372 PROBLEM SOLVING

GRADE: 12

LEVEL: 2

CREDITS: 5

RECOMMENDED PREREQUISITE: None

BASIC TEXTS:	Reviewing Mathematics, Amsco School Publications, 2003
	NEFE High School Financial Planning Program, National Endowment for Financial Education, 2001
SUPPLEMENTARY TEXTS:	Fantasy Football and Mathematic Dan Flockhart, 2006
	Amsco's Preparing for Qualifying examinations in Mathematics, Amsco School Publications, 2001
	Test Preparation, Globe Fearon Educational Publisher, 2000
	Skills Review Prentice Hall, 1995
	Mastering Essential Mathematics South-Western Educational Publishing, 1998
REQUIRED MATERIALS:	writing utensil, notebook, and scientific calculator

COURSE DESCRIPTION:

The focus of the first half of the course is on improving problem solving and on applying strategies to answer the types of test questions students are likely to encounter such as multiple choice, grid response, free form, and open-ended. The remainder of the course, through project work, will cover a variety of topics such as pattern finding, probability, descriptive statistics, logic, and basic financial literacy. Contemporary technology will be used to assist in problem solving.

MISSION RELATED GOALS:

This class will provide the student with a variety of opportunities to demonstrate academic excellence and intellectual curiosity by communicating effectively, solving complex problems, and working with others toward a common goal.

STUDENT EXPECTATIONS FOR LEARNING ADDRESSED:

Students will be afforded opportunities to apply mathematical concepts to real-world applications. A variety of teaching methods will be used to foster an environment that promotes self-confidence and respect for others throughout the school and global community.

GENERAL PERFORMANCE OBJECTIVES

Students will be able to:
1. Simplify and perform operations involving fractions, decimals, and percents.
2. Simplify and perform operations involving algebraic and rational expressions.
3. Perform basic operations involving probability and statistics.
4. Solve algebraic equations and inequalities.
5. Perform operations with polynomials.
6. Factor by various methods.
7. Identify, classify, and measure different types of geometric figures.
8. Apply the formulas for perimeter, area, circumference, and volume of geometric figures.
9. Understand and interpret various data representations.
10. Choose and represent data in an appropriate graphical representation.
11. Search the Internet for mathematical solutions and concepts.
12. Understand the financial planning process and apply that process through assignments relating to their everyday experiences with money.

MASSACHUSETTS FRAMEWORK STRANDS

- Number Sense
- Patterns, Relations, and Algebra
- Geometry
- Measurement
- Data Analysis, Statistics, and Probability

CURRICULUM FRAMEWORK LEARNING STANDARDS:

I.   Identify and use the properties of operations on real numbers, including the associative, commutative, and distributive properties. (10.N.1)
II. Simplify numerical expressions, including those involving positive integer exponents or the absolute value; apply such simplifications in the solution of problems. (10.N.2)
III. Describe, complete, extend, analyze, and create a wide variety of patterns.(10.P.1)

IV.   Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and x- and y-intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or a geometric description of the line, e.g., by using the "point-slope" or "slope y-intercept" formulas. Explain the significance of a positive, negative, zero, or undefined slope. (10.P.2)
V.   Add, subtract, and multiply polynomials. Divide polynomials by monomials. (10.P.3)
VI.   Solve equations and inequalities and apply to the solution of problems. (10.P.6)
VII.   Solve everyday problems that can be modeled using linear, reciprocal, quadratic, or exponential functions. (10.P.7)
VIII.   Recognize and solve problems involving angles formed by transversals of coplanar lines. Recognize and solve problems associated with radii and chords. (10.G.3)
IX.   Solve simple triangle problems using the triangle angle sum property and/or the Pythagorean Theorem. (10.G.5)
X.   Draw the results, and interpret transformations on figures in the coordinate plane. (10.G.9)
XI.   Demonstrate the ability to visualize solid objects. (10.G.10)
XII.   Calculate perimeter, circumference, and area of common geometric figures such as parallelograms, trapezoids, circles, and triangles. (10.M.1)
XIII.   Given the formula, find the lateral area, surface area, and volume of prisms and spheres. (10.M.2)
XIV.   Select, create, and interpret an appropriate graphical representation (e.g., scatterplot, table, stem-and-leaf plots, box-and-whisker plots, circle graph, line graph, and line plot) for a set of data and use appropriate statistics (e.g., mean, median, range, and mode) to communicate information about the data. Use these notions to compare different sets of data. (10.D.1)
XV.   Describe a set of frequency distribution data by spread (i.e., variance and standard deviation), skewness, symmetry, number of modes, or other characteristics. Use these concepts in everyday applications. (12.D.5)
XVII.   Use combinatorics (e.g., "fundamental counting principle," permutations, and combinations) to solve problems, in particular, to compute probabilities of compound events. Use technology as appropriate. (12.D.6)

UNITS AND THEMES:

I. Patterns and Problem Solving (7 days)	10.P.1, 12.P.2
II. Basic Arithmetic (12 day)	10.N.1, 10.N.2
III. Algebra Review (18 days)	10.N.2, 10.P.6, 10.P.7
IV. Geometry and Measurement (10 days)	10.M.1, 10.M.2, 10.G.3, 10.G.5
V. Probability and Statistics (10 days)	10.D.1, 12.D.1, 12.D.5, 12.D.6
VI. Fantasy Football (20 days)	10.N.1, 10.N.2, 10.D.1
VII. Review, Mid-term, and Final (3 days)	

COURSE OUTLINE:

*(Unit VI Fantasy Football starts at the beginning of the course and runs throughout the entire semester)

I.   Patterns and Problem Solving (7 days)   10.P.1, 12.P.2

    A.   Shape patterns
    B.   Identifying positions in patterns
    C.   Two dimensional patterns
    D.   Sequences
    E.   Primes, factors, and multiples
    F.   Tables with patterns
    G.   Open ended questions
    H.   Logic

II.   Basic Arithmetic (12 day)   10.N.1, 10.N.2

    A.   Computations with fractions, decimals, and percents
    B.   Scientific notation
    C.   Rounding and estimation
    D.   Prime factorization
    E.   Squares and square roots

III.   Algebra Review (18 days)   10.N.2, 10.P.6, 10.P.7

    A.   Evaluating expressions and order of operations
    B.   Solving equations in one variable
    C.   Graphing and solving inequalities
    D.   Ratio and proportion
    E.   Solving percent problems
    F.   Percent increase and decrease
    G.   Linear equations
    H.   Addition and subtraction of polynomials
    I.   Multiplication of polynomials
    J.   Basic factoring

IV.   Geometry and Measurement (10 days)   10.M.1, 10.M.2, 10.G.3, 10.G.5

    A.   Finding and estimating length
    B.   Metric units, customary units, and conversions
    C.   Lines and angles
    D.   Triangles
    E.   Review of Pythagorean Theorem
    F.   Polygons and quadrilaterals
    G.   Circles
    H.   Perimeter, area, and volume
    I.   Open ended questions

V. Probability and Statistics (10 days)   10.D.1, 12.D.1, 12.D.5, 12.D.6

    A.   Measures of Central Tendency
    B.   Using list and tables
    C.   Bar, line, and circle graphs
    D.   Stem-and-leaf and box-and-whisker plots
    E.   Interpreting graphs and choosing appropriate graph
    F.   Theoretical and experimental probability
    G.   Introduction of permutations and combinations

VI. Financial Literacy (10 days)

    A.   Financial Planning
    B.   Career Exploration
    C.   Budgeting
    D.   Savings vs. Investments
    E.   Credit: Costs vs. Benefits
    F.   Insurance Basics

VII. Fantasy Football (20 days)   10.N.1, 10.N.2, 10.D.1

    A.   Statistical Analysis
    B.   Solving Algebraic Formulas
    C.   Real world applications
    D.   Budgeting
    E.   Partner/Share Time Management Skills

VII. Review, Mid-term, and Final (3 days)

SUGGESTED INSTRUCTIONAL STRATEGIES

    1.   Lecture
    2.   Written Exercises
    3.   Group Work
    4.   Individual and Group Projects
    5.   Use of Manipulatives
    6.   Use of a Variety of Questioning Techniques
    7.   Board work
    8.   Calculator Activities
    9.   Games (Math Jeopardy, etc.)
    10.   Student Presentations
    11.   A variety of assessment tools (partner quizzes, etc.)
    12.   Guest speakers (credit, insurance, savings, investments)

SUGGESTED INTEGRATED ACTIVITIES:

1.   Mathematics scavenger hunt using newspapers, magazines, and the Internet.

2.   Internet Web Quest – A team of two students will plan a trip from Sacramento, CA to Boston, MA. The trip itinerary must include a visit to twenty-five (25) state capitols and Washington, D.C. Students will keep a daily expense log and mileage record. The competition will be based upon the shortest distance traveled per expense.
3.   Students will develop and conduct a survey on student interests.
4.   Students will investigate the statistical properties of a real-world product (M&Ms).
5.   Students will design and build a free-standing structure and determine costs associated.

USE OF TOOLS/TECHNOLOGY:

1.   Classroom computer with Internet and integrated software package.
2.   Use a scientific or graphing calculator.
3.   Use an overhead projector with transparencies.
4.   Powerpoint Lessons using SMARTBoard or LCD and screen.
5.   SMARTBoard Notebook lessons using SMARTBoard or LCD and screen.
6.   Use laptops for Microsoft Word and Excel to design a statistical experiment and summarize findings in tabular and written format.

ASSESSMENT TECHNIQUES:

1.   Students will take free-response performance tests
2   Students will keep a journal
3   Students will participate in classroom discussions and demonstrate problem solving on the blackboard or overhead projector
4.   Students will work in cooperative situations and report their results
5.   Students will prepare integrated projects