Math 1312 Section 2.4 The Angles of a Triangle

Definition:

A **triangle** (symbol Δ) is the union of three line segments that are determined by three noncollinear points.

Each of the three noncollinear points is a **vertex**.

Line segments connecting any two points are the **sides**.

Example 1:



Classifying Triangles

Triangles According to the Equality of the Lengths of their Sides

- 1. Scalene triangle has no congruent sides.
- 2. Isosceles triangle has at least two congruent sides.
- 3. Equilateral triangle has three congruent sides.

Question: Is equilateral triangle also an isosceles triangle?

Triangles According to the Kind of Angles

1. Acute triangle has three acute angles.

2. **Obtuse** triangle has one obtuse angle.

3. **Right** triangle has a right angle.

1.

4. Equiangular triangle has three congruent angles.

Example 2: Classify the triangle. a) In $\triangle ABC$, AB = 5, BC = 5, and $m \angle B = 90^{\circ}$.

b) In $\triangle DEF$, DE = 5, EF = 6, and DF = 7.

Theorem(Angle Sum Theorem): The sum of the measures of the interior angles of a triangle is 180°.

Example 3: In ΔNMQ , $m \angle N = 40^{\circ}$ and $m \angle M = 55^{\circ}$. Find $m \angle Q$.

Corollary: Each angle in an equiangular triangle measures 60° .

Corollary: The acute angles in a right triangle are complementary.

Example 4:



Example 5: $\angle B$ is a right angle in $\triangle ABC$; $m \angle A = 43$. Find $m \angle C$.

Corollary (Third Angle Theorem): If two angles of one triangle are congruent to two angles of a second triangle, then the third angles of the triangles are congruent.



Definition:

An **exterior angle** is formed by one side of a triangle and the extension of another side. **Remote interior angles** are the interior angles of a triangle that are not adjacent to a given angle.

Example 6: In the figure below, $\angle CBD$ is an exterior angle of $\triangle ABC$. $\angle A$ and $\angle C$ are remote interior angles. They will not touch the exterior angles.



Corollary (Exterior Angle Theorem): The measure of an exterior angel of a triangle is equal to the sum of the measures of the two remote interior angles.

Example 7: A surveyor has drawn a triangle on a map. One angle measures 42° and another measures 53° . Find the measure of the third angle.

Corollary: There can be at most one right or obtuse angle in a triangle.

Example 8: Can a triangle have angles of the following measures?

- a) 38, 70, and 72
- b) 91, 90, and "something"

Example 9: Find the measure of each of the angles below. $\overrightarrow{AB} \parallel \overrightarrow{CD}$.





Example 10: If \overline{AB} is perpendicular to \overline{BC} , find the measure of each angle in the figure below.

Example 11: Given: $m \angle 1 = 8(x + 2)$ $m \angle 3 = 5x - 3$ $m \angle 5 = 5(x + 1) - 2$ Find *x* and measures of angles 1, 2, 3, 4 and 5.



- $x = _$ $m \angle 1 = _$
- $m \angle 2 = _$ $m \angle 3 = _$
- $m \angle 4 = _$ $m \angle 5 = _$