Name____ Analytic Geometry Notes 9/8/2014

Proving Lines are parallel

Transitive Property of Equality **If a = b and b = c, then a = c.**

If $\angle A \cong \angle B$ and $\angle B \cong \angle C$, then $\angle A \cong \angle C$

Substitution Property of Equality **If a = b, then a can be substituted for b in any equation or expression**

If $m\angle A = 50°$ and $m\angle B = 50°$ then $m\angle A = m\angle B$.

GOAL **Prove that two lines are parallel and use properties of parallel lines to solve problems**

VOCABULARY

Postulate 16 ***Corresponding Angles Converse*** If two lines are cut by a transversal so that corresponding angles are congruent, then the lines are parallel.

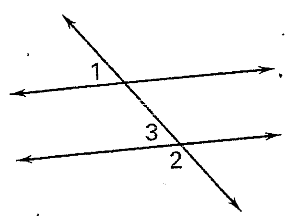
Theorem 3.8 ***Alternate Interior Angles Converse*** If two lines are cut by a transversal so that alternate interior angles are congruent, then the lines are parallel.

Theorem 3.9 ***Consecutive Interior Angles Converse*** If two lines are cut by a transversal so that consecutive interior angles are supplementary, then the lines are parallel.

Theorem 3.10 ***Alternate Exterior Angles Converse*** If two lines are cut by a transversal so that alternate exterior angles are congruent, then the lines are parallel.

EXAMPLE 1 *Proving that Two Lines are Parallel*

Prove that lines j and k are parallel.



SOLUTION

Given: $m\angle 1 = 53°$

$m\angle 2 = 127°$

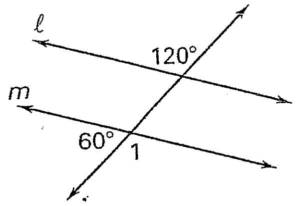
Prove: $j \parallel k$

Statements	Reasons
1. $m\angle 1 = 53°$ $m\angle 2 = 127°$	1.
2. $m\angle 3 + m\angle 2 = 180°$	2.
3. $m\angle 3 + 127° = 180°$	3.
4. $m\angle 3 = 53°$	4.
5. $\angle 3 \cong \angle 1$	5.
6. $j \parallel k$	6.

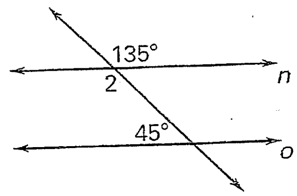
Exercises for Example 1

Prove the statement from the given information.

1. Prove: $\ell \parallel m$



2. Prove: $n \parallel o$

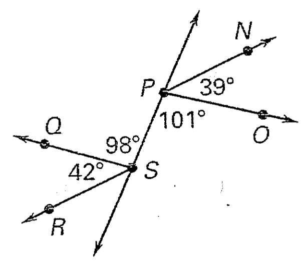


EXAMPLE 2 Identifying Parallel Lines

Determine which rays are parallel.

a. Is $\overrightarrow{PN}$ parallel to $\overrightarrow{SR}$?

b. Is $\overrightarrow{PO}$ parallel to $\overrightarrow{SQ}$?



SOLUTION

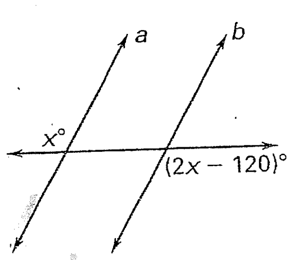
a. Decide whether $\overrightarrow{PN} \parallel \overrightarrow{SR}$.

b. Decide whether $\overrightarrow{PO} \parallel \overrightarrow{SQ}$.

Exercises for Example 2

Find the value of x that makes $a \parallel b$.

3.



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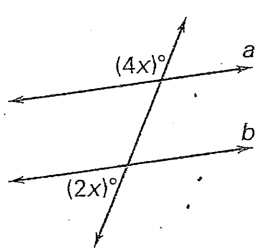

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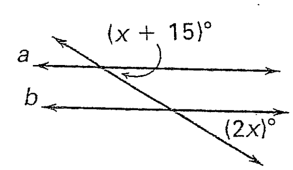


LESSON 3.4

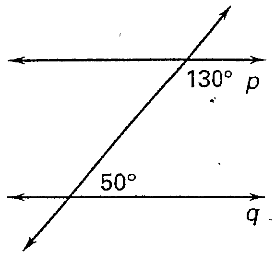
NAME ____________________ DATE __________

Practice A

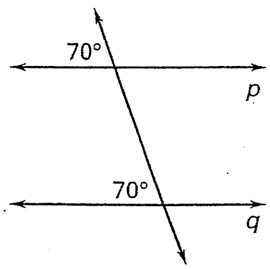
For use with pages 150–156

Is it possible to prove that lines *p* and *q* are parallel? If so, state the postulate or theorem you would use.

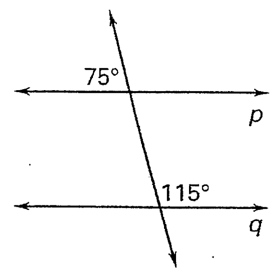
1.



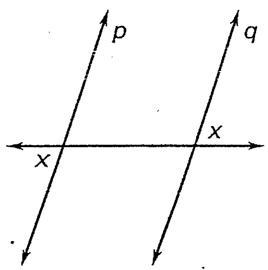
2.



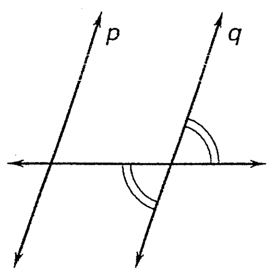
3.



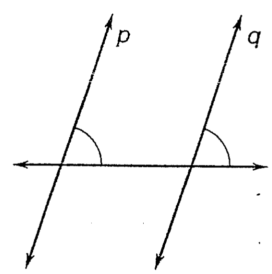
4.



5.

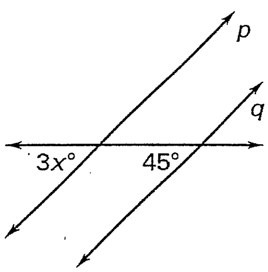


6.

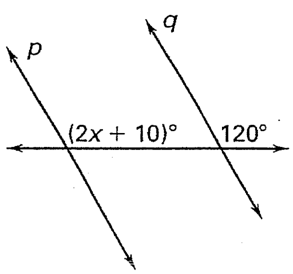


Find the value of *x* that makes $p \parallel q$.

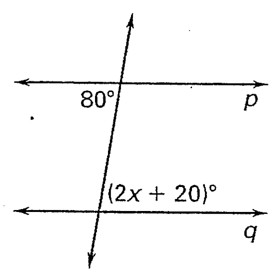
7.



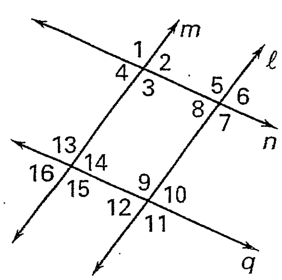
8.



9.



Use the diagram and the given information to determine which lines are parallel.



10. $\angle 13 \cong \angle 11$

11. $\angle 4 \cong \angle 8$

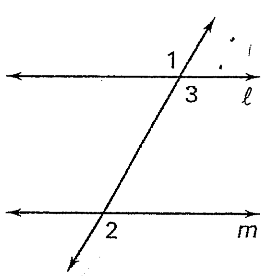
12. $\angle 16 \cong \angle 2$

13. $\angle 7 \cong \angle 9$

14. Complete the two-column proof of the Alternate Exterior Angles Converse Theorem.

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

Prove: $\ell \parallel m$



Statements	Reasons
1. $\angle 1 \cong \angle 2$	**1.** __________
2. $\angle 1 \cong \angle 3$	**2.** __________
3. $\angle 2 \cong \angle 3$	**3.** __________
4. $\ell \parallel m$	**4.** __________

Lesson 3.4

LESSON 3.4

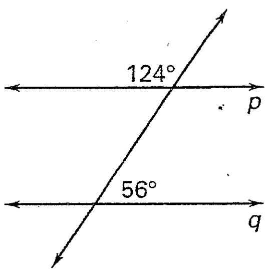
NAME ______________________________ DATE __________

Practice B

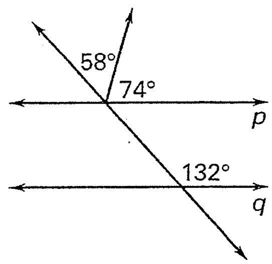
For use with pages 150–156

Is it possible to prove that lines p and q are parallel? If so, state the postulate or theorem you would use.

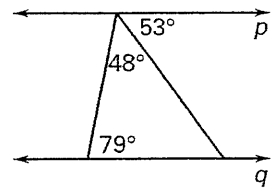
1.



2.

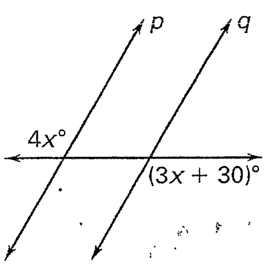


3.

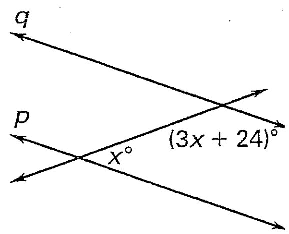


Find the value of x that makes $p \parallel q$.

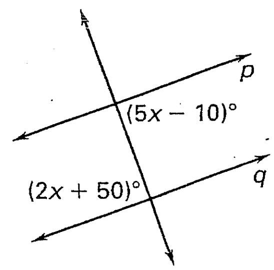
4.



5.



6.



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

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

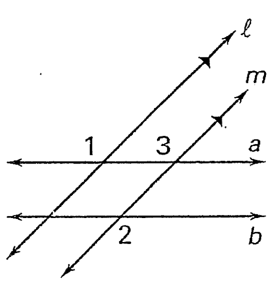
8. If two lines are cut by a transversal so that consecutive interior angles are (congruent, supplementary, complementary), then the lines are parallel.

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

10. Complete the two-column proof.

Given: $\ell \parallel m$, $\angle 1 \cong \angle 2$

Prove: $a \parallel b$

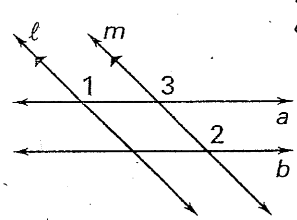


Statements	Reasons
1. $\ell \parallel m$	1. ________
2. $\angle 1 \cong \angle 3$	2. ________
3. $\angle 1 \cong \angle 2$	3. ________
4. $\angle 2 \cong \angle 3$	4. ________
5. $a \parallel b$	5. ________

11. Write a two-column proof.

Given: $\ell \parallel m$, $\angle 1 \cong \angle 2$

Prove: $a \parallel b$



Statements	Reasons
1. $\ell \parallel m$	________
2. $\angle 1 \cong \angle 2$	________
3. $\angle 1 \cong \angle 3$	________
4. $\angle 3 \cong \angle 2$	________
5. $a \parallel b$	________

Lesson 3.4

Name Key

Proving Lines are parallel

Analytic Geometry Notes 9/8/2014

Transitive Property of Equality — If a = b and b = c, then a = c.

If $\angle A \cong \angle B$ and $\angle B \cong \angle C$, then $\angle A \cong \angle C$

Substitution Property of Equality — If a = b, then a can be substituted for b in any equation or expression

If $m\angle A = 50°$ and $m\angle B = 50°$ then $m\angle A = m\angle B$.

GOAL Prove that two lines are parallel and use properties of parallel lines to solve problems

VOCABULARY

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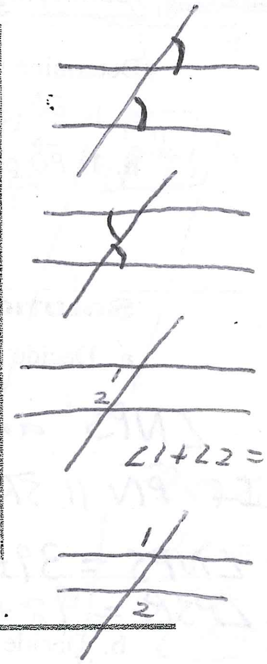
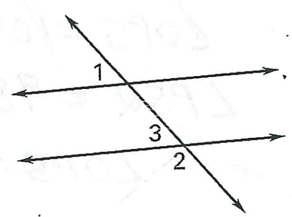


$\angle 1 + \angle 2 = 180°$

$\angle 1 \cong \angle 2$

EXAMPLE 1 *Proving that Two Lines are Parallel*

Prove that lines *j* and *k* are parallel.

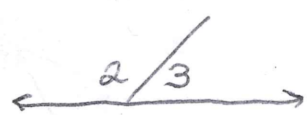


SOLUTION

Given: $m\angle 1 = 53°$

$m\angle 2 = 127°$

Prove: $j \parallel k$

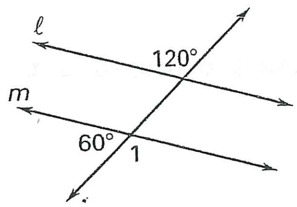


Statements	Reasons
1. $m\angle 1 = 53°$ $m\angle 2 = 127°$	1. Given
2. $m\angle 3 + m\angle 2 = 180°$	2. Linear Pair Postulate
3. $m\angle 3 + 127° = 180°$	3. Substitution
4. $m\angle 3 = 53°$	4. subtract
5. $\angle 3 \cong \angle 1$	5. Substitute
6. $j \parallel k$	6. Corresponding Angles are congruent

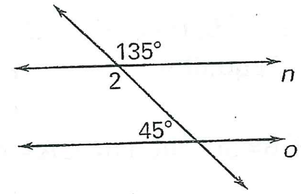
Exercises for Example 1

Prove the statement from the given information.

1. Prove: $\ell \parallel m$



2. Prove: $n \parallel o$

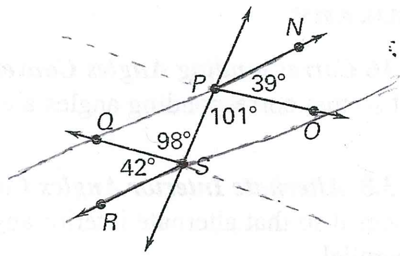


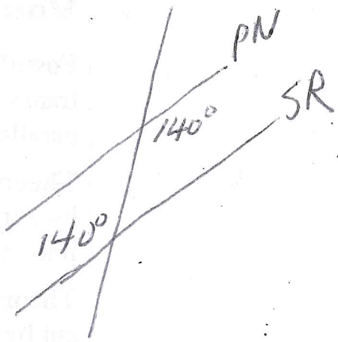
EXAMPLE 2 Identifying Parallel Lines

Determine which rays are parallel.

a. Is $\overrightarrow{PN}$ parallel to $\overrightarrow{SR}$?

b. Is $\overrightarrow{PO}$ parallel to $\overrightarrow{SQ}$?





SOLUTION

a. Decide whether $\overrightarrow{PN} \parallel \overrightarrow{SR}$.

$\angle NPS$ and $\angle PSR$ are alt. interior angles

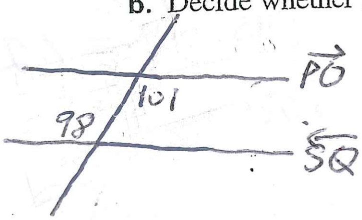
If $\overrightarrow{PN} \parallel \overrightarrow{SR}$, then $\angle NPS \cong \angle PSR$

$\angle NPS = 39 + 101 = 140°$

$\angle PSR = 98 + 42 = 140°$

since $\angle NPS \cong \angle PSR$, $\overrightarrow{PN} \parallel \overrightarrow{SR}$

b. Decide whether $\overrightarrow{PO} \parallel \overrightarrow{SQ}$.



$\angle OPS = 101°$

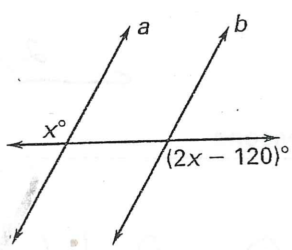
$\angle PSQ = 98°$

$\angle OPS \neq \angle PSQ$ so $\overrightarrow{PQ}$ and $\overrightarrow{SQ}$ not parallel rays.

Exercises for Example 2

Find the value of x that makes $a \parallel b$.

3.

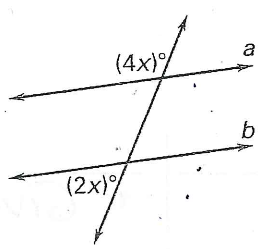


$x = 2x - 120$

$120° = x$

$\boxed{x = 120°}$

4.

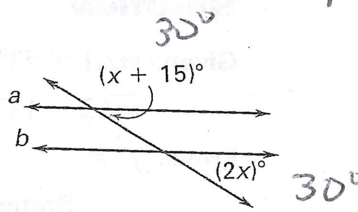


$2x + 4x = 180$

$6x = 180$

$\boxed{x = 30}$

5.



$x + 15 = 2x$

$\boxed{15 = x}$

LESSON **3.4**

NAME ______________________ DATE __________

Practice A

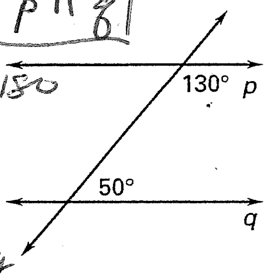
For use with pages 150–156

Is it possible to prove that lines *p* and *q* are parallel? If so, state the postulate or theorem you would use.

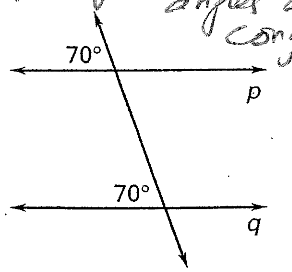
1. $\boxed{p \parallel q}$

$130 + 50 = 180$

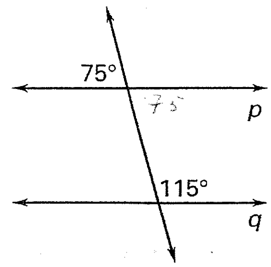
consecutive interior angles are supplementary



2. $\boxed{p \parallel q}$ corresponding angles are congruent

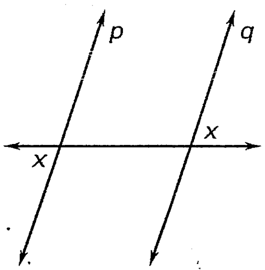


3. $\boxed{\text{No}}$

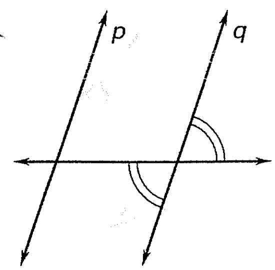


4. $\boxed{p \parallel q}$

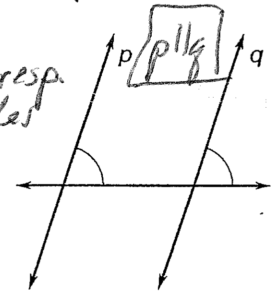
alt. ext. angles are ≅.



5. $\boxed{\text{No}}$



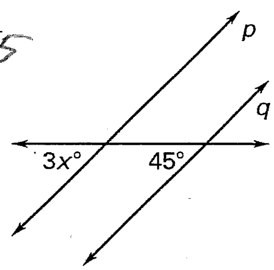
6. $\boxed{p \parallel q}$ Corresp. angles are ≅



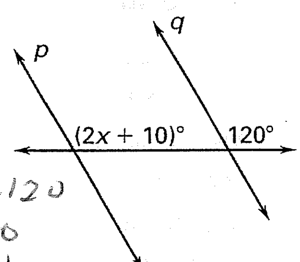
Find the value of *x* that makes $p \parallel q$.

7. $3x = 45$

$\boxed{x = 15}$



8.



$2x + 10 = 120$

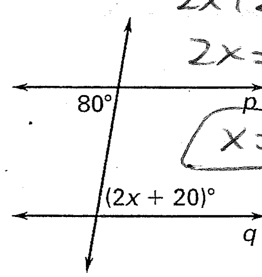
$2x = 110$

$\boxed{x = 55}$

9. $2x + 20 = 80$

$2x = 60$

$\boxed{x = 30}$



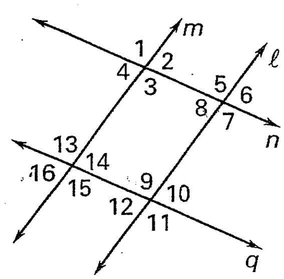
Use the diagram and the given information to determine which lines are parallel.

10. $\angle 13 \cong \angle 11$ $\boxed{m \parallel \ell}$

11. $\angle 4 \cong \angle 8$ $\boxed{m \parallel \ell}$

12. $\angle 16 \cong \angle 2$ $\boxed{n \parallel q}$

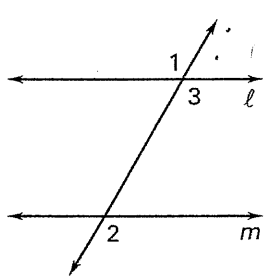
13. $\angle 7 \cong \angle 9$ $\boxed{n \parallel q}$



14. Complete the two-column proof of the Alternate Exterior Angles Converse Theorem.

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

Prove: $\ell \parallel m$



Statements	Reasons
1. $\angle 1 \cong \angle 2$	1. Given
2. $\angle 1 \cong \angle 3$	2. vert. angles ≅
3. $\angle 2 \cong \angle 3$	3. Substitute
4. $\ell \parallel m$	4. Corresp. angles congruent converse

Lesson 3.4

LESSON
3.4

NAME ______________________ DATE __________

Practice B

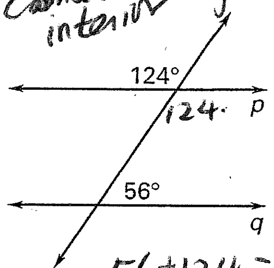
For use with pages 150–156

consec. interior angles supplementary

79+48+53=180

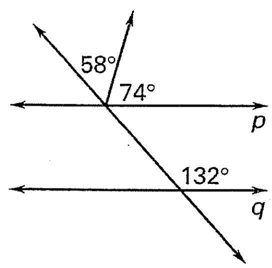
Is it possible to prove that lines *p* and *q* are parallel? If so, state the postulate or theorem you would use.

1. consecutive interior angles=180

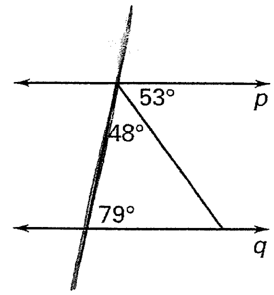


56+124=180

2. corresp. 58+74=132



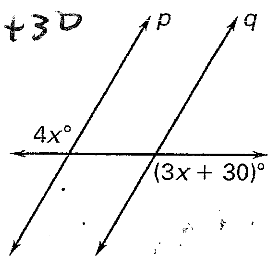
3.



Find the value of *x* that makes $p \parallel q$.

4. 4x=3x+30

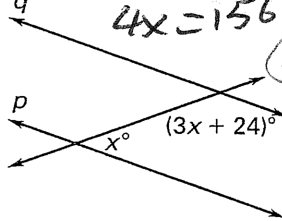
x=30



5. x+3x+24=180

4x=156

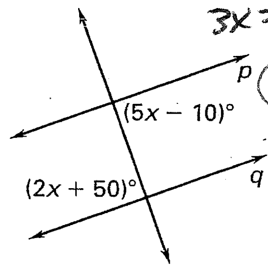
x=39



6. 5x-10=2x+50

3x=60

x=20



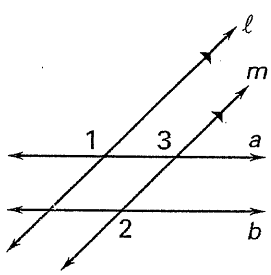
Choose the word(s) that best completes the statement.

7. If two lines are cut by a transversal so that alternate interior angles are (congruent, supplementary, complementary), then the lines are parallel.
8. If two lines are cut by a transversal so that consecutive interior angles are (congruent, supplementary, complementary), then the lines are parallel.
9. If the lines are cut by a transversal so that (alternate interior, alternate exterior, corresponding) angles are congruent, then the lines are parallel.

10. Complete the two-column proof.

Given: $\ell \parallel m$, $\angle 1 \cong \angle 2$

Prove: $a \parallel b$.

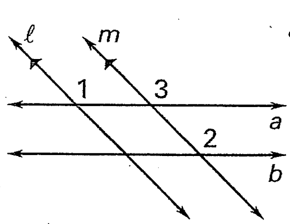


Statements	Reasons
1. $\ell \parallel m$	1. given
2. $\angle 1 \cong \angle 3$	2. corresp. angles congruent
3. $\angle 1 \cong \angle 2$	3. alt. exterior congruent
4. $\angle 2 \cong \angle 3$	4. substitute
5. $a \parallel b$	5. alt. ext.

11. Write a two-column proof.

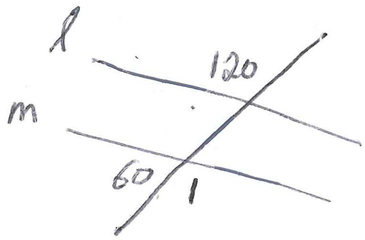
Given: $\ell \parallel m$, $\angle 1 \cong \angle 2$

Prove: $a \parallel b$



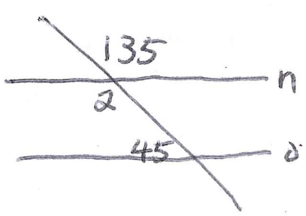
Statements	Reasons
1. $\ell \parallel m$	Given
2. $\angle 1 \cong \angle 2$	Given
3. $\angle 1 \cong \angle 3$	Corresp. angles congruent
4. $\angle 3 \cong \angle 2$	substitution
5. $a \parallel b$	Corresp. angles $\cong$

1) Prove $l \parallel m$



1) $60° + \angle 1 = 180°$ · linear pair postulate
2) $\angle 1 = 120°$ alt. ext. are congruent
3) $\angle 2 = 120°$
4) $\angle 1 \cong \angle 2$
5) $l \parallel m$

2) Prove $n \parallel o$



1) $\angle 2 \approxeq 135°$
2) $\angle 2 + 45 = 180°$
3) $n \parallel o$