

Proving Lines Parallel Notes

Name _____

Corresponding Angles Converse Postulate:

- If corresponding angles are \cong then the lines are \parallel .

Proof of the Alternate Exterior Angles Converse Theorem:

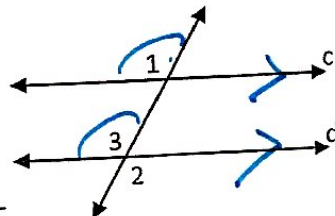
- If alternate exterior angles are \cong then the lines are \parallel .

Given: $\angle 1 \cong \angle 2$

Prove: $c \parallel d$

- $\angle 1 \cong \angle 2$
- $\angle 3 \cong \angle 2$
- $\angle 1 \cong \angle 3$
- $c \parallel d$

- Given
- V.A. \cong
- Subst or Trans.
- corr. $\cong \Rightarrow \parallel$ lines



Proof of the Consecutive Interior Angles Converse Theorem:

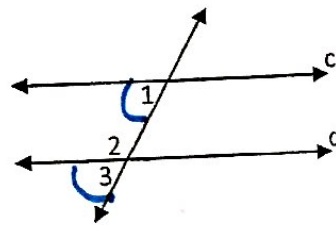
- If consecutive interior angles are supp. then the lines are \parallel .

Given: $\angle 1$ & $\angle 2$ are supplementary

Prove: $c \parallel d$

- $\angle 1$ & $\angle 2$ supp
- $\angle 1 + \angle 2 = 180$
- $\angle 2 + \angle 3 = 180$
- $\angle 1 + \angle 2 = \angle 2 + \angle 3$
- $\angle 1 \cong \angle 3$
- $c \parallel d$

- Given
- Def. of Supp.
- L.P. Supp
- Trans.
- Subtraction
- corr. $\cong \Rightarrow \parallel$ lines



Proof of the Alternate Interior Angles Converse Theorem:

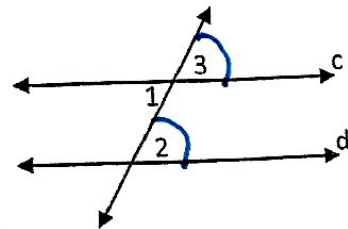
- If alternate interior angles are \cong then the lines are \parallel .

Given: $\angle 1 \cong \angle 2$

Prove: $c \parallel d$

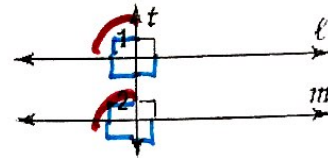
- $\angle 1 \cong \angle 2$
- $\angle 1 \cong \angle 3$
- $\angle 2 \cong \angle 3$
- $c \parallel d$

- Given
- V.A. \cong
- Trans.
- corr. $\cong \Rightarrow \parallel$ lines



• If two lines are \perp to the same line, then they are \parallel .

Given: $l \perp t$ and $m \perp t$
 Prove: $l \parallel m$



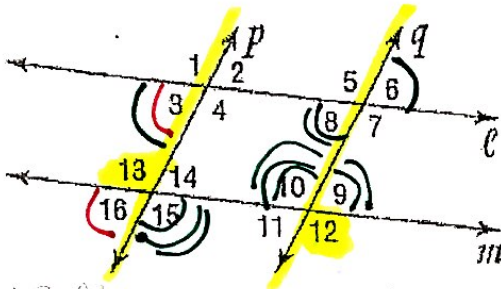
1. $l \perp t \text{ \& } m \perp t$ 1. Given

2. $\angle 1 = 90$
 $\angle 2 = 90$ 2. Definition of Perpendicular

3. $\angle 1 \cong \angle 2$ 3. Trans.

4. $l \parallel m$ 4. corr $\cong \Rightarrow \parallel$ lines

Example 1: Determine which lines, if any, are parallel. State which postulate or theorem that justifies your answer.



a) $\angle 16 \cong \angle 3$ $l \parallel m$ because corr. $\cong \Rightarrow \parallel$ lines

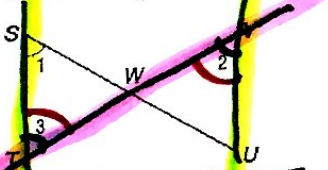
b) $m\angle 14 + m\angle 10 = 180$ $p \parallel q$ because consec. int supp $\Rightarrow \parallel$ lines

c) $\angle 3 \cong \angle 16$ because $p \parallel q$ alt. ext. $\cong \Rightarrow \parallel$ lines

d) $\angle 8 \cong \angle 9$ because $l \parallel m$ alt. int $\cong \Rightarrow \parallel$ lines

Example 2

Given: $\angle 2 \cong \angle 1$
 $\angle 1 \cong \angle 3$
 Prove: $ST \parallel UV$



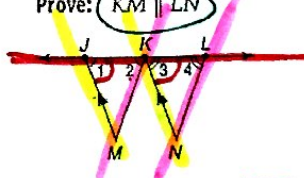
1. $\angle 2 \cong \angle 1, \angle 1 \cong \angle 3$ 1. Given

2. $\angle 2 \cong \angle 3$ 2. Trans.

3. $ST \parallel UV$ 3. Alt. int $\cong \Rightarrow \parallel$ lines

Example 3

Given: $\overline{JM} \parallel \overline{KN}$
 $\angle 1 \cong \angle 2$
 $\angle 3 \cong \angle 4$
 Prove: $\overline{KM} \parallel \overline{LN}$



1. $\overline{JM} \parallel \overline{KN}, \angle 1 \cong \angle 2$ 1. Given

2. $\angle 3 \cong \angle 4$ 2. corr. \cong

3. $\angle 2 \cong \angle 4$ 3. Substitution

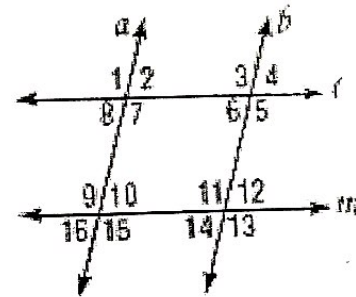
4. $\overline{KM} \parallel \overline{LN}$ 4. corr $\cong \Rightarrow \parallel$ lines

You try: Use the figure from Example 1.

- A.) $\angle 10 + \angle 8 = 180$ $l \parallel m$ because consec. int supp $\Rightarrow \parallel$ lines
- B.) $\angle 10 \cong \angle 15$ $p \parallel q$ because Alt. Int $\cong \Rightarrow \parallel$ lines
- C.) $\angle 15 \cong \angle 4$ $l \parallel m$ because corr $\cong \Rightarrow \parallel$ lines
- D.) $\angle 13 \cong \angle 12$ $p \parallel q$ because Alt. Ext $\cong \Rightarrow \parallel$ lines

Proving Lines Parallel HW

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



1. $\angle 3 \cong \angle 7$

2. $\angle 9 \cong \angle 11$

3. $\angle 2 \cong \angle 16$

4. $m\angle 5 + m\angle 12 = 180$

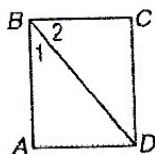
5. **PROOF** Provide a reason for each statement in the proof of Theorem 3.7.

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

$\overline{BC} \perp \overline{CD}$

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

Proof:



Statements

Reasons

1. $\overline{BC} \perp \overline{CD}$

1.

2. $m\angle ABC = m\angle 1 + m\angle 2$

2.

3. $\angle 1$ and $\angle 2$ are complementary.

3.

4. $m\angle 1 + m\angle 2 = 90$

4.

5. $m\angle ABC = 90$

5.

6. $\overline{BA} \perp \overline{BC}$

6.

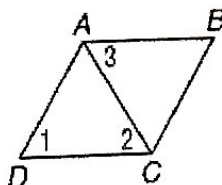
7. $\overline{BA} \parallel \overline{CD}$

7.

6. **Given:** $\angle 1 \cong \angle 2, \angle 1 \cong \angle 3$

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

(Hint: this is only 3 steps)



1) $\angle 1 \cong \angle 2$
 $\angle 1 \cong \angle 3$

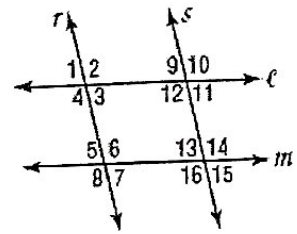
Given

2)

3)

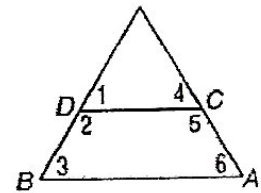
For Exercises 1-6, complete the proof.

7. Given: $\angle 1 \cong \angle 5$, $\angle 15 \cong \angle 5$
 Prove: $\ell \parallel m$, $r \parallel s$



Statements	Reasons
1. $\angle 15 \cong \angle 5$	1. _____
2. $\angle 13 \cong \angle 15$	2. _____
3. $\angle 5 \cong \angle 13$	3. _____
4. $r \parallel s$	4. _____
5. _____	5. Given
6. _____	6. If corr \angle s are \cong , then lines \parallel .

8. Given: $\angle 2$ and $\angle 3$ are supplementary.
 Prove: $\overline{AB} \parallel \overline{CD}$



1. _____	1. _____
2. _____	2. _____
3. $\angle 1 + \angle 2 = 180$	3. _____
4. _____	4. Substitution
5. _____	5. _____
6. _____	6. _____

Review from last unit: Justify THE SET UP!! Then solve for x.

Find x so that $\ell \parallel m$.

