Chapter 3

Triangles

3.1 Congruent Triangles

DEFINITIONS

18. Two triangles are **congruent triangles** if the six parts of the first triangle are congruent to the six corresponding parts of the second triangle.

19. In this context, **Identity** is the reason we cite when verifying that a line segment (or an angle) is congruent to itself; also known as the Reflexive Property of Congruent.

Postulates

12. If the three sides of one triangle are congruent to the three sides of a second triangle, then the triangles are congruent (SSS).

13. If two sides and the included angle of one triangle are congruent to the two sides and the included angle of a second triangle, then the triangles are congruent (SAS).

14. If two angles and the included side of one triangle are congruent to two angles and the included side of a second triangle, then the triangles are congruent (ASA).

Theorems and Corollaries

3.1.1 If two angles and the non-included side of one triangle are congruent to two angles and a non-included side of a second triangle, then the triangles are congruent (AAS).

3.2 Corresponding Parts of Congruent Triangles

Theorems and Corollaries

3.2.1 If the hypotenuse and a leg of one right triangle are congruent to the hypotenuse and a leg of a second right triangle, then the triangles are congruent (HL).

3.3 Isosceles Triangles

Definitions

20. The **perimeter** of a triangle is the sum of the lengths of its sides.

Theorems and Corollaries

3.3.1 Corresponding altitudes of congruent triangles are congruent.

3.3.2 The bisector of the vertex angle of an isosceles triangle separates the triangle into two congruent triangles.

3.3.3 If two sides of a triangle are congruent, then the angles opposite these sides are also congruent.

3.3.4 If two angles of a triangle are congruent, then the sides opposite these angles are also congruent.

3.3.5 An equilateral triangle is also equiangular.

3.3.6 An equiangular triangle is also equilateral.

3.5 Inequalities in a Triangle

Definitions

21. Let a and b be real numbers. a **is greater than** b ($a > b$) if and only if there is a positive number p for which $a = b + p$.

Theorems, Corollaries and Lemmas

3.5.1 If B is between A and C on $\overline{\text{AC}}$, then $AC > AB$. (The measure of a line segment is greater than the measure of any of its parts.

3.5.2 If $\overrightarrow{BD}$ separates $\angle ABC$ into two parts ($\angle 1$ and $\angle 2$), then m$\angle ABC >$ m$\angle 1$ and m$\angle ABC >$ m$\angle 2$. (The measure of an angle is greater than the measure of any of its parts.

3.5.3 The measure of an exterior angle of a triangle is greater than the measure of either nonadjacent interior angle.

3.5.4 If a triangle contains a right or an obtuse angle, then the measure of this angle is greater than the measure of either of the remaining angles.

3.5.5 **(Addition Property of Inequality)** if $a > b$ and $c > d$, then $a + c > b + d$.

3.5.6 If one side of a triangle is longer than a second side, then the measure of the angle opposite the longer side is greater than the measure of the angle opposite the shorter side.

3.5.7 If the measure of one angle of a triangle is greater than the measure of a second angle, then the side opposite the larger angle is longer than the side opposite the smaller angle.

3.5.8 The perpendicular segment from a point to a line is the shortest segment that can be drawn from the point to the line.

3.5.9 The perpendicular segment from a point to a plane is the shortest segment that can be drawn from the point to the plane.

3.5.10 **(Triangle Inequality)** The sum of the lengths of any two sides of a triangle is greater than the length of the third side.

3.5.10 **(Triangle Inequality, Alternate Form)** The length of any side of a triangle must lie between the sum and the difference of the lengths of the other two sides.