

**Real-World Example 3** Proof Using Triangle Inequality Theorem

**TRAVEL** The distance from Colorado Springs, Springs, Colorado, to Abilene, Texas, is the same as the distance from Colorado Springs to Tulsa, Oklahoma. Prove that a direct flight from Colorado Springs to Tulsa through Lincoln, Nebraska, is a greater distance than a nonstopflight from Colorado Springs to Abilene.

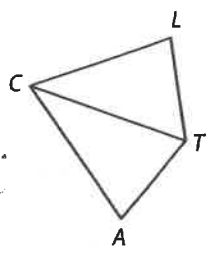


**Real-WorldLink**  
A direct flight is not the same as a nonstop flight. For a direct flight, passengers do not change planes, but the plane may make one or more stops before continuing to its final destination.

Draw a simpler diagram of the situation and label the diagram. Draw in side  $\overline{LT}$  to form  $\triangle CTL$ .

**Given:**  $CA = CT$

**Prove:**  $CL + LT > CA$



**Proof:**

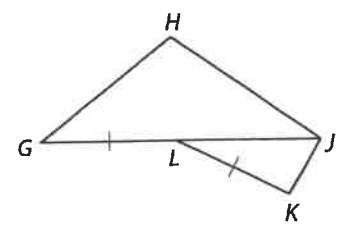
Statements	Reasons
1. $CA = CT$	1. Given
2. $CL + LT > CT$	2. Triangle Inequality Theorem
3. $CL + LT > CA$	3. Substitution

**Guided Practice**

3. Write a two-column proof.

**Given:**  $GL = LK$

**Prove:**  $JH + GH > JK$



**Check Your Understanding**

= Step-by-Step Solutions begin on page R14.

**Example 1** Is it possible to form a triangle with the given side lengths? If not, explain why not.

- 1. 5 cm, 7 cm, 10 cm
- 2. 3 in., 4 in., 8 in.
- 3. 6 m, 14 m, 10 m

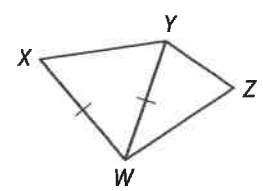
**Example 2** 4. **MULTIPLE CHOICE** If the measures of two sides of a triangle are 5 yards and 9 yards, what is the least possible measure of the third side if the measure is an integer?

- A 4 yd
- B 5 yd
- C 6 yd
- D 14 yd

**Example 3** 5. **PROOF** Write a two-column proof.

**Given:**  $\overline{XW} \cong \overline{YW}$

**Prove:**  $YZ + ZW > XW$



**Example 1**

Is it possible to form a triangle with the given side lengths? If not, explain why not.

- 6. 4 ft, 9 ft, 15 ft
- 7. 11 mm, 21 mm, 16 mm
- 8. 9.9 cm, 1.1 cm, 8.2 cm
- 9. 2.1 in., 4.2 in., 7.9 in.
- 10.  $2\frac{1}{2}$  m,  $1\frac{3}{4}$  m,  $5\frac{1}{8}$  m
- 11.  $1\frac{1}{5}$  km,  $4\frac{1}{2}$  km,  $3\frac{3}{4}$  km

**Example 2**

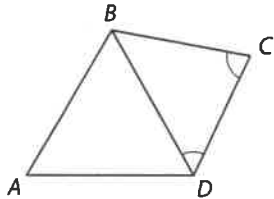
Find the range for the measure of the third side of a triangle given the measures of two sides.

- 12. 4 ft, 8 ft
- 13. 5 m, 11 m
- 14. 2.7 cm, 4.2 cm
- 15. 3.8 in., 9.2 in.
- 16.  $\frac{1}{2}$  km,  $3\frac{1}{4}$  km
- 17.  $2\frac{1}{3}$  yd,  $7\frac{2}{3}$  yd

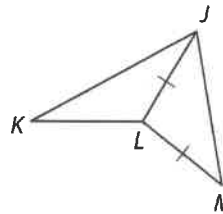
**Example 3**

**PROOF** Write a two-column proof.

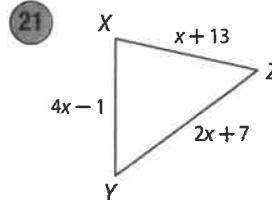
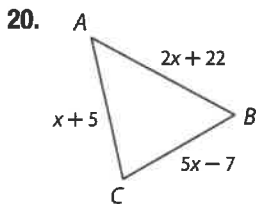
18. **Given:**  $\angle BCD \cong \angle CDB$   
**Prove:**  $AB + AD > BC$



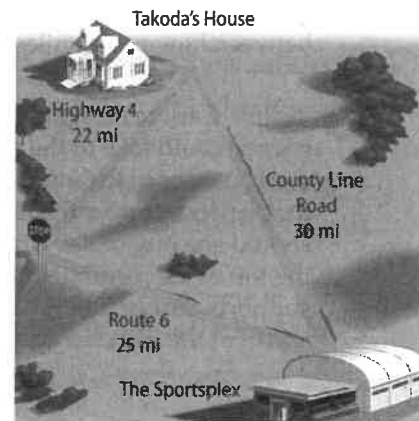
19. **Given:**  $\overline{JL} \cong \overline{LM}$   
**Prove:**  $KJ + KL > LM$



**CCSS SENSE-MAKING** Determine the possible values of  $x$ .



22. **DRIVING** Takoda wants to take the most efficient route from his house to a soccer tournament at The Sportsplex. He can take County Line Road or he can take Highway 4 and then Route 6 to the get to The Sportsplex.



- a. Which of the two possible routes is the shortest? Explain your reasoning.
- b. Suppose Takoda always drives below the speed limit. If the speed limit on County Line Road is 30 miles per hour and on both Highway 4 and Route 6 it is 55 miles per hour, which route will be faster? Explain.

23. **PROOF** Write a two-column proof.

- Given:**  $\triangle ABC$   
**Prove:**  $AC + BC > AB$  (Triangle Inequality Theorem)  
*(Hint: Draw auxiliary segment  $\overline{CD}$ , so that C is between B and D and  $\overline{CD} \cong \overline{AC}$ .)*

