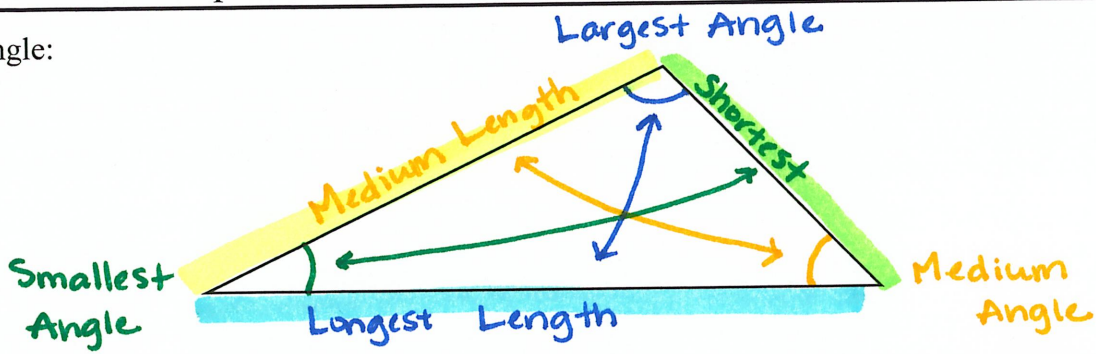


Chapter 5.6: Use Inequalities in a Triangle

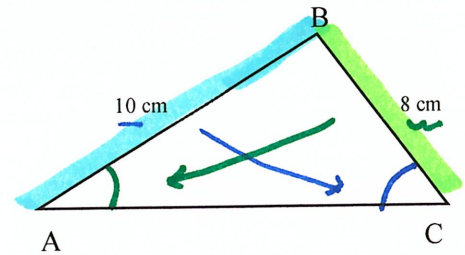
Scalene Triangle:



Theorem 5.10:

If one side of a triangle is longer than another side, then the angles opposite the longer side is larger than the angle opposite the shorter side.

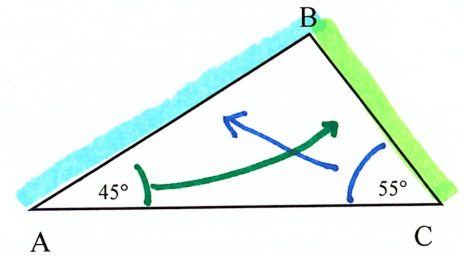
$$AB > BC \text{ then } m\angle C > m\angle A$$



Theorem 5.11:

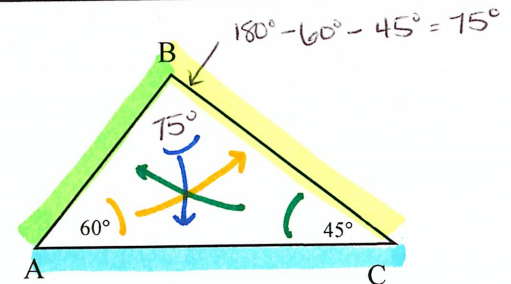
If one angle of a triangle is larger than another angle, then the side opposite the larger angle is longer than the side opposite the smaller angle.

$$m\angle C > m\angle A \text{ then } AB > BC$$



1. List the sides of $\triangle ABC$ in order from shortest to longest.

$$\begin{array}{ccc} m\angle C & , & m\angle A & , & m\angle B \\ \downarrow & & \downarrow & & \downarrow \\ \underline{AB} & , & \underline{BC} & , & \underline{AC} \end{array}$$



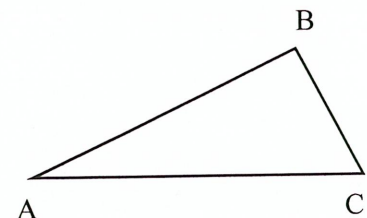
Triangle Inequality Theorem (Theorem 5.12):

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

$$AB + BC > CA$$

$$BC + CA > AB$$

$$CA + AB > BC$$



2. Is it possible to construct a triangle with the given side lengths?

a.) 6, 7, 11

$$6 + 7 > 11 \quad \checkmark$$

$$7 + 11 > 6 \quad \checkmark$$

$$11 + 6 > 7 \quad \checkmark$$

Yes.

b.) 6, 3, 9

$$3 + 6 > 9 \quad \times$$

$$6 + 9 > 3 \quad \checkmark$$

$$9 + 3 > 6 \quad \checkmark$$

No.

c.) 30, 10, 14

$$30 + 10 > 14 \quad \checkmark$$

$$10 + 14 > 30 \quad \times$$

$$14 + 30 > 10 \quad \checkmark$$

No.

3. A triangle has one side length of 14in and another length of 10in. Describe the possible lengths of the third side.

$$14 - 10 = 4$$

$$14 + 10 = 24$$

$$4 \text{ in} < x < 24 \text{ in}$$

4. A triangle has one side length of 23 meters and another length of 17 meters. Describe the possible lengths of the third side.

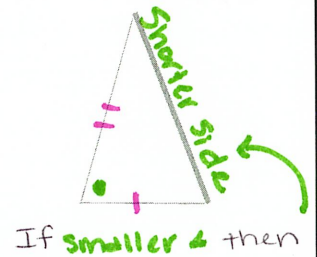
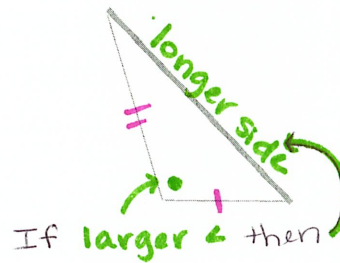
$$23 - 17 = 6$$

$$23 + 17 = 40$$

$$6 \text{ in} < x < 40 \text{ in}$$

Hinge Theorem (Theorem 5.13):

If two sides of one triangle are congruent to two sides of another triangle, and the included angle of the first is larger than the included angle of the second, then the third side of the first is longer than the third side of the second.



Converse of the Hinge Theorem (Theorem 5.14):

If two sides of one triangle are congruent to two sides of another triangle, and third side of the first is longer than the third side of the second, then the included angle of the first is larger than the included angle of the second.

