# Elliptic Geometry (Chapter 6)

Read the *Extra*, pages 233–234, on non-Euclidean geometry. As discussed there, the surface of a sphere provides a model of elliptic geometry: a point is any point on the surface of the sphere, and a line is a *great circle* of the sphere, that is, the intersection of the surface of the sphere and a plane that passes through the center of the sphere (see the diagram on page 234).

The following exercises will help you investigate some of the differences between Euclidean geometry and elliptic geometry.

1. Use the diagram at the right to explain why the following theorem from Euclidean geometry is not true in elliptic geometry.

    Theorem 3-9: Through a point outside a line, there is exactly one line perpendicular to the given line.

2. Decide whether the given postulate or theorem of Euclidean geometry appears to be true or false in elliptic geometry. Support your conclusion about each statement with one or more diagrams.
    a. *Postulate 6*: Through any two points there is exactly one line.
    b. *Theorem 3-7*: In a plane two lines perpendicular to the same line are parallel.
    c. *Theorem 3-11*: The sum of the measures of the angles of a triangle is 180°.
    d. *Theorem 6-1*: The measure of an exterior angle of a triangle is greater than the measure of either remote interior angle.
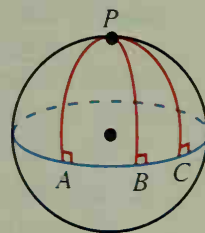
Human Similarity (Chapter 7)

Materials: Tape measure

In this project you will investigate the following conjectures.

   (1) Human beings in the same broad age group (such as small children, adolescents, or adults) are approximately similar in basic shape. For example, the ratio of head size to height is about the same for most adults.

   (2) Human beings in different broad age groups are not similar. For example, an infant's arms are shorter relative to its height than are an adult's arms.

1. Plan and carry out an investigation to test the conjectures stated above. For example, you could measure height, length of head, and length of arms for members of several age groups, such as infants (under 6 months), 2–5 year-old children, students your own age, and adults. Then develop a method of using the data you gather to draw conclusions about conjectures (1) and (2).

2. Design a report to present your data, your methods, and your conclusions. Include a scale drawing of an average person in each group. Draw all of your diagrams the same height, adjusting the relative size of heads and arms to reflect the average ratios of lengths that you found. See if people outside of your class can identify the ages of the people you have drawn.