

**Center for Talent Development – Northwestern University**  
**2005-2006 Saturday Enrichment Program**  
**Session II**  
**Circular Reasoning**

**COURSE DESCRIPTION:**

In this course, students use two different software packages, Circular Reasoning and a Logo programming environment, and a set of online activities to develop their understanding of geometric concepts.

With Circular Reasoning, students explore and illustrate geometric concepts related to circles, such as radius, central angle, arc, chord, segment, and sector. As they use the software to manipulate various attributes of circles, they will also learn geometric properties of circles and acquire a concrete grasp of important theorems as they develop a higher level of geometric reasoning.

With Logo, students will learn angle relations needed to program a screen object to draw polygons and other geometric objects. Logo will also give them the opportunity to manipulate shapes algebraically.

The online activities illustrate particular points or serve as a bridge between work with Circular Reasoning and Logo.

**COURSE GOALS AND OBJECTIVES:**

The purpose of this course is threefold:

1. To give students rich experiences with geometric objects they manipulate in software to understand and create definitions of geometric terms used in high school geometry.
2. To give students experience in solving geometry problems by making use of known facts and software-based constructions.
3. To introduce students to geometric propositions and informal proofs.

**EVALUATION PROCESS:**

Students in this course are not expected to have any programming background, but may have different levels of mathematics experience. Therefore, course material is available to challenge the highest performing student, but students will be assessed according to the progress they make during the course rather than any particular level of attainment. All students are expected to be highly motivated and to work accordingly.

Assessments will be based on tests, exercises and project work.

Students are expected to send in assignments as they are completed, to submit weekly progress reports and to ask questions on the text when it is not clear by posting them to the class discussion forum or contacting the instructor directly.

**TEXTS AND MATERIALS:**

Readings and materials are available online for students who choose to do activities or readings outside of regular class time.

Software used in this course:

Circular Reasoning, which is available as a free download at [http://www.leonelearningsystems.com/circular\\_reasoning.htm](http://www.leonelearningsystems.com/circular_reasoning.htm). Circular Reasoning currently runs under Windows only.

Logo software, also available as a free download. There are two versions of Logo suggested for this course:

George Mills's MSWLogo for Windows users (<http://www.softronix.com/logo.html>).

OR

Brian Harvey's Berkeley Logo for mac users (<http://www.cs.berkeley.edu/~bh/>).

MSWLogo will be used in the classroom.

Online activities for Windows or mac users are available at <http://www.leonelearningsystems.com/kids.htm>. Many of the activities requires installation of the MicroWorlds Web Player from <http://www.microworlds.com/webplayer/index.html>.

## **COURSE TOPICS:**

This is a nine-month correspondence course. Since this is a self-paced course, students will determine the breadth and depth of their explorations of each topic. The topics are taken from the chapter headings of the text. Some of the topics may be covered more or less in depth and out of sequence, depending on questions that arise in forum discussions.

### **Topics:**

- Circle parts (arc, chord, radius, segment, sector, central angle, diameter, semicircle)
- Kinds of angles (acute, right, obtuse, straight, reflex)
- Pairs of lines (parallel lines, perpendicular lines, perpendicular bisector)
- Pairs of angles (vertical, supplementary, complementary, congruent pairs made by parallel lines cutting a transversal)
- Regular polygons (internal and external angles)
- Properties of a circle
- Dividing up a circle (relating equivalent fractions and fractions of a circle to degrees in a circle)
- Using a protractor
- Total Turtle Trip Theorem
- Drawing similar figures programmatically