November 24, 2014

# 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.

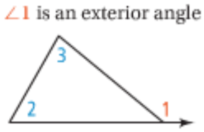
take note

**Property** **Comparison Property of Inequality**

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

take note

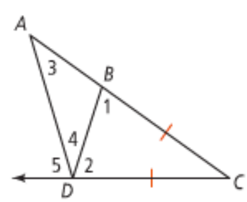
**Corollary** **Corollary to the Triangle Exterior Angle Theorem**

| 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 $m\angle 1 > m\angle 3$ |

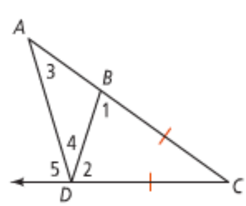


**Problem 1** **Applying the Corollary**

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



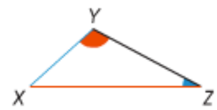

**Got It?** **1.** Why is $m\angle 5 > m\angle C$?



take note

## Theorem 5-10

| Theorem | If . . . | Then . . . |
|---|---|---|
| If two sides of a triangle are not congruent, then the larger angle lies opposite the longer side. | $XZ > XY$ | $m\angle Y > m\angle Z$ |




*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?**


**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?

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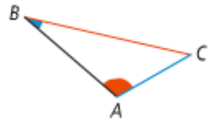
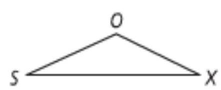
## Theorem 5-11

| Theorem | If . . . | Then . . . |
| --- | --- | --- |
| If two angles of a triangle are not congruent, then the longer side lies opposite the larger angle. | $m\angle A > m\angle B$  | $BC > AC$ |



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.



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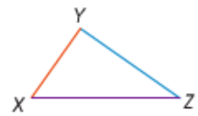
**take note**

### 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.

$XY + YZ > XZ$ $\quad$ $YZ + XZ > XY$ $\quad$ $XZ + XY > YZ$




*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

**b.** 4 yd, 6 yd, and 9 yd

**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?