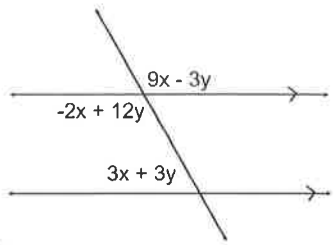
3.3 - Proofs with Parallel Lines

Find the values of x and y.



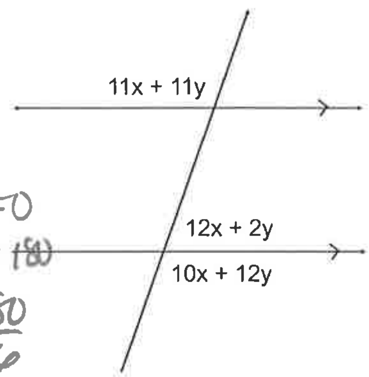
$$9x - 3y = -2x + 12y$$
$$+2x - 12y \quad +2x - 12y$$
$$11x - 15y = 0$$

$$-2x + 12y + 3x + 3y = 180$$
$$x + 15y = 180$$

$$11x - 15y = 0$$
$$x + 15y = 180$$
$$\frac{12x}{12} = \frac{180}{12}$$
$$x = 15$$

$$15 + 15y = 180$$
$$15y = 165$$
$$y = 11$$

Find the values of x and y.



$$11x + 11y = 10x + 12y$$
$$-10x - 12y \quad -10x - 12y$$
$$x - y = 0$$

$$12x + 2y + 10x + 12y = 180$$
$$22x + 14y = 180$$

$$x - y = 0 \rightarrow 14x - 14y = 0$$
$$22x + 14y = 180$$
$$\frac{36x}{36} = \frac{180}{36}$$
$$x = 5$$

$$5 - y = 0$$
$$5 = y$$

Warm Up

Essential Question

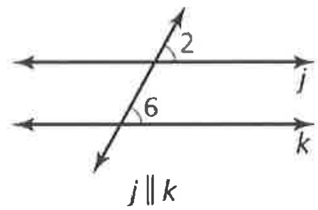
For which of the theorems involving parallel lines and transversals is the converse true?

Essential Question

Theorem

Theorem 3.5 Corresponding Angles Converse

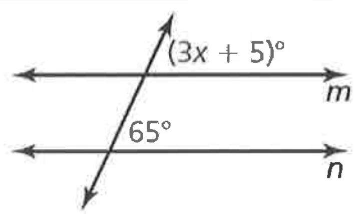
If two lines are cut by a transversal so the corresponding angles are congruent, then the lines are parallel.



Proof Ex. 36, p. 180

Theorem

Find the value of x that makes $m \parallel n$.



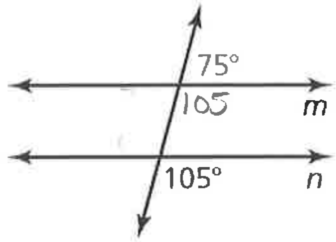
$3x+5=65$

$3x=60$

$x=20$

Example 1

1. Is there enough information in the diagram to conclude that $m \parallel n$? Explain.



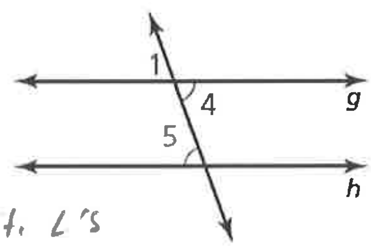
Yes, you can use linear pair postulate and then converse to corr. ∠'s theorem

2. Explain why the Corresponding Angles Converse is the converse of the Corresponding Angles Theorem (Theorem 3.1).

Because you are flipping the corresponding ∠'s theorem

Monitoring Progress 1-2

Prove that if two lines are cut by a transversal so the alternate interior angles are congruent, then the lines are parallel.



Statement	Reason
$\angle 4 \cong \angle 5$	Given
$\angle 1$ + $\angle 4$ are vert. ∠'s	Def. of vert. ∠'s
$\angle 1 \cong \angle 4$	vert. ∠'s thm
$\angle 1 \cong \angle 5$	Transitive
$g \parallel h$	Converse of Corr. ∠'s Postulate

Example 2

Alternate Interior Angles Converse: If alternate interior angles are congruent, then the lines are parallel.

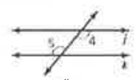
Alternate Exterior Angles Converse: If alt. ext. angles are congruent, then the lines are parallel.

Consecutive Interior Angles Converse: If same side int. angles are supplementary, then the lines are parallel.

Theorems

Theorem 3.6 Alternate Interior Angles Converse

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

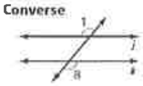


$j \parallel k$

Proof Example 2, p. 140

Theorem 3.7 Alternate Exterior Angles Converse

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

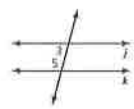


$j \parallel k$

Proof Ex. 11, p. 142

Theorem 3.8 Consecutive Interior Angles Converse

If two lines are cut by a transversal so the consecutive interior angles are supplementary, then the lines are parallel.



If $\angle 3$ and $\angle 5$ are supplementary, then $j \parallel k$.

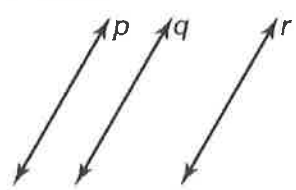
Proof Ex. 12, p. 142

Theorems

Theorem

Theorem 3.9 Transitive Property of Parallel Lines

If two lines are parallel to the same line, then they are parallel to each other.

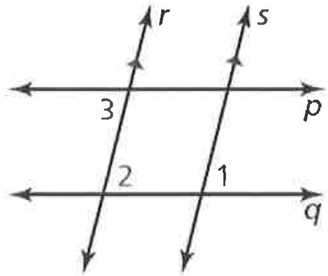


If $p \parallel q$ and $q \parallel r$, then $p \parallel r$.

Proof Ex. 39, p. 144; Ex. 48, p. 162

Theorem

In the diagram, $r \parallel s$ and $\angle 1$ is congruent to $\angle 3$. Prove $p \parallel q$.

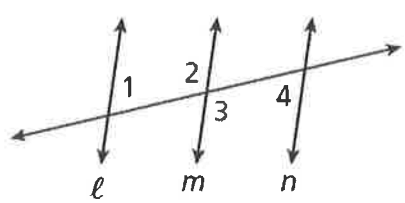


Statement	Reason
$\angle 1 \cong \angle 3$	Given
$r \parallel s$	Given
$\angle 1 \cong \angle 2$	Corr. ∠'s Post.
$\angle 2 \cong \angle 3$	Transitive POC
$p \parallel q$	Converse of Alt. Int. ∠'s Thm

Example 3

Given: $\angle 1 \cong \angle 4$, $\angle 3$ and $\angle 4$ are supplementary.

Prove: $\ell \parallel m$



Statements	Reasons
1. $\angle 1 \cong \angle 4$	**1.** Given
2. $m\angle 1 = m\angle 4$	**2.** Def. ≅ ∠s
3. $\angle 3$ and $\angle 4$ are supp.	**3.** Given
4. $m\angle 3 + m\angle 4 = 180°$	**4.** Def. of Supp. Angles
5. $m\angle 3 + m\angle 1 = 180°$	**5.** Substitution
6. $m\angle 2 = m\angle 3$	**6.** Vert.∠s Thm.
7. $m\angle 2 + m\angle 1 = 180°$	**7.** Substitution
8. $\ell \parallel m$	**8.** Conv. of Same-Side Interior ∠s Post.

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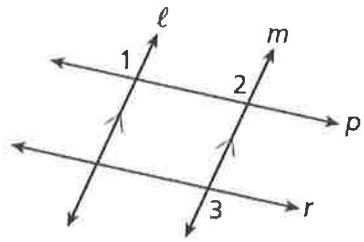
Given: $p \parallel r$, $\angle 1 \cong \angle 3$
Prove: $\ell \parallel m$



Statements	Reasons
1. $p \parallel r$	**1.** Given
2. $\angle 3 \cong \angle 2$	**2.** Alt. Ext. $\angle$s Thm.
3. $\angle 1 \cong \angle 3$	**3.** Given
4. $\angle 1 \cong \angle 2$	**4.** Trans. Prop. of $\cong$
5. $\ell \parallel m$	**5.** Conv. of Corr. $\angle$s Post.

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Homework:

pg. 142 #4-6, 13-18, 21-25, 28, 34-36, 40

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