

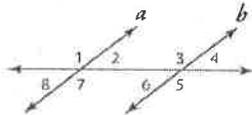
3-5 Proving Lines Parallel

Target: I will be able to prove two lines are parallel.

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 $a \parallel b$.



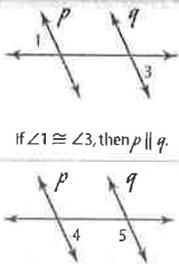
Theorems Proving Lines Parallel

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 $p \parallel q$.

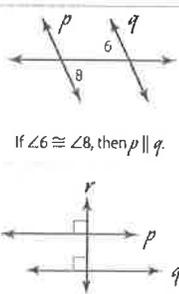


3.7 Alternate Interior Angles Converse
If two lines in a plane are cut by a transversal so that a pair of alternate interior angles is congruent, then the lines are parallel.

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

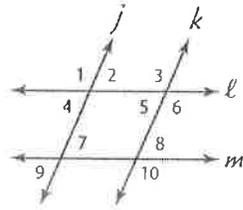
3.8 Perpendicular Transversal Converse
In a plane, if two lines are perpendicular to the same line, then they are parallel.

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

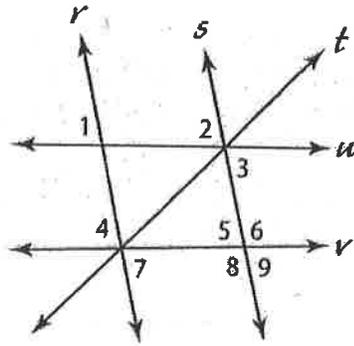


Given the following information, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.

1. $\angle 1 \cong \angle 3$ *j||k, conv. corresp. \angle s post.*

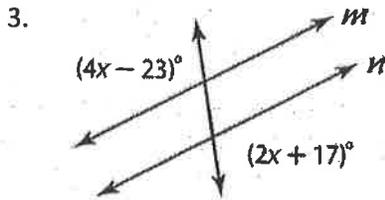


2. $m\angle 7 + m\angle 8 = 180$



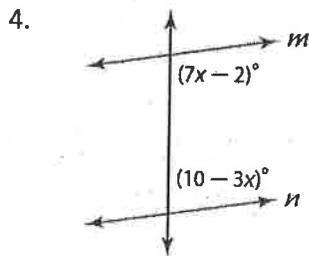
$r \parallel s$, consec.
int. \angle
conv.

Find x so that $m \parallel n$. Identify the postulate or theorem you used.



$$\begin{aligned} 4x - 23 &= 2x + 17 \\ -2x &\quad -2x \\ \hline 2x - 23 &= 17 \\ +23 &\quad +23 \\ \hline 2x &= 40 \\ \frac{2x}{2} &= \frac{40}{2} \end{aligned}$$

$x = 20$ alt. ext. \angle conv.



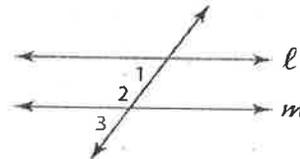
$$\begin{aligned} 7x - 2 + 10 - 3x &= 180 \\ 4x + 8 &= 180 \\ 4x &= 172 \\ \frac{4x}{4} &= \frac{172}{4} \end{aligned}$$

$x = 43$ consec. int. \angle conv.

5. **PROOF** Copy and complete the proof of Theorem 3.6.

Given: $\angle 1$ and $\angle 2$ are supplementary.

Prove: $l \parallel m$



Proof:

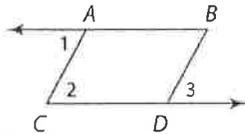
Statements	Reasons
a. $\angle 1$ and $\angle 2$ are suppl.	a. Given
b. $\angle 2$ and $\angle 3$ form a linear pair.	b. $\angle 2$ and $\angle 3$ are a linear pair
c. $\angle 2$ and $\angle 3$ are suppl.	c. $\angle 2$ and $\angle 3$ are a linear pair
d. $\angle 1 \cong \angle 3$	d. $\angle 1$ and $\angle 3$ are vertical angles
e. $l \parallel m$	e. $\angle 1$ and $\angle 3$ are alternate exterior angles

PROOF Write a two-column proof for each of the following.

6. Given: $\angle 1 \cong \angle 3$

$\overline{AC} \parallel \overline{BD}$

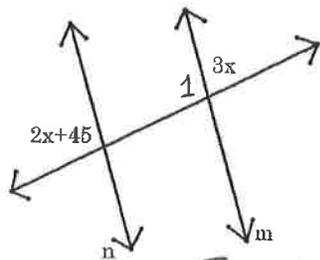
Prove: $\overline{AB} \parallel \overline{CD}$



statement	reason
1. $\angle 1 \cong \angle 3$ $\overline{AC} \parallel \overline{BD}$	1. Given
2. $\angle 2 \cong \angle 3$	2. corr. \angle s post.
3. $\angle 1 \cong \angle 2$	3. transitive
4. $\overline{AB} \parallel \overline{CD}$	4. alt. int. \angle conv.

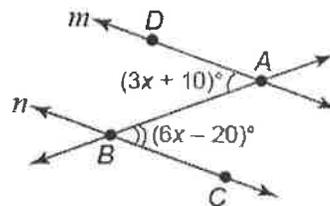
Find x so that $m \parallel n$. Identify the postulate or theorem you used.

7.



$$\begin{aligned}
 m\angle 1 + 3x &= 180 \text{ [Suppl. thm.]} \\
 m\angle 1 &= 180 - 3x \\
 2x + 45 &= m\angle 1 \text{ [Conv. Corr. } \angle \text{s Post]} \\
 2x + 45 &= 180 - 3x \text{ [Subst.]} \\
 5x + 45 &= 180 \\
 5x &= 135 \\
 \frac{5x}{5} &= \frac{135}{5} \\
 x &= 27
 \end{aligned}$$

8.



$$\begin{aligned}
 3x + 10 &= 6x - 20 \\
 \text{(Alt. Int } \angle \text{ Conv.)} \\
 10 &= 3x - 20 \\
 30 &= 3x \\
 \frac{30}{3} &= \frac{3x}{3} \\
 10 &= x
 \end{aligned}$$

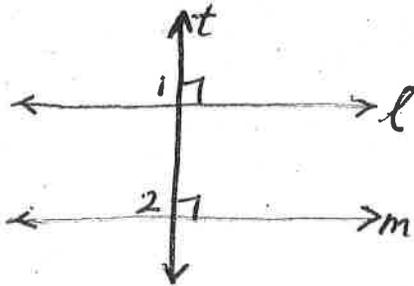
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rlls, conv. corr. \angle post.	Given	Congruent	no lines can be proven \parallel .
rlls, alt. ext. \angle are \cong .	alt, int \angle thm.	jllk, conv. corr. \angle post.	Figure out # 22 on your own. 
63, alt. int. \angle conv.	$\angle 2$	corresp. \angle post.	90°
mLt	$\ell // m$, consec. int. \angle conv.	rlls, alt. int. \angle conv.	Transitive
conv. corr. \angle post.	conv. corr. \angle post.	Figure out # 24 on your own 	$\angle 1$
alt. int. \angle thm.	39, alt. ext. \angle conv.	Vertical \angle thm.	Given
$\ell // m$	perp. trans. thm.	27, vert. \angle thm. and consec. int. \angle conv.	$\ell // v$, Consec. int. \angle conv.

statements	reasons
1. $\overline{WX} \parallel \overline{YZ}, \angle 2 \cong \angle 3$	1.
2. $\angle 1 \cong \angle 3$	2.
3. $\angle 1 \cong \angle 2$	3.
4. $\overline{WY} \parallel \overline{XZ}$	4.

statements	reasons
1. $\angle 1 \cong \angle 2, \overline{LJ} \perp \overline{ML}$	1.
2. $\overline{JL} \parallel \overline{KM}$	2.
3. $\overline{KM} \perp \overline{ML}$	3.

30. Given: $l \perp t, m \perp t$
 Prove: $l \parallel m$



Since $l \perp t$ and _____, the measure of $\angle 1$ and $\angle 2$ are _____.
 Since _____ and _____ have the same measure, they are _____.
 By the converse of _____,
 $l \parallel m$.