## Chapter 7

## Locus and Concurrence

### 7.1 Locus of Points

## Definitions

43. A locus is the set of all point and only those points that satisfy a given condition (or set of conditions).
44. A circle is the locus of points in a plane that are a fixed distance from a given point.

## Theorems, Corollaries and Lemmas

7.1.1 The locus of points in a plane and equidistant from the sides of an angle is the angle bisector.
7.1.2 The locus of points in a plane that are equidistant from the endpoints of a line segment is the perpendicular bisector of that line segment.

### 7.2 Concurrence of Lines

## DEFINITIONS

45. A number of lines are concurrent if they have exactly one point in common.

Theorems, Corollaries and Lemmas
7.2.1 The three angle bisectors of the angles of a triangle are concurrent. This point is called the incenter.
7.2.2 The three perpendicular bisectors of the sides of a triangle are concurrent. This point is called the circumcenter.
7.2.3 The three altitudes of a triangle are concurrent. This point is called the orthocenter.
7.2.4 The three medians of a triangle are concurrent at a point that is $2 / 3$ the distance from any vertex to the midpoint of the opposite side. This point is called the centroid.

### 7.3 More About Regular Polygons

## DEFINITIONS

46. The center of a regular polygon is the common center for the inscribed circle and the circumscribed circle.
47. A radius of a regular polygon is any line segment that joins the center of the polygon to one of its vertices.
48. An apothem of a regular polygon is any line segment drawn from the center of that polygon perpendicular to one of the sides.
49. A central angle of a regular polygon is an angle formed by two consecutive radii of the polygon.

## Theorems, Corollaries and Lemmas

7.3.1 A circle can be circumscribed about (or inscribed in) any regular polygon.
7.3.2 The measure of the central angle of a regular polygon of $n$ sides is given by $c=\frac{360^{\circ}}{n}$.
7.3.3 Any radius of a regular polygon bisects the angle at the vertex to which it is drawn.
7.3.4 Any apothem of a regular polygon bisects the side of the polygon to which it is drawn.

