Chapter 2

Parallel Lines

2.1   The Parallel Postulate and Special Angles

DEFINITIONS

14. **Parallel lines** are two lines in the same plane that do not intersect.

POSTULATES

10. **(Parallel Postulate)** Through a point not on a line, exactly one line is parallel to the given line.

11. If two parallel lines are cut by a transversal, then the corresponding angles are congruent.

THEOREMS

2.1.1 From a point not on a given line, there is exactly one line perpendicular to the given line.

2.1.2 If two parallel lines are cut by a transversal, then the alternate interior angles are congruent.

2.1.3 If two parallel lines are cut by a transversal, then the alternate exterior angles are congruent.

2.1.4 If two parallel lines are cut by a transversal, then the interior angles on the same side of the transversal are supplementary.

2.1.5 If two parallel lines are cut by a transversal, then the exterior angles on the same side of the transversal are supplementary.

CONSTRUCTIONS

6. Construct a line perpendicular to a given line through a point not on the line.

2.3   Proving Lines Parallel

THEOREMS

2.3.1 If two lines are cut by a transversal so that the corresponding angles are congruent, then these lines are parallel.

2.3.2 If two lines are cut by a transversal so that the alternate interior angles are congruent, then these lines are parallel.

2.3.3 If two lines are cut by a transversal so that the alternate exterior angles are congruent, then these lines are parallel.

2.3.4 If two lines are cut by a transversal so that the interior angles on the same side of the transversal are supplementary, then these lines are parallel.

2.3.5 If two lines are cut by a transversal so that the exterior angles on the same side of the transversal are supplementary, then these lines are parallel.

2.3.6 If two lines are each parallel to a third line, then these lines are parallel to each other.

2.3.7 If two coplanar lines are each perpendicular to a third line, then these lines are parallel to each other.

Constructions

7. Construct a line parallel to a given line through a point not on the line.

2.4   The Angles of a Triangle

DEFINITIONS

15. A **triangle** is the union of three line segments that are determined by three noncollinear points.

THEOREMS AND COROLLARIES

2.4.1 In a triangle, the sum of the measures of the interior angles is 180°.

2.4.2 Each angle of an equiangular triangle measures 60°.

2.4.3 The acute angles of a right triangle are complementary.

2.4.4 If two angles of one triangle are congruent to two angles of another triangle, then the third angles are also congruent.

2.4.5 The measure of the exterior angle of a triangle equals the sum of the measures of the two nonadjacent interior angles.

2.5   Convex Polygons

DEFINITIONS

16. A **polygon** is a closed plane figure whose sides are line segments that intersect only at the endpoints.

17. A **regular polygon** is a polygon that is both equilateral and equiangular.

THEOREMS AND COROLLARIES

2.5.1 The total number of diagonals in a polygon of n sides is given by $D = \frac{n(n-3)}{2}$

2.5.2 The sum S of the measures of the interior angles of a polygon with n sides is given by $S = (n-2) \cdot 180°$. Note that $n > 2$ for any polygon.

2.5.3 The measure I of each interior angle of a regular polygon or equiangular polygon of n sides is $I = \frac{(n-2)\cdot 180°}{n}$.

2.5.4 The sum of the four interior angles of a quadrilateral is $360°$.

2.5.5 The sum of the measures of the exterior angles of a polygon (one at each vertex) is $360°$.

2.5.6 The measure E of each exterior angle of a regular polygon or equiangular polygon of n sides is $E = \frac{360°}{n}$.