

## **Math Competency Criteria November 18, 2010**

### Statement of Philosophy

The new level of math competency has been designated to be an intermediate algebra course or a course at the same level and rigor as intermediate algebra. We interpret this to mean that a student is math competent by demonstrating skills in intermediate algebra, geometry, statistics, advanced mathematical topics, critical thinking and problem solving, or other areas of quantitative reasoning.

We believe that math competency is best accomplished by completing a course that is fundamentally a course in mathematics, has a pre-requisite of Elementary Algebra, and is most likely taught by the department of mathematics or statistics.

While we do not expect a course to meet all criteria, the course must contain a substantial number of mathematical concepts and skills. We have established a process to review mathematics-based courses against established criteria and designate a course as meeting math competency if it is awarded a minimum score of 8 points when evaluated against the stated criteria.

### Criteria:

1. Intermediate Algebraic Skills and Concepts (5 points)
  - Simplify expressions and solve equations including polynomial, rational, absolute value, radical, exponential, and logarithmic
  - Solve nonlinear and absolute value inequalities; solve systems of equations and inequalities
  - Graph and perform simple transformations (translations, reflections, and scale factors) on linear, quadratic, exponential, logarithmic, simple rational, and simple polynomial functions
  - Demonstrate the ability to appropriately use function and inverse function notation, terminology, and operations
  - Solve application problems using intermediate algebra context-appropriate models
  
2. Geometric Skills and Concepts (5 points)
  - Apply algebraic skills to geometric problems
  - Solve mathematical and logical problems which require geometric skills
  - Prove geometric theorems using both direct and indirect proof structures
  - Understand conditional, inverse, converse and contra-positive statements and use their related truth values to draw conclusions
  - Apply properties of triangles, quadrilaterals, and other polygons to solve problems and prove related theorems
  - Solve problems involving segments and angles within circles
  - Solve problems in coordinate geometry, including proofs
  - Apply skills to topics in solid geometry, including cylinders, prisms, cones, pyramids, and spheres
  - Use trigonometric ratios of sine, cosine, and tangent to solve applied problems

3. Statistics Skills and Concepts (5 points)
  - Organize information into any/all of its four forms: words, data tables, graphs, and algebraic equations
  - Collect data and calculate descriptive statistics including measures of central tendency, variation, and position
  - Solve probability problems including combinatorics (permutations and combinations), and the analysis of alternatives and risk
  - Apply statistical estimation techniques to construct confidence intervals
  - Solve probability problems using probability distributions including the binomial, normal, and Poisson
  - For a given scenario, select the appropriate test of hypothesis and calculate the test statistic
  - Set up and run a hypothesis test and interpret the results using normal, student-t, chi square, and f-distributions
  
4. Advanced Mathematical Topics (5 points)
  - Solve problems using theorems from number theory, graph theory, set theory, non-Euclidean geometry, or other advanced topics in mathematics.
  - Apply appropriate techniques of proof to validate a given theorem
  - Solve problems involving matrices and determinants
  - Apply techniques of calculus to solve higher level mathematical problems
  - Apply techniques beyond the intermediate algebra level to solve application problems in areas such as finance, biology, and linear programming
  
5. Critical Thinking and Problem Solving (5 points)
  - Analyze the validity of arguments using truth tables
  - Solve problems of logic
  - Identify and analyze problems; creatively propose, analyze, implement, and evaluate solutions to problems
  - Identify a collection of problem solving strategies that would apply to a given mathematical situation, problem, or puzzle
  - Evaluate the appropriateness of a particular problem solving strategy for a given mathematical problem
  
6. Other Areas of Quantitative Reasoning (5 points)
  - Solve problems involving sequences and series
  - Solve problems related to conic sections
  - Use modeling techniques and curve-fitting analysis
  - Demonstrate an understanding of voting methods
  - Explain the advantages and disadvantages between various home mortgage alternatives
  - Other