

**Practice – Proofs Involving Parallel and Perpendicular Lines** **No Textbook Correlation**

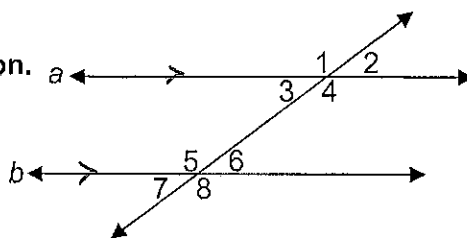
Name KEY Date \_\_\_\_\_ Period \_\_\_\_\_

Choose the word(s) that best completes the statements.

- If two lines are cut by a transversal so that alternate interior angles are (congruent), supplementary, complementary), then the lines are parallel.
- If two lines are cut by a transversal so that same-side interior angles are (congruent, (supplementary), complementary), then the lines are parallel.
- If two lines are cut by a transversal so that ((alternate interior), alternate exterior, (corresponding)) angles are congruent, then the lines are parallel.
- If two coplanar lines are perpendicular to the same line, then the two lines are (perpendicular, (parallel), skew) to each other.

**a || b. State the postulate or theorem that justifies each conclusion.**

Example:  $\angle 4 \cong \angle 8$  because || lines  $\rightarrow$  corresponding  $\angle$ s  $\cong$



- $\angle 1 \cong \angle 8$  || lines  $\rightarrow$  AEA's  $\cong$
- $\angle 3 \cong \angle 7$  || lines  $\rightarrow$  corresp.  $\angle$ s  $\cong$
- $\angle 4$  supplementary to  $\angle 6$  || lines SSI  $\angle$ s Supplement.
- $\angle 3$  supplementary to  $\angle 4$  linear pair
- $\angle 7 \cong \angle 6$  vertical  $\angle$ s

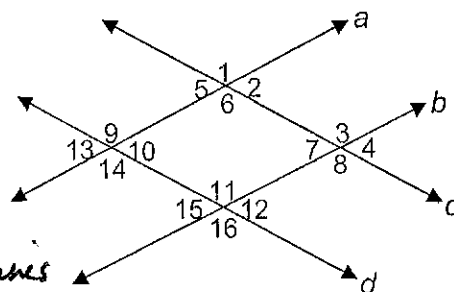
**State the postulate or theorem (shorthand) that allows you to conclude that  $j || k$ .**

Example: corr.  $\angle$ 's  $\cong \rightarrow ||$  lines

<p>10. <u>AEA's <math>\cong \rightarrow   </math> lines</u></p>	<p>11. <u>SSI <math>\angle</math>s supplement. <math>\rightarrow   </math> lines</u></p>	<p>12. <u>AZA's <math>\cong \rightarrow   </math> lines</u></p>	<p>13. <u>Correspond <math>\angle</math>s <math>\cong \rightarrow   </math> lines</u></p>
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Use the figure and the given information to determine which lines, if any, are parallel. Justify using a theorem or postulate.

- $\angle 9 \cong \angle 16 \rightarrow$  a || b because AEA's  $\cong$
- $\angle 5 \cong \angle 7 \rightarrow$  a || b because Corresp  $\angle$ s  $\cong$
- $\angle 14 \cong \angle 16 \rightarrow$  a || b because corresp  $\angle$ s  $\cong$
- $\angle 1 \cong \angle 16 \rightarrow$  \_\_\_\_\_ || \_\_\_\_\_ because cannot conclude || lines
- $\angle 5 \cong \angle 10 \rightarrow$  c || d because AIA's  $\cong$

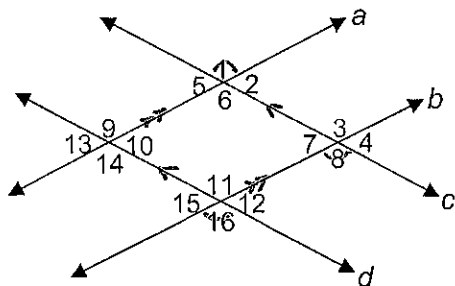


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Fill in the missing statements and reasons in each proof shown below. You must mark the diagram for credit.

19. Given:  $a \parallel b$   
 $c \parallel d$

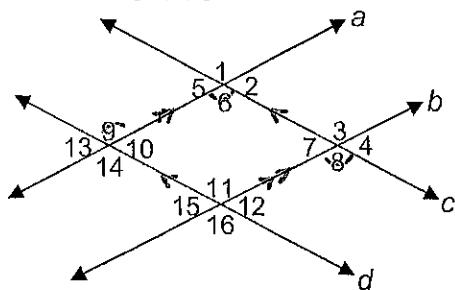
Prove:  $\angle 1 \cong \angle 16$



Statements	Reasons
1) $a \parallel b, c \parallel d$	1) given
2) $\angle 1 \cong \angle 8$	2) <del>parallel lines</del> $\parallel$ lines $\rightarrow$ $\angle$ 's $\cong$
3) $c \parallel d$	3) given
4) $\angle 8 \cong \angle 16$	4) $\parallel$ lines $\rightarrow$ $\text{corresp. } \angle$ s $\cong$
5) $\angle 1 \cong \angle 16$	5) Transitive prop. $\cong$

20. Given:  $a \parallel b$   
 $c \parallel d$

Prove:  $\angle 9 \cong \angle 8$

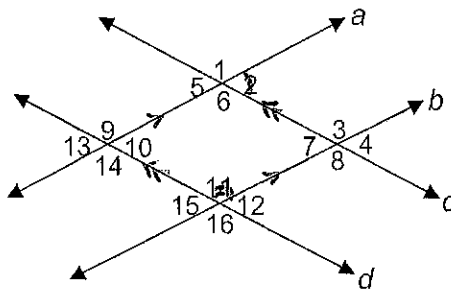


Statements	Reasons
1) $c \parallel d$	1) given (be careful)
2) $\angle 9 \cong \angle 6$	2) $\parallel$ lines $\rightarrow$ $\text{Alt } \angle$ s $\cong$
3) $a \parallel b$	3) given
4) $\angle 6 \cong \angle 8$	4) $\parallel$ lines $\rightarrow$ $\text{corresp } \angle$ s $\cong$
5) $\angle 9 \cong \angle 8$	5) Transitive prop. $\cong$ .

21. Given:  $a \parallel b$   
 $c \parallel d$

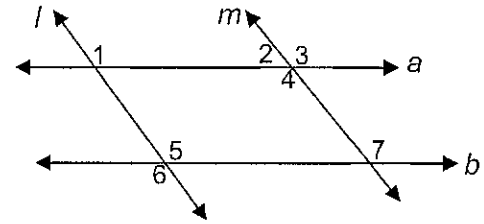
Prove:  $m\angle 2 + m\angle 11 = 180^\circ$

Statements	Reasons
1) $a \parallel b$	1) given
2) $\angle 2$ & $\angle 3$ are supplementary	2) $\parallel$ lines, $\text{SSI } \angle$ s $\text{suppl.}$
3) $c \parallel d$	3) given
4) $\angle 3 \cong \angle 11$	4) $\parallel$ lines $\rightarrow$ $\text{corresp } \angle$ s $\cong$
5) $m\angle 2 + m\angle 3 = 180$	5) def $\text{supp } \angle$ s.
6) $m\angle 3 = m\angle 11$	6) def $\text{congruent } \angle$ s
7) $m\angle 2 + m\angle 11 = 180$	7) Substitution



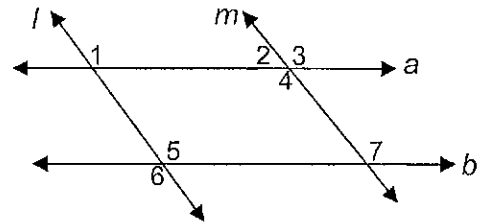
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22. Given:  $l \parallel m$   
 $\angle 1 \cong \angle 7$   
 Prove:  $a \parallel b$



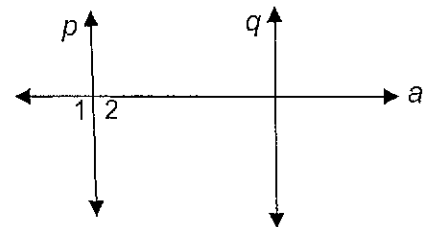
Statements	Reasons
1) $l \parallel m$	1) given
2) $\angle 1 \cong \angle 4$	2) $\parallel$ lines $\rightarrow$ A.I.A.s $\cong$
3) $\angle 1 \cong \angle 7$	3) given
4) $\angle 4 \cong \angle 7$	4) Transitive Prop $\cong$
5) $a \parallel b$	5) A.I.A.s $\cong \rightarrow \parallel$ lines

23. Given:  $a \parallel b$   
 $\angle 5$  is supplementary to  $\angle 2$   
 Prove:  $l \parallel m$



Statements	Reasons
1) $\angle 5$ supplementary $\angle 2$	1) given
2) $m\angle 5 + m\angle 2 = 180^\circ$	2) def. supp. $\angle$ s
3) $a \parallel b$	3) given
4) $\angle 1 \cong \angle 5$	4) $\parallel$ lines $\rightarrow$ corresp. $\angle$ s $\cong$
5) $m\angle 1 = m\angle 5$	5) def. $\cong$ $\angle$ s
6) $m\angle 1 + m\angle 2 = 180^\circ$	6) substitution
7) $\angle 1$ supp. to $\angle 2$	7) def. supp. $\angle$ s
8) $l \parallel m$	8) <del>Supplementary <math>\angle</math>s</del> <sup>SSI</sup> $\rightarrow \parallel$ lines

24. Given:  $\angle 1 \cong \angle 2$   
 $p \perp q$   
 Prove:  $q \perp a$

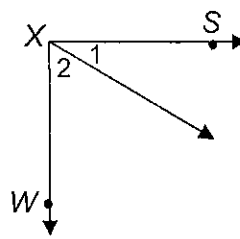


Statements	Reasons
1) $\angle 1 \cong \angle 2$	1) given
2) $p \perp a$	2) intersecting lines form $\cong$ linear pair, lines are $\perp$
3) $p \parallel q$	3) given
4) $q \perp a$	4) perpendicular transversal theorem

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25. Given:  $\angle 1$  &  $\angle 2$  are Complementary

Prove:  $\overline{SX} \perp \overline{WX}$

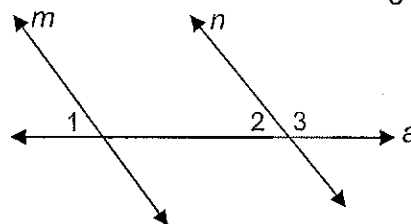


Statements	Reasons
1) $\angle 1$ & $\angle 2$ are Complementary	1) given
2) $m\angle 1 + m\angle 2 = 90$	2) def. comp. $\angle$ s
3) $m\angle WXS = m\angle 1 + m\angle 2$	3) $\angle$ addition post.
4) $m\angle WXS = 90$	4) substitution
5) $\angle WXS$ is right	5) definition of right $\angle$ .
6) $\overline{SX} \perp \overline{WX}$	6) definition $\perp$ lines

26. Prove the statement: If two parallel lines are cut by a transversal, then the same-side exterior angles are supplementary.

Given:  $m \parallel n$   $\angle 2$  &  $\angle 3$  linear pair

Prove:  $\angle 1$  is supplementary to  $\angle 3$



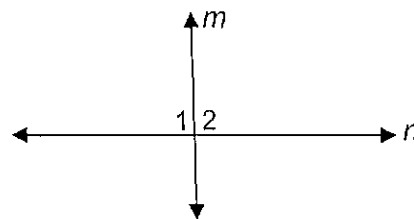
Statements	Reasons
1) $m \parallel n$	1) given
2) $\angle 1 \cong \angle 2$	2) $\parallel$ lines $\rightarrow$ corresp. $\angle$ s $\cong$
3) $m\angle 1 \cong m\angle 2$	3) def. $\cong$ $\angle$ s
4) $\angle 2$ & $\angle 3$ are linear pair	4) given
5) $m\angle 2 + m\angle 3 = 180$	5) def. linear pair
6) $m\angle 1 + m\angle 3 = 180$	6) substitution
7) $\angle 1$ is supplementary to $\angle 3$	7) def. supplem. $\angle$ s.

27. Prove the statement: If two coplanar lines are perpendicular, then they form a pair of congruent, supplementary angles.

First write the given(hypothesis) and the prove(conclusion) using the diagram.

Given:  $m \perp n$   $\angle 1$  &  $\angle 2$  form linear pair

Prove:  $\angle 1 \cong \angle 2$  and  $\angle 1$  &  $\angle 2$  are supplementary



Statements	Reasons
1) $m \perp n$	1) given
2) $m\angle 1 = 90^\circ$	2) def. perp. lines
3) $\angle 1$ & $\angle 2$ form lin. pair	3) given
4) $m\angle 1 + m\angle 2 = 180$	4) def. linear pair
5) $\angle 1$ & $\angle 2$ supplem.	5) def. supplem. $\angle$ s. Q.E.D.
6) $90 + m\angle 2 = 180$	6) substitution
7) $m\angle 2 = 90^\circ$	7) subtraction
8) $\angle 1 \cong \angle 2$	8) def. congruent $\angle$ s