3.3 Exercises

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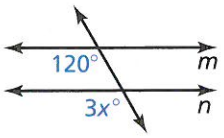
Vocabulary and Core Concept Check

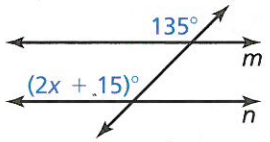
1. **VOCABULARY** Two lines are cut by a transversal. Which angle pairs must be congruent for the lines to be parallel?

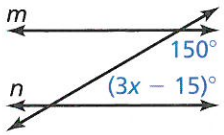
2. **WRITING** Use the theorems from Section 3.2 and the converses of those theorems in this section to write three biconditional statements about parallel lines and transversals.

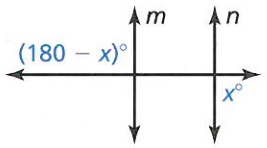
Monitoring Progress and Modeling with Mathematics

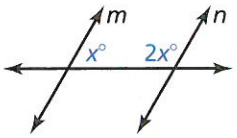
In Exercises 3–8, find the value of x that makes $m \parallel n$. Explain your reasoning. *(See Example 1.)*

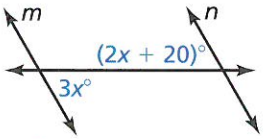
3. 

4. 

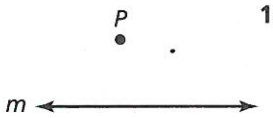
5. 

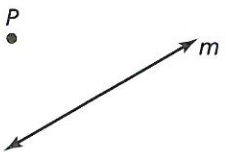
6. 

7. 

8. 

In Exercises 9 and 10, use a compass and straightedge to construct a line through point P that is parallel to line m.

9. 

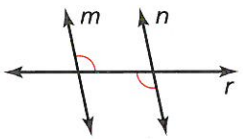
10. 

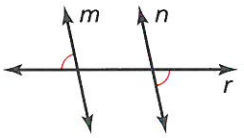
PROVING A THEOREM **In Exercises 11 and 12, prove the theorem.** *(See Example 2.)*

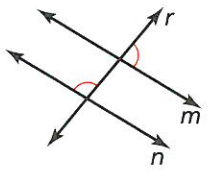
11. Alternate Exterior Angles Converse (Theorem 3.7)

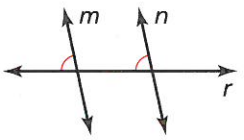
12. Consecutive Interior Angles Converse (Theorem 3.8)

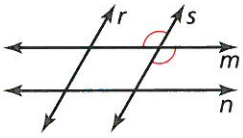
In Exercises 13–18, decide whether there is enough information to prove that $m \parallel n$. If so, state the theorem you would use. *(See Example 3.)*

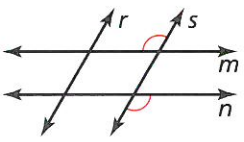
13. 

14. 

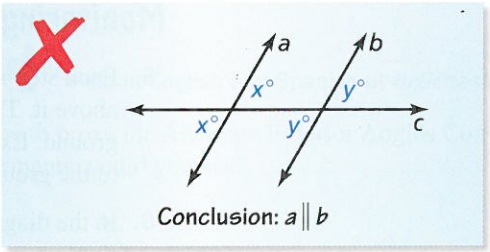
15. 

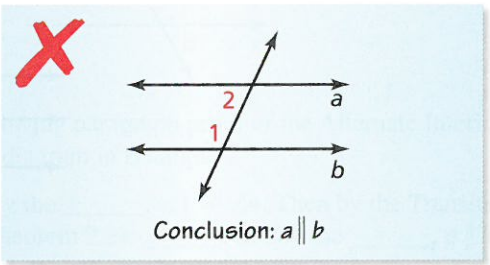
16. 

17. 

18. 

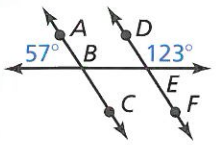
ERROR ANALYSIS **In Exercises 19 and 20, describe and correct the error in the reasoning.**

19. 

20. 

In Exercises 21–24, are $\overleftrightarrow{AC}$ and $\overleftrightarrow{DF}$ parallel? Explain your reasoning.

21.



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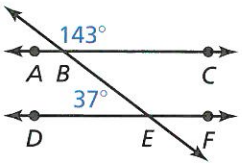

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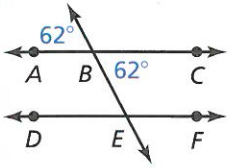

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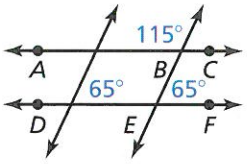
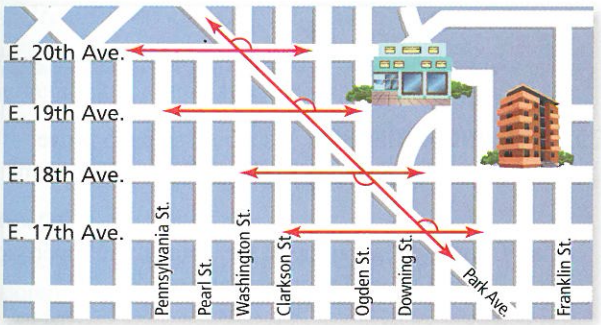
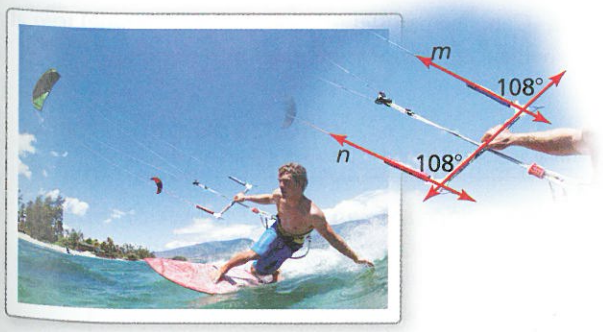


25. ANALYZING RELATIONSHIPS The map shows part of Denver, Colorado. Use the markings on the map. Are the numbered streets parallel to one another? Explain your reasoning. *(See Example 4.)*

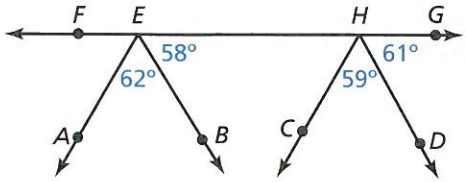


26. ANALYZING RELATIONSHIPS Each rung of the ladder is parallel to the rung directly above it. Explain why the top rung is parallel to the bottom rung.

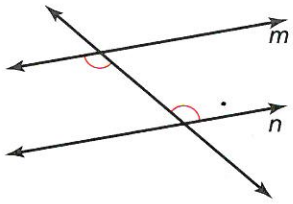
27. MODELING WITH MATHEMATICS The diagram of the control bar of the kite shows the angles formed between the control bar and the kite lines. How do you know that n is parallel to m?



28. REASONING Use the diagram. Which rays are parallel? Which rays are not parallel? Explain your reasoning.



29. ATTENDING TO PRECISION Use the diagram. Which theorems allow you to conclude that $m \parallel n$? Select all that apply. Explain your reasoning.



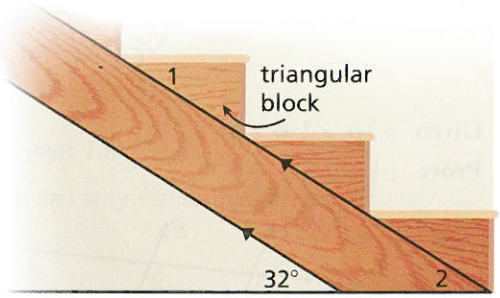
Ⓐ Corresponding Angles Converse (Thm. 3.5)

Ⓑ Alternate Interior Angles Converse (Thm. 3.6)

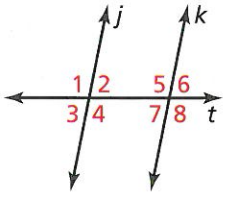
Ⓒ Alternate Exterior Angles Converse (Thm. 3.7)

Ⓓ Consecutive Interior Angles Converse (Thm. 3.8)

30. MODELING WITH MATHEMATICS One way to build stairs is to attach triangular blocks to an angled support, as shown. The sides of the angled support are parallel. If the support makes a 32° angle with the floor, what must $m\angle 1$ be so the top of the step will be parallel to the floor? Explain your reasoning.



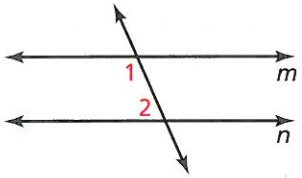
31. ABSTRACT REASONING In the diagram, how many angles must be given to determine whether $j \parallel k$? Give four examples that would allow you to conclude that $j \parallel k$ using the theorems from this lesson.



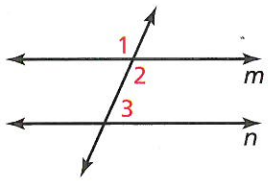
32. THOUGHT PROVOKING Draw a diagram of at least two lines cut by at least one transversal. Mark your diagram so that it cannot be proven that any lines are parallel. Then explain how your diagram would need to change in order to prove that lines are parallel.

PROOF In Exercises 33–36, write a proof.

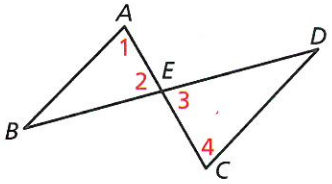
33. Given $m\angle 1 = 115°, m\angle 2 = 65°$
Prove $m \parallel n$



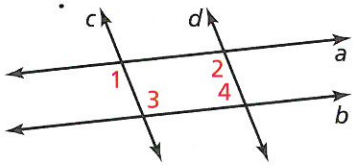
34. Given $\angle 1$ and $\angle 3$ are supplementary.
Prove $m \parallel n$



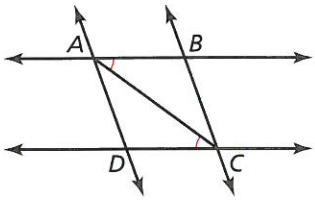
35. Given $\angle 1 \cong \angle 2, \angle 3 \cong \angle 4$
Prove $\overline{AB} \parallel \overline{CD}$



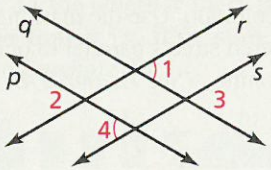
36. Given $a \parallel b, \angle 2 \cong \angle 3$
Prove $c \parallel d$



37. MAKING AN ARGUMENT Your classmate decided that $\overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$ based on the diagram. Is your classmate correct? Explain your reasoning.



38. HOW DO YOU SEE IT? Are the markings on the diagram enough to conclude that any lines are parallel? If so, which ones? If not, what other information is needed?



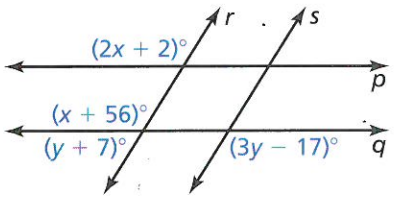
39. PROVING A THEOREM Use these steps to prove the Transitive Property of Parallel Lines Theorem (Theorem 3.9).

a. Copy the diagram with the Transitive Property of Parallel Lines Theorem on page 141.

b. Write the **Given** and **Prove** statements.

c. Use the properties of angles formed by parallel lines cut by a transversal to prove the theorem.

40. MATHEMATICAL CONNECTIONS Use the diagram.



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

b. Find the value of y that makes $r \parallel s$.

c. Can r be parallel to s and can p be parallel to q at the same time? Explain your reasoning.

Maintaining Mathematical Proficiency

Reviewing what you learned in previous grades and lessons

Use the Distance Formula to find the distance between the two points. *(Section 1.3)*

41. (1, 3) and (−2, 9)

42. (−3, 7) and (8, −6)

43. (5, −4) and (0, 8)

44. (13, 1) and (9, −4)