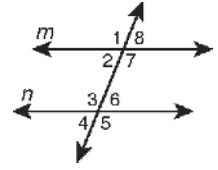


LESSON
4-3

Proving Lines Are Parallel

Practice and Problem Solving: A/B

Use the figure for Problems 1–8. Tell whether lines m and n must be parallel from the given information. If they are, state your reasoning. (*Hint: The angle measures may change for each problem, and the figure is for reference only.*)



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

2. $m\angle 3 = (15x + 22)^\circ$, $m\angle 1 = (19x - 10)^\circ$,
 $x = 8$

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

4. $m\angle 2 = (5x + 3)^\circ$, $m\angle 3 = (8x - 5)^\circ$,
 $x = 14$

5. $m\angle 8 = (6x - 1)^\circ$, $m\angle 4 = (5x + 3)^\circ$, $x = 9$

6. $\angle 5 \cong \angle 7$

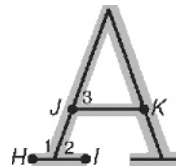
7. $\angle 1 \cong \angle 5$

8. $m\angle 6 = (x + 10)^\circ$, $m\angle 2 = (x + 15)^\circ$

9. Look at some of the printed letters in a textbook. The small horizontal and vertical segments attached to the ends of the letters are called *serifs*. Most of the letters in a textbook are in a serif typeface. The letters on this page do not have serifs, so these letters are in a sans-serif typeface. (*Sans* means “without” in French.) The figure shows a capital letter A with serifs. Use the given information to write a paragraph proof that the serif, segment \overline{HI} , is parallel to segment \overline{JK} .

Given: $\angle 1$ and $\angle 3$ are supplementary.

Prove: $\overline{HI} \parallel \overline{JK}$



4. 62°
5. a. $m\angle 2 + m\angle 3 = 180^\circ$
 b. Corr. \angle s Thm.
 c. $m\angle 1 = m\angle 2$
 d. $m\angle 1 + m\angle 3 = 180^\circ$
 e. Subst.
6. $x = 50$; $y = 25$

Practice and Problem Solving: C

1. Possible answer: $m\angle 1 + m\angle 2 = 180^\circ$ and $m\angle 3 + m\angle 4 = 180^\circ$ by the Same-Side Int. \angle s Thm. Thus, the total of the angle measures is 360° .
2. 360°
3. 360° ; Possible answer:

Statements	Reasons
1. Draw \overline{BE} parallel to \overline{AD} .	1. Construction
2. $m\angle 1 + m\angle ABE = 180^\circ$, $m\angle 4 + m\angle DEB = 180^\circ$	2. Same-Side Int. \angle s Thm.
3. $m\angle 1 + m\angle 4 + m\angle ABE + m\angle DEB = 360^\circ$	3. Add Prop. of =
4. $m\angle 3 + m\angle CEB + m\angle CBE = 180^\circ$	4. Given
5. $m\angle DEB + m\angle CEB = 180^\circ$	5. Lin. Pair Thm.
6. $m\angle 3 + m\angle CEB + m\angle CBE = m\angle DEB + m\angle CEB$	6. Subst. (Steps 4,5)
7. $m\angle 3 + m\angle CBE = m\angle DEB$	7. Subtr. Prop. of =
8. $m\angle 1 + m\angle 3 + m\angle 4 + m\angle ABE + m\angle CBE = 360^\circ$	8. Subst. (Steps 3,7)
9. $m\angle 2 = m\angle ABE + m\angle CBE$	9. Angle Add. Post.
10. $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 = 360^\circ$	10. Subst. (Steps 8, 9)

Practice and Problem Solving: Modified

1. 140°
2. 70°
3. 75
4. 150
5. congruent
6. equal
7. parallel; transversal
8. supplementary
9. congruent
10. $\angle 3$ and $\angle 5$; $\angle 4$ and $\angle 6$
11. $\angle 1$ and $\angle 7$; $\angle 2$ and $\angle 8$
12. $\angle 3$ and $\angle 6$; $\angle 4$ and $\angle 5$

Reading Strategies

1. $\angle 1 \cong \angle 5$
2. $\angle 2 \cong \angle 6$
3. $\angle 3 \cong \angle 7$
4. $\angle 4 \cong \angle 8$
5. $\angle 2 \cong \angle 8$
6. $\angle 3 \cong \angle 5$
7. $\angle 1 \cong \angle 7$
8. $\angle 4 \cong \angle 6$
9. $\angle 2 + \angle 5 = 180^\circ$
10. $\angle 3 + \angle 8 = 180^\circ$
11. $m\angle 6 = 47^\circ$ by the Corresponding Angles Postulate
12. $m\angle 3 = 133^\circ$ by the Same-Side Interior Angles Theorem

Success for English Learners

1. All the angle pairs will be either congruent angles or supplementary angles.
2. Same-side interior angles, angles that form a linear pair, and exterior angles on the same side of the transversal are supplementary angles.

LESSON 4-3

Practice and Problem Solving: A/B

1. $m \parallel n$; Conv. of Alt Int. \angle s Thm.
2. $m \parallel n$; Conv. of Corr. \angle s Thm.

- m and n are parallel if and only if $m\angle 7 = 90^\circ$.
- $m \parallel n$; Conv. of Same-Side Int. \angle s Thm.
- m and n are not parallel.
- $m \parallel n$; Conv. of Corr. \angle s Thm.
- $m \parallel n$; Conv. of Alt Ext. \angle s Thm.
- m and n are not parallel.
- Possible answer: The given information states that $\angle 1$ and $\angle 3$ are supplementary. $\angle 1$ and $\angle 2$ are also supplementary by the Linear Pair Theorem. Therefore $\angle 3$ and $\angle 2$ must be congruent by the Congruent Supplements Theorem. Since $\angle 3$ and $\angle 2$ are congruent, \overline{HI} and \overline{JK} are parallel by the Converse of the Corresponding Angles Theorem.

Practice and Problem Solving: C

- $x = 11$; $y = -5$; $m\angle 1 = 57^\circ$; $m\angle 2 = 57^\circ$; $m\angle 3 = 123^\circ$
-

Possible answer: Draw \overline{AE} so it forms a 90° angle with \overline{AB} by the Protractor Postulate. The Angle Addition Postulate states that $m\angle FAD$, $m\angle 2 = m\angle FAB$, so by substitution $m\angle FAD + m\angle 2 = 90^\circ$. It is given that $\angle 1 \cong \angle 2$, so $m\angle 1 = m\angle 2$ by the definition of congruent angles. Substituting again reveals that $m\angle FAD + m\angle 1 = 90^\circ$. $\angle FAD$, $\angle 1$, and $\angle AFD$ form a triangle, so by the given information $m\angle FAD + m\angle 1 + m\angle AFD = 180^\circ$. Substitution and the Subtraction Property of Equality show that $m\angle AFD = 90^\circ$. Then by the definition of right angle, $\angle FAB$ and $\angle AFD$ are right angles. \overline{AE} intersects both \overline{CD} and \overline{AB} in right angles, so \overline{AB} and \overline{CD} are parallel lines.

- $x = 61$, $y = -64$, $m\angle 1 = 177^\circ$, $m\angle 2 = 177^\circ$, $m\angle 3 = 3^\circ$

Practice and Problem Solving: Modified

- Conv. of Corr. \angle s Thm.
- $m\angle 3 = 68^\circ$, $\angle 3 \cong \angle 7$, Conv. of Corr. \angle s Thm.
- parallel
- transversal; congruent
- supplementary
- a. Given
b. $\angle 2$ and $\angle 3$ are supplementary
c. $m \parallel n$

Reading Strategies

- Converse of the Alternate Exterior Angles Theorem
- Converse of the Same-Side Interior Angles Theorem
- Converse of the Alternate Interior Angles Theorem
- Converse of the Corresponding Angles Postulate
- No; $\angle 1 \neq \angle 5$.
- 61°

Success for English Learners

- The given angles $\angle 2$ and $\angle 6$ are alternate interior angles. The Converse of the Alternative Interior Angles Theorem proves the lines are parallel.
- The given angles $\angle 8$ and $\angle 4$ are alternate exterior angles. The Converse of the Alternate Exterior Angles Theorem proves the lines are parallel.

LESSON 4-4

Practice and Problem Solving: A/B

- $GH = 16$; $CH = 12$
- $CR = 17$; $PQ = 15$
- a. $m \perp n$
b. $m\angle 1 = 90^\circ$; $m\angle 2 = 90^\circ$
c. Def. of $\cong \angle$ s
d. $\angle 1$ and $\angle 2$ are a linear pair.