5-6 Inequalities in One Triangle

Content Standard
Extends G.CO.10 Prove theorems about triangles . . .

Objective To use inequalities involving angles and sides of triangles

Essential Understanding The angles and sides of a triangle have special relationships that involve inequalities.

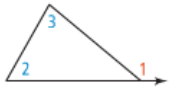
take note

Property Comparison Property of Inequality

If $a = b + c$ and $c > 0$, then $a > b$.

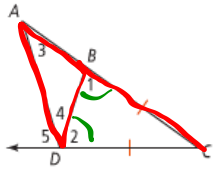
take note

Corollary Corollary to the Triangle Exterior Angle Theorem

Corollary	If . . .	Then . . .
The measure of an exterior angle of a triangle is greater than the measure of each of its remote interior angles.	$\angle 1$ is an exterior angle 	$m\angle 1 > m\angle 2$ and $m\angle 1 > m\angle 3$

Problem 1 Applying the Corollary

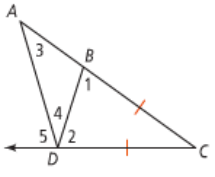
Use the figure at the right. Why is $m\angle 2 > m\angle 3$?



$m\angle 1 = m\angle 2$ $\quad m\angle 1 > m\angle 3$

$m\angle 2 > m\angle 3$

Got It? 1. Why is $m\angle 5 > m\angle C$?



$\angle 5$ is an exterior $\angle$

$\angle C$ is a remote interior $\angle$

$m\angle 5 > m\angle C$

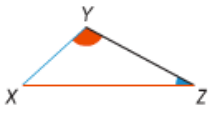
Corollary to the $\triangle$ Exterior $\angle$ Thm

take note

Theorem 5-10

Theorem
If two sides of a triangle are not congruent, then the larger angle lies opposite the longer side.

If . . .
$XZ > XY$



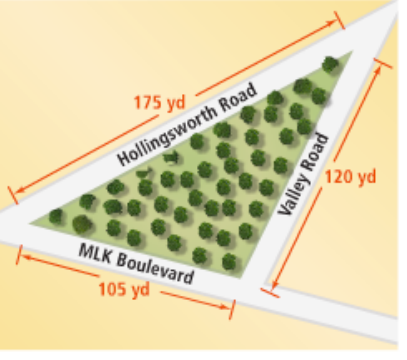
Then . . .
$m\angle Y > m\angle Z$

You will prove Theorem 5-10 in Exercise 40.

Problem 2 Using Theorem 5-10

A town park is triangular. A landscape architect wants to place a bench at the corner with the largest angle. Which two streets form the corner with the largest angle?

MLK Blvd. & Valley Rd.



Got It? 2. Suppose the landscape architect wants to place a drinking fountain at the corner with the second largest angle. Which two streets form the corner with the second-largest angle?

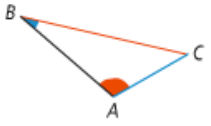
MLK Blvd. & Hollingsworth Rd.

take note

Theorem 5-11

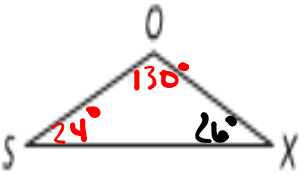
Theorem
If two angles of a triangle are not congruent, then the longer side lies opposite the larger angle.

If . . .
$m\angle A > m\angle B$



Then . . .
$BC > AC$

Got It? 3. Reasoning In the figure at the right, $m\angle S = 24$ and $m\angle O = 130$. Which side of $\triangle SOX$ is the shortest side? Explain your reasoning.



$m\angle X + 24 + 130 = 180$

$m\angle X + 154 = 180$

$m\angle X = 26°$

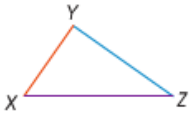
$\overline{OX}$ is the shortest side because it is across from the smallest $\angle$

take note

Theorem 5-12 Triangle Inequality Theorem

The sum of the lengths of any two sides of a triangle is greater than the length of the third side.

$XY + YZ > XZ$ $YZ + XZ > XY$ $XZ + XY > YZ$



You will prove Theorem 5-12 in Exercise 45.

Got It? **4.** Can a triangle have sides with the given lengths? Explain.

a. 2 m, 6 m, and 9 m

$2+6>9$ X

not a $\triangle$

b. 4 yd, 6 yd, and 9 yd

$4+6>9$ ✓

$6+9>4$ ✓

$4+9>6$ ✓

is a $\triangle$

Got It? **5.** A triangle has side lengths of 4 in. and 7 in. What is the range of possible lengths for the third side?

4, 7, x

$4+7 > x$

$11 > x$

$4+x>7$

$-4 \quad -4$

$x > 3$

$7+x>4$

$-7 \quad -7$

$x > -3$

$3 < x < 11$

Name

5.6

pg. 328-330 # 6-8
10-20 even
21-32
34
36-39

Notes 5.7