Center *for* Talent Development – Northwestern University
2005-2006 LearningLinks Program
Mathematics and Computers Honors

COURSE DESCRIPTION:

This course will introduce students to programming as a mathematical activity. The students will receive instruction in the fundamentals of a list processing language similar to Scheme, which is used in computer science courses at the college level.

Students will explore programming techniques, including; flow of control, functions and function composition, variables and variable scoping and computer graphics.

Emphasis will be on using programming and discrete math to explore pre-calculus concepts.

COURSE GOALS AND OBJECTIVES:

1. To learn to program the computer using a list processing language.
2. To learn to use programming to explore concepts in mathematics.

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 exercises and projects suggested in the text and participation in the class discussion forum. Asking questions on the forum are just as important as providing answers for other students.

Students are expected to submit assignments as they are completed, to send in 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. By the end of the course, students are also expected to submit a project dealing with vectors, analytic geometry, polynomials, parametric equations, or other topics taken from the text.

TEXTS AND MATERIALS:

Approaching Precalculus Mathematics Discretely
by Philip G. Lewis
ISBN 0-262-12138-7

George Mills's MSWLogo for Windows users, which is available as a free download at http://www.softronix.com/logo.html, or Brian Harvey's Berkeley Logo for mac users, which is available as a free download at http://www.cs.berkeley.edu/~bh/.

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:

Logo Fundamentals and Function Composition
Transformations, Functions, and Problem Solving
Mapping the Plane to the Computer Screen
Vectors and Vector Operations
Linear Transformations
Recursions, Induction, and Logo Procedures
Transformations Extended to Three Dimensions
Representing Functions Graphically
Vectors Applied to Algebra
Toward the Calculus: Rational Functions and Limits
The Trigonometric Functions from a Graphic Point of View
Approaching the Calculus