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 non-collinear points.

Each of the three noncollinear points is a $\sqrt{2}$ Line segments connecting any two points are the _____ OD

Classifying Triangles

Triangles Classified by Congruent sides alene No congruent sides leas Sosce Two congruent sides Cqui latera Three congruent sides Triangles Classified by Angles all angles are acute an one right angle one obtuse angle -quiangular

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all angles are congruent

Question: Is equilateral triangle also an isosceles triangle?

- A. Always true.
- B. Sometimes true.
- C. Never true

Question: Is isosceles triangle also an equilateral triangle?

- A. Always true.
- B. Sometimes true.
- C. Never true

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

NOTE: we need an *auxiliary* (or helping) line drawn to prove this theorem.

Definition: When there is exactly one figure with certain properties, than such a figure is *determined*.

Example: A line or a segment through a point NOT on a given line, parallel to a given line.



Explanation: Such a line is *unique*, i.e. there is exactly one line with such property.

Definition: A figure is *underdetermined* if more than one possible figure is described.

Example: Draw a line that goes through the midpoint of a segment.



Explanation: You may draw infinitely many lines that contain a certain point (midpoint in the example).

Definition: A figure is *overdetermined* when it is not possible to draw a figure that satisfies all conditions stated.

Example: Draw a line that contains three noncolliner points.

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Explanation: This is **NOT** possible. Noncolliner points are points NOT on the same line.

Definition: A theorem that follows directly from a previous theorem is a of that theorem. **Corollary**: Each angle in an equiangular triangle measures 60°.

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

Example: Classify the following triangles.

- 1. In $\triangle ABC$, AB = 5, BC = 5, and $m \angle B = 90^{\circ}$. **Discolor**
- 2. In $\triangle PQR$, PQ = 5, QR = 6, and PR = 7.
- 3. In ΔDOG , $m \ge D = 39^\circ$ and $m \ge G = 51^\circ$. $m \ge O = 180 39 51 = 90^\circ$ Scalence Right

90

4. In $\triangle CAT$, $m \angle A = 2x^\circ$, $m \angle C = (x - 23)^\circ$, and $m \angle \overline{A} = (x - 17)^\circ$

$$2x + x - 23 + x - 17 = 180 \quad m < A = 2(55) = 110^{\circ}$$

$$4x - 40 = 180 \quad m < C = 55 - 23 = 32^{\circ}$$

$$4x = 220 \quad m < C = 55 - 23 = 32^{\circ}$$

$$x = 55 \quad m < T = 55 - 17 = 38^{\circ}$$
Scalene obtuse

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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.

Corollary: The measure of an exterior angle of a triangle equals the sum of the two measures of the two non-adjacent interior angles.

Example:

a. Name one exterior angle for triangle ABC.



Example:

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.



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



Example: If $\overline{AB} \perp \overline{BC}$, then find the measure of each angle in the figure below.





$m \angle 6 = $ _	90-64 = 26°
<i>m</i> ∠7 = _	140°
<i>m</i> ∠8 = _	<u>180 - 140 - 26</u> = 14°