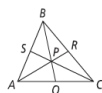## Lesson 5.6 Warm Up

1. Solve for x: 3x - 7 > 12

2. What is the slope of a vertical line?

3. In the figure, P is the centroid of the triangle.
   a. If PR = 6, find AP.

   b. If SC = 6, find CP.

Lesson 5.6 Inequalities in One Triangle

For a neighborhood improvement project, you volunteer to help build a new sandbox at the town playground. You have two boards that will make up two sides of the triangular sandbox. One is 5 ft long and the other is 8 ft long. Boards come in the lengths shown. Which boards can you use for the third side of the sandbox? Explain.

15 ft
12 ft
8 ft
8 ft
5 ft
5 ft
2 ft

Theorem 5-10

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

Ex. 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?

175 yd — Hollingsworth Road
120 yd — Valley Road
105 yd — MLK Boulevard

Theorem 5-11

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

Proof Indirect Proof of Theorem 5-11

Given: $m\angle A > m\angle B$

Prove: $BC > AC$

Step 1 Assume temporarily that $BC \not> AC$. That is, assume temporarily that either $BC < AC$ or $BC = AC$.

Step 2 If $BC < AC$, then $m\angle A < m\angle B$ (Theorem 5-10). This contradicts the given fact that $m\angle A > m\angle B$. Therefore, $BC < AC$ must be false.
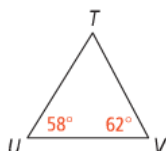
If $BC = AC$, then $m\angle A = m\angle B$ (Isosceles Triangle Theorem). This also contradicts $m\angle A > m\angle B$. Therefore, $BC = AC$ must be false.

Step 3 The temporary assumption $BC \not> AC$ is false, so $BC > AC$.
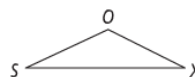
Multiple Choice Which choice shows the sides of $\triangle TUV$ in order from shortest to longest?

(A) $\overline{TV}, \overline{UV}, \overline{UT}$
(B) $\overline{UT}, \overline{UV}, \overline{TV}$
(C) $\overline{UV}, \overline{UT}, \overline{TV}$
(D) $\overline{TV}, \overline{UT}, \overline{UV}$

58°   62°

1 In the figure below, m<S = 24 and m<O = 130. Which side of triangle SOX is the shortest side?

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.

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

Ex. Can a triangle have sides with the given lengths?
  a. 3 ft, 7 ft, 8 ft

  b. 5 ft, 15 ft, 10 ft

2 Can a triangle have side lengths of 2 m, 6 m, and 9 m?

  Yes

  No

3 Can a triangle have side lengths of 4 yd, 6 yd,

  and 9 yd?

  Yes
  No

Ex. A triangle has side lengths of 5 cm and 8 cm. What are
  the possible lengths of the third side?

Ex. A triangle has side lengths of 4 in and 7 in. What are the
  possible lengths of the third side?

4 A triangle has side lengths of 9 in and 4 in. What are
  the possible lengths of the third side (written as a
  compound inequality).

5 Use the figure below. Which side is the longest?
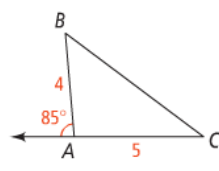
6   A friend tells you that she drew a triangle with
    perimeter of 16 and one side of length 8. How do you
    know she made an error in her drawing?