Addition**
$x=46.5$	**4. Division**

Example 3: Write a two-column proof.

Given: $\angle 1$ **and** $\angle 2$ **are complementary and** $\overleftrightarrow{AB} \perp \overleftrightarrow{BC}$

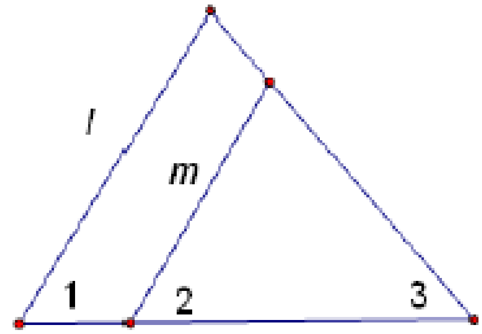
Prove: $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$



Statements	Reasons
1. $\angle 1$ and $\angle 2$ are complementary	1. Given
2. $m\angle 1 + m\angle 2 = m\angle BCD$	2. Angle Add. Post.
3. $m\angle 1 + m\angle 2 = 90$	3. Def. of compl. $\angle$'s
4. $m\angle BCD = 90$	4. Substitution
5. $\overleftrightarrow{CD} \perp \overleftrightarrow{BC}$	5. Def. of $\perp$ lines
6. $\overleftrightarrow{AB} \perp \overleftrightarrow{BC}$	6. Given
7. $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$	7. If 2 lines are $\perp$ to the same line, then they are $\parallel$.

Write a two-column proof.

6.



Given: $\angle 1 \cong \angle 3$ **and** $\angle 2 \cong \angle 3$

Prove: $l \parallel m$

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