I. **OVERVIEW**  
The following information will appear in the 2009 - 2010 catalog

**MATH-80 Plane Geometry**  

**Prerequisite:** Satisfactory completion of MATH 70 or MATH 71 and MATH 72 or equivalent placement by MJC assessment process.

Theorems of plane geometry, proofs and the nature of a mathematical proof, numerical solution of geometric problems, and constructions using compass and straight edge. Field trips are not required. Course is applicable to the associate degree.

II. **LEARNING CONTEXT**  
Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. **COURSE CONTENT**

1. **Required Content:**
   a. Fundamental Concepts
      i. Inductive and deductive reasoning
      ii. Some undefined terms and basic definitions
      iii. Angles
      iv. Basic geometric constructions
      v. Introduction to proof and indirect proof
      vi. Theorems involving supplementary, complementary, and vertical angles
   b. Congruent triangles and basic theorems
      i. Congruent triangles
      ii. Proving corresponding parts of congruent triangles equal
      iii. Theorems involving isosceles triangles
      iv. Other ways to prove right triangles congruent
   c. Parallels and parallelograms
      i. Parallel lines
      ii. The sum of the angles in a triangle
      iii. Sums of angles of polygons
iv. Parallelograms
v. Rectangles and rhombuses
vi. Trapezoids
d. Areas and related topics
   i. Areas of polygons
   ii. Areas of circles
   iii. The Pythagorean theorem
   iv. Some special right triangles
   v. Surface area and volume
e. Ratio, proportion, and similarity
   i. Ratio and proportion
   ii. Similar triangles
f. Circles and more on similarity
   i. Circles
   ii. Theorems involving chords, tangents, and secants
g. Regular polygons and circles
   i. Circles circumscribed about and inscribed within regular polygons
   ii. Areas of regular polygons
h. Mathematical logic
   i. Valid reasoning
   ii. The converse, inverse, and the contrapositive
i. An introduction to analytic geometry
   i. The Cartesian coordinate system
   ii. The straight line
   iii. Proving geometric theorems
j. Transformation geometry
   i. Isometries and congruence
   ii. Similitudes and similarity
Problem solving using transformations

Right Triangle Trigonometry
  i. The Sine, Cosine, and Tangent ratios
  ii. Other trigonometric ratios
  iii. Basic identities
  iv. Law of Cosines and Law of Sines
  v. Solving triangles
  vi. Applications

B. ENROLLMENT RESTRICTIONS

1. Prerequisites

   Satisfactory completion of MATH 70 or MATH 71 and MATH 72 or equivalent placement by MJC assessment process.

2. Requisite Skills

   Before entering the course, the student will be able to:

   a. Simplify arithmetic expressions using the correct order of operations.
   b. Simplify algebraic expressions by combining like terms.
   c. Solve linear equations in one variable.
   d. Solve and graph linear inequalities in one variable.
   e. Determine the slope of a line from either the graph or the equation and explain its meaning.
   f. Graph linear equations and inequalities in two variables.
   g. Graph linear equations and inequalities in two variables.
   h. Solve systems of linear equations in two variables by the graphing method, the substitution method, or the elimination-by-addition method.
   i. Solve systems of linear inequalities by graphing and shading.
   j. Add, subtract, multiply, and divide polynomials.
   k. Factor polynomials, by factoring out the GCF, factoring by grouping, special factorizations, and guess and check.
   l. Solve quadratic equations by factoring, completing the square, or using the quadratic formula.
   m. Multiply and divide rational expressions.
   n. Add and subtract rational expressions with linear or simple quadratic denominators.
   o. Simplify complex fractions.
p. Solve equations involving rational expressions by clearing fractions.

q. Simplify algebraic expressions by correctly applying the rules of exponents.

C. HOURS AND UNITS

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<thead>
<tr>
<th>INST METHOD</th>
<th>TERM HOURS</th>
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<tr>
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<tr>
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D. METHODS OF INSTRUCTION (TYPICAL)

Instructors of the course might conduct the course using the following method:

1. Lectures which develop theoretical material

2. Demonstrations of mathematical techniques, applications and problem-solving strategies by both instructor and students

3. Applications of material to specific problems

4. Homework assignments and/or in-class exercises require students to analyze a given problem, select an appropriate procedure to solve the problem, apply the procedure, and evaluate the adequacy of both the result of the procedure and the procedure itself.

E. ASSIGNMENTS (TYPICAL)

1. EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS

Time spent on coursework in addition to hours of instruction (lecture hours)

Homework assignments should be assigned on a daily or weekly basis. Exercises from the textbook can be used for these assignments, to be supplemented as desired. Each hour of class time should produce almost 2 hours of homework.

Several exams should occur during the semester, apportioned as appropriate. Each exam should require several hours of preparation from the student.

A comprehensive final exam should be held during the scheduled time. This exam should require several hours of preparation from the student.

2. EVIDENCE OF CRITICAL THINKING

Assignments require the appropriate level of critical thinking

Homework is expected to help foster a student's understanding of the material, and give them an understanding of the level of performance that will be expected of them. The textbook itself has many fine examples of such problems.

Quizzes and exams should challenge a student to perform at a high level. Free-response questions are expected to be the norm, such as the following:

1) An observer in a lighthouse is 70 feet above sea level. She spots a whale and measures the angle of depression to the whale to be 16.2°. What is the horizontal distance to the whale, to the nearest foot?

2) A pile of highly reactive Cesium metal dust is in the shape of a right circular cone. The diameter of the base of the cone is 18 centimeters and the height of the cone is 15 centimeters. What is the surface area of this cone, to the nearest thousandth of a square centimeter? (Hint: You need to find
the slant height first!)

3) Construct a regular octagon within a provided circle using only a compass and straightedge.

4) Use the two-column proof method to prove that the acute angles of a right triangle are complementary.

F. **TEXTS AND OTHER READINGS (TYPICAL)**


III. **DESIRED LEARNING**

A. **COURSE GOAL**

   *As a result of satisfactory completion of this course, the student should be prepared to:*

   Solve both applied and theoretical problems involving geometry and right triangle trigonometry, and demonstrate understanding of basic logic and the concept of mathematical proof.

B. **STUDENT LEARNING GOALS**

   *Mastery of the following learning goals will enable the student to achieve the overall course goal.*

   1. **Required Learning Goals**

      *Upon satisfactory completion of this course, the student will be able to:*

      a. compare deductive and inductive reasoning processes.

      b. categorize given statements as definitions, axioms, or theorems.

      c. perform geometric constructions using straightedge and compass.

      d. prove theorems using direct and indirect reasoning about:
         1. congruent triangles.
         2. similar triangles.
         3. parallel lines.
         4. other polygons.
         5. right triangles.
         6. circles, tangents, chords, and secants.
         7. ratio and proportion.
         8. inequalities.

      e. conclude whether given arguments constitute proofs.

      f. solve problems involving two or more of the following:
         1. similar triangles.
         2. length, area, and volume of polygons and circles.
         3. right triangle relationships.
         4. special right triangles.
         5. parallel lines

      g. use geometric formulas in both practical and theoretical problems.

      h. solve triangles using basic trigonometric ratios, the Law of Sines, and the Law of Cosines.

      i. solve application problems involving the use of trigonometry.
IV. METHODS OF ASSESSMENT (TYPICAL)

A. FORMATIVE ASSESSMENT
   1. Assigned Homework
   2. Exams
   3. Quizzes

B. SUMMATIVE ASSESSMENT
   1. Final examination