Unit 1.1 section 10

Practice – Proofs Involving Parallel and Perpendicular Lines

Name ________________________ Date ______________ Period _______

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

1. If two lines are cut by a transversal so that alternate interior angles are (congruent, supplementary, complementary), then the lines are parallel.

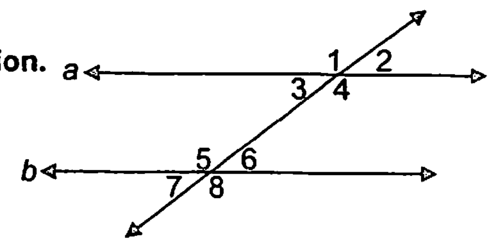
2. If two lines are cut by a transversal so that same-side interior angles are (congruent, supplementary, complementary), then the lines are parallel.

3. If two lines are cut by a transversal so that (alternate interior, alternate exterior, corresponding) angles are congruent, then the lines are parallel.

4. If two coplanar lines are perpendicular to the same line, then the two lines are (perpendicular, parallel, skew) to each other.

$a \parallel b$. State the postulate or theorem that justifies each conclusion.

Example: $\angle 4 \cong \angle 8$ because <u>|| lines → corresponding ∠s ≅</u>



5. $\angle 1 \cong \angle 8$ ______________________________

6. $\angle 3 \cong \angle 7$ ______________________________

7. $\angle 4$ supplementary to $\angle 6$ ______________________________

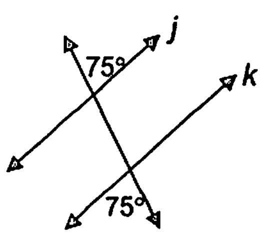
8. $\angle 3$ supplementary to $\angle 4$ ______________________________

9. $\angle 7 \cong \angle 6$ ______________________________

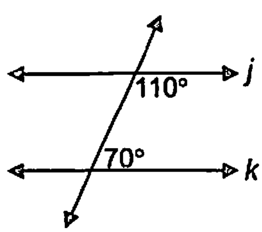
State the postulate or theorem (shorthand) that allows you to conclude that $j \parallel k$.

Example: <u>corr. ∠'s ≅ → // lines</u>

10. ________________



11. ________________



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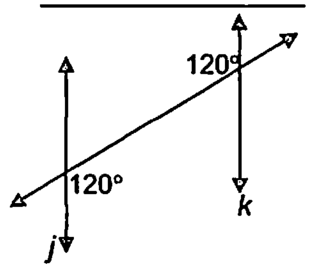

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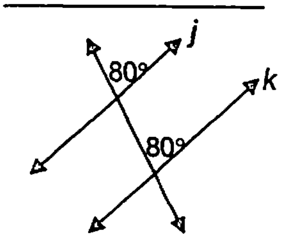
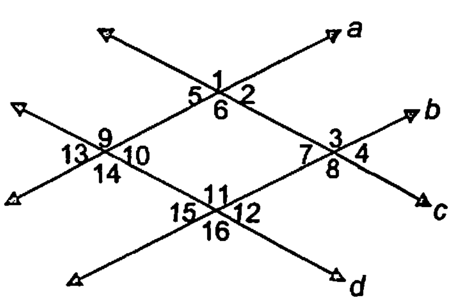


Use the figure and the given information to determine which lines, if any, are parallel. Justify using a theorem or postulate.



14. $\angle 9 \cong \angle 16$ → ___ || ___ because ______________________

15. $\angle 5 \cong \angle 7$ → ___ || ___ because ______________________

16. $\angle 14 \cong \angle 16$ → ___ || ___ because ______________________

17. $\angle 1 \cong \angle 16$ → ___ || ___ because ______________________

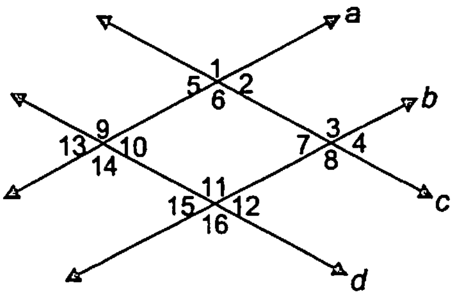
18. $\angle 5 \cong \angle 10$ → ___ || ___ because ______________________

Page 1

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

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

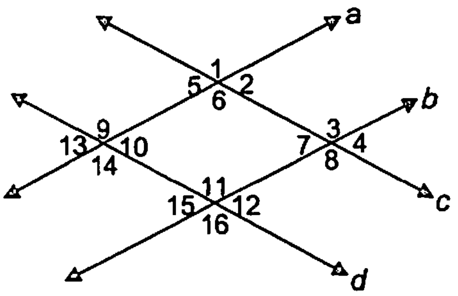
Prove: $\angle 1 \cong \angle 16$



Statements	Reasons
1)	1) given
2) $\angle 1 \cong \angle 8$	2)
3)	3) given
4) $\angle 8 \cong \angle 16$	4)
5)	5) Transitive prop. $\cong$

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

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

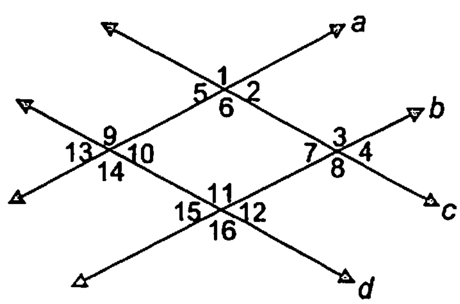


Statements	Reasons
1)	1) given (be careful)
2) $\angle 9 \cong \angle 6$	2)
3)	3) given
4)	4)
5) $\angle 9 \cong \angle 8$	5)

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

Prove: $m\angle 2 + m\angle 11 = 180°$

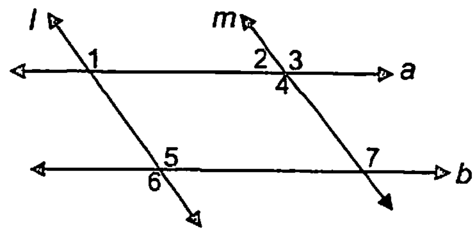
Statements	Reasons
1)	1) given
2) $\angle 2$ & $\angle 3$ are supplementary	2)
3)	3)
4)	4)
5)	5)
6)	6)
7)	7)



22. Given: $l \parallel m$

$\angle 1 \cong \angle 7$

Prove: $a \parallel b$

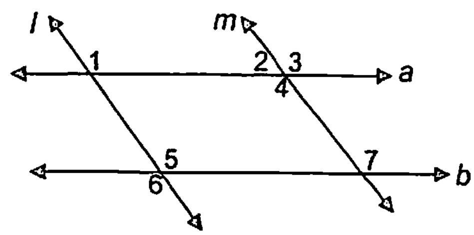


Statements	Reasons
1) $l \parallel m$	1) given
2)	2)
3)	3)
4)	4)
5)	5)

23. Given: $a \parallel b$

$\angle 5$ is supplementary to $\angle 2$

Prove: $l \parallel m$

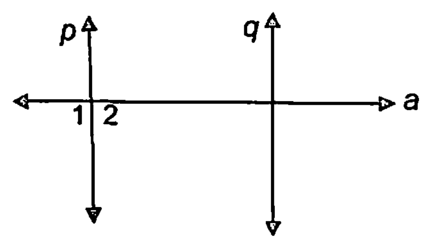


Statements	Reasons
1) $\angle 5$ supplementary $\angle 2$	1)
2)	2)
3) $a \parallel b$	3)
4) $\angle 1 \cong \angle 5$	4)
5)	5)
6) $m\angle 1 + m\angle 2 = 180°$	6)
7)	7)
8) $l \parallel m$	8)

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

$p \parallel q$

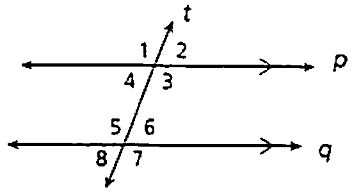
Prove: $q \perp a$



Statements	Reasons
1)	1)
2)	2)
3)	3)
4)	4)

2 PROOF — Alternate Interior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of alternate interior angles have the same measure.



Given: $p \parallel q$
Prove: $m\angle 3 = m\angle 5$

Complete the proof by writing the missing reasons. Choose from the following reasons. You may use a reason more than once.

Same-Side Interior Angles Postulate	Given	Definition of supplementary angles
Subtraction Property of Equality	Substitution Property of Equality	Linear Pair Theorem

Statements	Reasons
1. $p \parallel q$	1.
2. $\angle 3$ and $\angle 6$ are supplementary.	2.
3. $m\angle 3 + m\angle 6 = 180°$	3.
4. $\angle 5$ and $\angle 6$ are a linear pair.	4.
5. $\angle 5$ and $\angle 6$ are supplementary.	5.
6. $m\angle 5 + m\angle 6 = 180°$	6.
7. $m\angle 3 + m\angle 6 = m\angle 5 + m\angle 6$	7.
8. $m\angle 3 = m\angle 5$	8.

REFLECT

2a. Suppose $m\angle 4 = 57°$ in the above figure. Describe two different ways to determine $m\angle 6$.

2b. In the above figure, explain why $\angle 1$, $\angle 3$, $\angle 5$, and $\angle 7$ all have the same measure.

2c. In the above figure, is it possible for all eight angles to have the same measure? If so, what is that measure?

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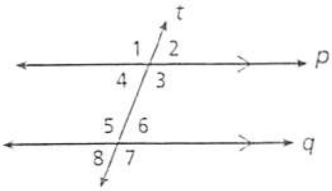
3 PROOF Corresponding Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of corresponding angles have the same measure.



Given: $p \parallel q$
Prove: $m\angle 1 = m\angle 5$

Complete the proof by writing the missing reasons.

Statements	Reasons
1. $p \parallel q$	1.
2. $m\angle 3 = m\angle 5$	2.
3. $m\angle 1 = m\angle 3$	3.
4. $m\angle 1 = m\angle 5$	4.

REFLECT

3a. Explain how you can you prove the Corresponding Angles Theorem using the Same-Side Interior Angles Postulate and a linear pair of angles.

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Many postulates and theorems are written in the form "If p, then q." The **converse** of such a statement has the form "If q, then p." The converse of a postulate or theorem may or may not be true. The converse of the Same-Side Interior Angles Postulate is accepted as true, and this makes it possible to prove that the converses of the previous theorems are true.

Converse of the Same-Side Interior Angles Postulate

If two lines are cut by a transversal so that a pair of same-side interior angles are supplementary, then the lines are parallel.

Converse of the Alternate Interior Angles Theorem

If two lines are cut by a transversal so that a pair of alternate interior angles have the same measure, then the lines are parallel.

Converse of the Corresponding Angles Theorem

If two lines are cut by a transversal so that a pair of corresponding angles have the same measure, then the lines are parallel.

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NAME ______________________________ DATE __________ PERIOD ______

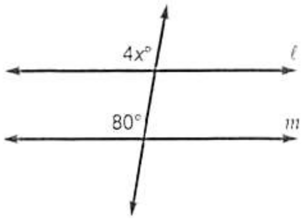
4-4 Practice

Student Edition
Pages 162–167

Proving Lines Parallel

Find x so that ℓ ∥ m.

1.



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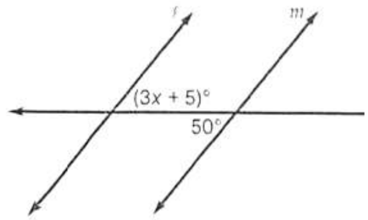

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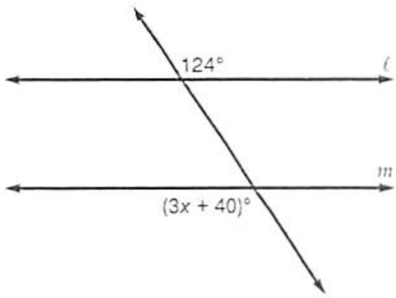

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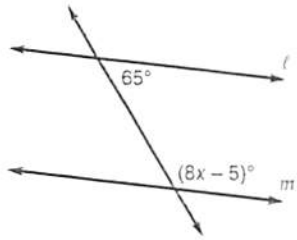

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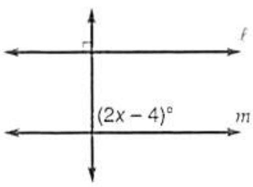

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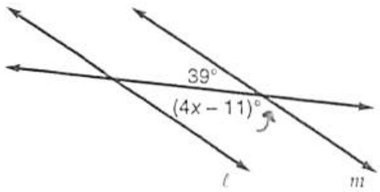
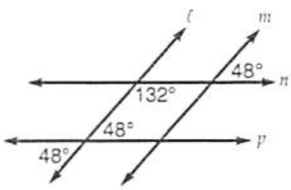


Name the pairs of parallel lines or segments.

7.



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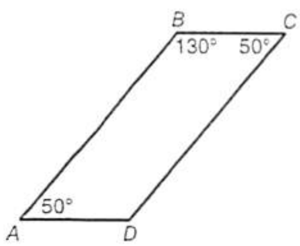

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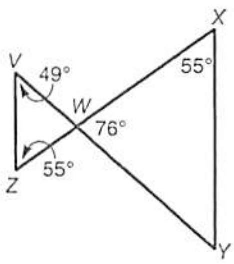
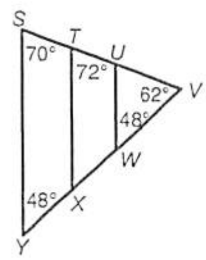
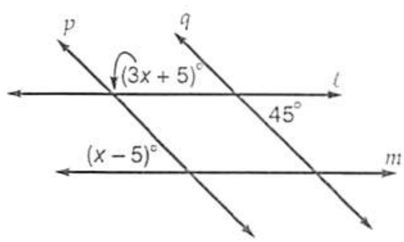


10.



11. Refer to the figure at the right.
  a. Find x so that the $\ell \parallel m$.
  b. Using the value you found in part a, determine whether lines p and q are parallel.



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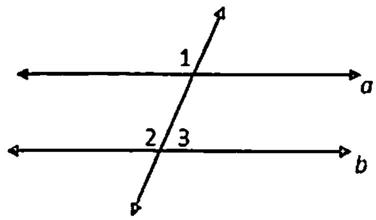
Name: ____________________

Parallel Lines and Proofs

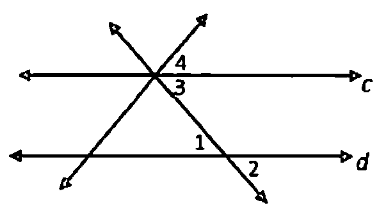
Fill in the blanks.

Given: $a \parallel b$
Prove: $m\angle 1 + m\angle 3 = 180°$



Statement	Reason
1. $a \parallel b$	**1.** Given
2. $\angle 1 \cong \angle 2$	**2.** ____________________ ____________________
3. $m\angle 1 = m\angle 2$	**3.** ____________________
4. ____________________	**4.** Definition of a linear pair
5. ____________________	**5.** If two angles form a linear pair, their angle measures sum to 180°.
6. $m\angle 1 + m\angle 3 = 180°$	**6.** ____________________

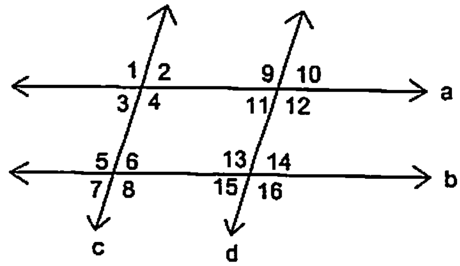
Given: $\angle 4 \cong \angle 3$; $c \parallel d$
Prove: $\angle 4 \cong \angle 2$



Statement	Reason
1. $\angle 4 \cong \angle 3$; $c \parallel d$	**1.** Given
2. $\angle 3 \cong \angle 1$	**2.** ____________________ ____________________
3. ____________________	**3.** Transitive Property of Congruence
4. ____________________	**4.** ____________________ ____________________
5. $\angle 4 \cong \angle 2$	**5.** ____________________

1. Given: $a \parallel b$; $c \parallel d$

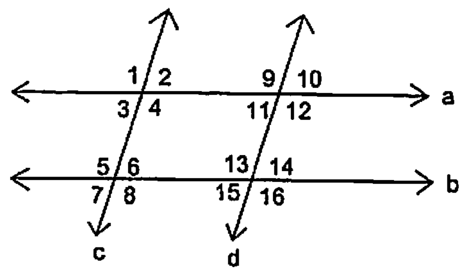
   Prove: $\angle 1 \cong \angle 13$



Statements	Reasons
1. $a \parallel b$; $c \parallel d$	1.
2. $\angle 1 \cong \angle 12$	2.
3. $\angle 12 \cong \angle 13$	3.
4. $\angle 1 \cong \angle 13$	4.

2. Given: $a \parallel b$

   Prove: $m\angle 9 + m\angle 14 = 180°$



Statements	Reasons
1. $a \parallel b$	1.
2. $m\angle 9 + m\angle 11 = 180°$	2.
3. $m\angle 11 = m\angle 14$	3.
4. $m\angle 9 + m\angle 14 = 180°$	4.

3. **GIVEN:** $g \parallel h$, $\angle 1 \cong \angle 2$
PROVE: $p \parallel r$

Statements	Reasons
1. $g \parallel h$, $\angle 1 \cong \angle 2$	1.
2. $\angle 1 \cong \angle 3$	2.
3. $\angle 2 \cong \angle 3$	3.
4. $p \parallel r$	4.