# 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.