

PRE-CALCULUS COLLEGE PREP B CURRICULUM GUIDE

COURSE OUTLINE/PROFICIENCIES

Course Number: 338

Revised: August 2009

Level: College Prep B

Textbook: Trigonometry, sixth edition

Charles P. McKeague, Mark D. Turner, Brooks/Cole Cengage Learning,
2008

Length: Full Year

Credit: 5 Credits

I. Prerequisite:

Students enrolling in this course must have attained at least a “B” average in Algebra II College Prep B or a “C” average in Algebra II College Prep A. Students who have completed Algebra II Academic with less than a “C” should also have teacher recommendation.

II. Course Description:

This is the fourth year of our college prep mathematics sequence offered to seniors. It is designed to give students the skills they need for the study of college level pre-calculus and ultimately calculus. Students will study the theory of functions and graphs, including algebraic and polynomial functions, exponential and logarithmic functions and trigonometric functions. Students will also study applications of trigonometry, trigonometric identities and equations.

High Point Regional High School’s curriculum and instruction are aligned to the State’s Core Curriculum Content Standards and address the elimination of discrimination by narrowing the achievement gap, by providing equity in educational programs and by providing opportunities for students to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

III. New Jersey Core Curriculum Content Standards Addressed

4.1, 4.2, 4.3, 4.5.

IV. Implementation of Technology

Graphing Calculators will be used throughout the course to encourage discovery, problem solving and to apply mathematics to real life situations. Students are encouraged to purchase their own TI-83+ or TI-84+ graphing calculator for use in this course and for future use in college courses.

Various websites, both interactive and informational, will be infused during class and students will be encouraged to use these sites on their own time.

The Smart Board will be utilized, when appropriate, in presenting or clarifying the current math topic.

V. Materials, Resources, Year Published, and Name of Text

Trigonometry , sixth edition, Charles P. McKeague, Mark D. Turner, Brooks/Cole Cengage Learning, 2008

Supplementary Text for 1st Marking Period (Prerequisites: Fundamental Concepts of Algebra): Precalculus, Third edition, Robert Blitzer, Pearson Prentice Hall, 2007

Companion Website for textbook: http://www.brookscole.com/cgi-wadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenumber=1

Can also be found on the website: mathtv.com

VI. Description of Instruction:

Students are expected to be active participants in the learning process. The teacher will involve them in the introduction and development of material through questioning and class discussions. This process enables the teacher to assess the students' current knowledge and expand on it. When appropriate, students are guided in discovering the concepts themselves through a study of patterns and by relating the new work to their prior knowledge. The graphing calculator will be used extensively throughout the course both to help students discover concepts and to strengthen their understanding of the concepts. Students are expected to read and study material independently and apply the concepts they learn to new situations. Understanding of concepts is stressed rather than rote memorization of skills. Problem solving is emphasized throughout the course.

Homework will be given almost every day and is an important part of the course, providing students with the opportunity to apply skills learned in class, strengthen their understanding of the concepts and identify areas they don't understand. It is imperative that students do homework regularly and conscientiously. Homework will be reviewed in class and it is the student's responsibility during that time to ask questions about problems he/she doesn't understand, to identify specific mistakes and to take notes on

any further explanations concerning these problems. Some of the homework will be based on the sample problems done in class and students are expected to study these examples and use them as a guide when doing their homework. Other problems will require students to extend the concepts learned in class to new situations. Students will also be given reading assignments either to preview material that will be taught the next day or to learn new concepts and procedures independently.

Throughout various chapters in the text students will be provided with websites coordinated with the material designed to help students through interactive tutorials, study tips and practice quizzes.

VII. Student Evaluation:

One to three quizzes, based on the course proficiencies, will be given during a unit and a unit test will be given at the end of each unit. An exam will be given at the end of each semester, covering all the work of that semester.

Homework will be checked regularly. It will usually not be graded for accuracy, but will be considered satisfactory if the work shown indicates the student has made a conscientious effort to complete the assignment. If a student is not able to complete the assignment because he/she doesn't understand the material, he/she may be asked to complete it after reviewing the material in class in order to receive credit for the assignment. Sometimes homework may be collected and graded as a quiz. This will occur only when the concepts have been thoroughly reviewed. Homework may also be collected and graded after it is reviewed in class. Students are expected to make corrections on homework as it is reviewed. Notebooks may also be collected and graded.

Grades will be calculated according to the school grading policy and the following guidelines:

- A. Marking Period Grade
 - 1. Quizzes and Tests 80 – 85 %
(may also include class assignments, homework and notebooks)
 - 2. Homework 15 – 20 %

- B. Final Grade
 - 1. Each Marking Period 20 %
 - 2. Midterm Exam 10 %
 - 3. Final Exam 10 %

VIII. District Policy: ACADEMIC INTEGRITY

Pupils are expected to be honest in all of their academic work. This means that they will not engage in any of the following acts:

- Cheating on examinations or other school assignments, including but not limited to, the non-authorized use of books or notes, the use of crib sheets, copying from other students' papers, exchanging information with other students orally, in writing, or by signals, obtaining copies of the examination illegally and other similar activities. Cheating through the use of technology to exchange information on any school assignment, examination, etc. is prohibited. Technology is defined as, but not limited to, computers, telephones, text messaging, palm pilots, calculators, cameras or any other hand held device.
- Plagiarism is not permitted in term papers, themes, essays, reports, images, take-home examinations, and other academic work. Plagiarism is defined as stealing or use without acknowledgment of the ideas, words, formulas, textual materials, on-line services, computer programs, etc. of another person, or in any way presenting the work of another person as one's own.
- Falsifications, including forging signatures, altering answers after they have been graded, inserting answers after the fact, erasing of grader's markings, and other acts that allow for falsely taking credit.

A pupil found guilty of academic dishonesty may be subjected to a full range of penalties including, but not limited to reprimand and loss of credit for all of the work that is plagiarized. Disciplinary action may also be a consequence of such behavior. Additional consequences may apply as defined in specific department policies and guidelines.

A teacher who believes that a pupil has been academically dishonest in his/her class should resolve the matter in the following manner:

- Reprimand the student orally and/or in writing. The teacher is also authorized to withhold credit for the work due to academic dishonesty.
- If warranted, the teacher shall file a written complaint against the student with the Administration, requesting a more stringent form of discipline. The complaint must describe in detail the academic dishonesty that is alleged to have taken place, and must request that the matter be reviewed by the Administration.
- The Administration will determine if further discipline of the pupil is appropriate, and will determine the nature of the discipline on a case-by-case basis.
- If the pupil is not in agreement with the disciplinary action of the Administration, he/she may appeal the action first to the Principal and secondly to the Superintendent. If the pupil is dissatisfied with the Superintendent's disposition of the case, he/she may grieve the action in accordance with Policy No. 5710, Pupil Grievance.

Unit 1 Pre-requisites: Fundamental Concepts of Algebra**Time: 35 days**

Students will be able to:

1. Evaluate algebraic expressions and use mathematical models.
2. Work with sets and find the union, intersection and complement of a set.
3. Classify real numbers and apply the properties of real numbers.
4. Solve absolute value equations/inequalities and graph absolute functions.
5. Apply basic algebra concepts, evaluate expressions, determine the domain of a function, and apply the laws of exponents.
6. Evaluate square roots and use rules of square roots to simplify and evaluate expressions.
7. Rationalize denominators containing roots.
8. Evaluate and perform operations with higher roots.
9. Perform operations with polynomials.
10. Factor polynomials.
11. Reduce, add, subtract, multiply and divide rational expressions.
12. Solve and graph linear and rational equations and inequalities.
13. Solve quadratic equations by factoring, square roots, completing the square and the quadratic formula.
14. Add, subtract, multiply, and divide complex numbers and solve quadratic equations with complex roots.
15. Graph equations by hand and using the graphing calculator.
16. Use a graphing utility to create tables and approximate the intercepts from a graph.

Resources:

1. Textbook- Appendix A Review of Functions and Appendix B Exponential and Logarithmic functions, page 443 – 500.
2. Supplementary Textbook: Blitzer, Precalculus third edition. Chapter P and Chapter 2
3. Teacher prepared worksheets and transparencies.
4. Graphing calculator.
5. Smart Board

Unit 2 Graphs**Time: 7 days**

Students will be able to:

1. Identify types of angles and determine their complements and supplements.
2. Identify special right triangles and prove the Pythagorean Theorem.
3. Use the Pythagorean Theorem to solve for missing sides of a right triangle.
4. Solve applications involving right triangles.
5. Graph lines and parabolas on a coordinate system by hand and with a graphing calculator.
6. Use the distance formula to derive the equation of a circle.
7. Identify angles in standard position and find coterminal angles.

Resources and Activities:

1. Textbook: Chapter 1.1-1.2
2. Applications and Extensions (Modeling) (from textbook):
 - a. p. 42 - 43 ex. 115, 119, 120, 124
3. Graphing Calculator Activities (from textbook):
Chapter Project p. 54
4. Teacher prepared worksheets and transparencies.
5. Graphing calculator.
6. Smart Board.
7. Companion website:

http://www.brookscole.com/cgiwadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenum=1

Unit 3 Introduction to Trigonometric Functions**Time: 10 days**

Students will be able to:

1. Identify the six trigonometric functions as ratios of x , y , and r .
2. Find the value of the trig functions given a point on the terminal side of an angle.
3. Derive and apply the reciprocal, ratio and Pythagorean identities
4. Use identities to find the value of various trig functions.
5. Write a trigonometric function in terms of other trig functions.

Resources and Activities:

1. Textbook chapter 1.3-1.5
2. Chapter 1 Group Project – Text Page 50
3. Graphing Calculators
4. Teacher prepared worksheets and transparencies.
5. Graphing calculator.
6. Smart Board.
7. Companion website:
http://www.brookscole.com/cgiwadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenumber=1

Unit 4 Right Triangle Trigonometry**Time: 14 days**

Students will be able to:

1. Define the six trigonometric functions as ratios of the sides of right triangles.
2. Determine the exact values of the trig functions for special right triangles.
3. Solve problems involving trig functions.
4. Convert between decimal degrees and degrees, minutes and seconds.
5. Use the graphing calculator to evaluate trigonometric functions.
6. Solve right triangles.
7. Solve application problems including topography, distance, force, and bearings.
8. Use vectors to represent quantities geometrically and find their magnitude.
9. Add, subtract and perform scalar multiplication with vectors.
10. Solve problems involving velocity, distance, force, and work using vectors.

Resources and Activities:

1. Textbook: Chapter 2
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
4. Smart Board.
5. Companion website:
http://www.brookscole.com/cgiwadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenumber=1

Unit 5 Radian Measure**Time: 12 days**

Students will be able to:

1. Find exact values of trigonometric functions using co-terminal or reference angles.
2. Use the calculator to approximate the value of trigonometric functions.
3. Find the radian measure of angles and convert between radian and degrees.
4. Define and evaluate the six trigonometric functions in terms of the rotation of a ray in standard position and a point on the unit circle.
5. Determine the range, domain and period of trigonometric functions.
6. Determine arc length, angular and linear speed, and the area of a sector of a circle.
7. Apply the concepts of trigonometry to solve real world problems.

Resources and Activities:

1. Textbook: Chapter 3
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
4. Smart Board.
5. Companion website:
http://www.brookscole.com/cgiwadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenum=1

Unit 6 Graphing and Inverse Functions**Time: 14 days**

Students will be able to:

1. Graph the six trigonometric functions.
2. Use amplitude, period, horizontal and vertical translation and phase shift to transform these graphs.
3. Determine trigonometric equations from their graphs.
4. Graph inverse trigonometric functions.
5. Evaluate compositions of trigonometric and inverse trigonometric functions.

Resources and Activities:

1. Textbook: Chapter 4 (Omit section 4.6)
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
4. Smart Board.
5. Companion website:
http://www.brookscole.com/cgiwadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenum=1

Unit 7 Identities and Formulas**Time: 15 days**

Students will be able to:

1. Use reciprocal trigonometric identities, quotient identities, Pythagorean identities, co-function identities and odd and even identities to simplify trigonometric expressions and solve trigonometric equations.
2. Establish trigonometric identities.
3. Apply identities for the cosine, sine and tangent of a difference or sum.
4. Apply the sum and difference formulas, double angle formulas and half angle formulas.
5. Use trigonometric concepts to solve equations and real world problems.
6. Convert equations between logarithmic form and exponential form.

Resources and Activities:

1. Textbook: Chapter 5 (Omit section 5.5)
2. Graphing Calculator
3. Teacher prepared worksheets and transparencies.
4. Smart Board.
5. Companion website:
http://www.brookscole.com/cgiwadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenum=1

Unit 8 Equations**Time: 15 days**

Students will be able to:

1. Convert between radians and degrees.
2. Find arc length, angular and linear speed, and area of a sector of a circle.
3. Define and evaluate the six trigonometric functions in terms of the lengths of the sides of a right triangle, the rotation of a ray in standard position, and a point on a unit circle.
4. Find exact values of trigonometric functions and use the calculator to approximate values.
5. Determine the range, domain, and period of trigonometric functions.
6. Graph the six trigonometric functions, and transformations of these graphs.
7. Apply the concepts of trigonometry to solve real world problems

Resources and Activities:

1. Textbook: Chapter 6
2. Graphing Calculator Activities
3. Teacher prepared worksheets and transparencies.
4. Graphing calculator.
5. Smart Board.
6. Companion website:

http://www.brookscole.com/cgiwadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenumber=1

Unit 9 Triangles**Time: 8 days**

Students will be able to:

1. Derive the Law of Sines and use it to solve triangles.
2. Use the Law of Sines to solve application and navigation problems involving heading.
3. Use the Law of Sines to solve triangles given the ambiguous case.
4. Derive the Law of Cosines and use it to solve triangles.
5. Use the Law of Cosines to solve application problems.

6. Develop three formulas for finding the area of any triangle given, SSS, SAS or ASA.
7. Apply area formulas to solve problems.

Resources and Activities:

1. Textbook: Chapter 7.1- 7.4
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
4. Smart Board.
5. Companion website

http://www.brookscole.com/cgiwadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenumber=1

Unit 10 Vectors: An Algebraic Approach**Time: 10 days**

1. Determine and graph vectors in component form.
2. Add, subtract and perform scalar multiplication with algebraic vectors.
3. Represent vectors in terms of horizontal and vertical vectors and unit vectors.
4. Use vector operations to solve problems.
5. Determine the dot product of two vectors, and use the dot product to determine the angle between two vectors.
6. Use vectors to solve work/force problems.

Resources and Activities:

1. Textbook: Chapter 7.5 – 7.6
2. Teacher prepared worksheets and transparencies.
3. Graphing calculator.
4. Smart Board.
5. Companion website:

http://www.brookscole.com/cgiwadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenumber=1

(OPTIONAL)**Unit 11 Complex Numbers and Polar Coordinates Time: 8 days**

Students will be able to:

1. Simplify complex numbers.
2. Add, subtract, multiply and divide complex numbers.
3. Represent complex numbers in trigonometric form and perform operations on them.
4. Convert between trigonometric and rectangular form
5. Use DeMoivre's Theorem to find powers of complex numbers
6. Divide complex numbers.
7. Graph complex numbers in a coordinate system

Resources:

1. Textbook: Chapter 8 (Omit 8.4 and 8.6)
2. Graphing Calculator Activities (teacher prepared materials)
"Exploring Polar Graphs"
3. Graphing calculator.
4. Smart Board.
5. Companion website:

http://www.brookscole.com/cgiwadsworth/course_products_wp.pl?fid=M20b&flag=student&product_isbn_issn=9780495108351&disciplinenum=1

Correlation to Core Content Curriculum Standards

STANDARD 4.1 (NUMBER AND NUMERICAL OPERATIONS) ALL STUDENTS WILL DEVELOP NUMBER SENSE AND WILL PERFORM STANDARD NUMERICAL OPERATIONS AND ESTIMATIONS ON ALL TYPES OF NUMBERS IN A VARIETY OF WAYS.

A. Number sense

1. Extend understanding of the number system to all real numbers.
Summer Assignment, proficiency 1
2. Compare and order rational and irrational numbers.
Covered in other courses
3. Develop conjectures and informal proofs of properties of number systems and sets of numbers.
Covered in other courses

B. Numerical operations

1. Extend understanding and use of operations to real numbers and algebraic procedures.
Covered in other courses
2. Develop, apply, and explain methods for solving problems involving rational and negative exponents.
Summer Assignment, proficiency 3
3. Perform operations on matrices
Addition and subtraction
Scalar multiplication

Covered in other courses
4. Understand and apply the laws of exponents to simplify expressions involving numbers raised to powers.
Summer Assignment, proficiency 3

C. Estimation

1. Recognize the limitations of estimation, assess the amount of error resulting from estimation, and determine whether the error is within acceptable tolerance limits.
Covered in other courses

STANDARD 4.2 (GEOMETRY AND MEASUREMENT) ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PROPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA.

A. Geometric properties

1. Use geometric models to represent real-world situations and objects and to solve problems using those models (e.g., use Pythagorean Theorem to decide whether an object can fit through a doorway).
2. Draw perspective views of 3D objects on isometric dot paper, given 2D representations (e.g., nets or projective views).
3. Apply the properties of geometric shapes.

Parallel lines -transversal, alternate interior angles, corresponding angles
Triangles

- a. Conditions for congruence
- b. Segment joining midpoints of two sides is parallel to and half the length of the third side
- c. Triangle Inequality

Minimal conditions for a shape to be a special quadrilateral

Circles -arcs, central and inscribed angles, chords, tangents.

Self-similarity

4. Use reasoning and some form of proof to verify or refute conjectures and theorems.
Verification or refutation of proposed proofs
Simple proofs involving congruent triangles.
Counterexamples to incorrect conjectures

All of these topics are covered in other courses.

B. Transforming Shapes

1. Determine, describe, and draw the effect of a transformation, or a sequence of transformations, on a geometric or algebraic object, and, conversely, determine whether and how one object can be transformed to another by a transformation or a sequence of transformations.

Transformations of geometric objects are covered in other courses.

Algebraic transformations are covered in unit 1, proficiency 10, unit 4, proficiency 4

2. Recognize three-dimensional figures obtained through transformations of two-dimensional figures (e.g., cone as rotating an isosceles triangle about an altitude), using software as an aid to visualization.
Covered in other courses
3. Determine whether two or more given shapes can be used to generate a tessellation.
Covered in other courses
4. Generate and analyze iterative geometric patterns.

Fractals (e.g., Sierpinski's Triangle)
Patterns in areas and perimeters of self-similar figures
Outcome of extending iterative process indefinitely

Covered in other courses

C. Coordinate Geometry

1. Use coordinate geometry to represent and verify properties of lines.

Distance between two points

Midpoint and slope of a line segment

Finding the intersection of two lines

Lines with the same slope are parallel

Lines that are perpendicular have slopes whose product is -1

Summer Assignment, proficiencies 4, 8, 9

2. Show position and represent motion in the coordinate plane using vectors.

Addition and subtraction of vectors

Unit 6, proficiency 1

D. Units of Measurement

1. Understand and use the concept of significant digits.

Covered in other courses

2. Choose appropriate tools and techniques to achieve the specified degree of precision and error needed in a situation.

Degree of accuracy of a given measurement tool

Finding the interval in which a computed measure (e.g., area or volume) lies, given the degree of precision of linear measurements

Covered in other courses

E. Measuring Geometric Objects

1. Use techniques of indirect measurement to represent and solve problems.

Similar triangles

Pythagorean theorem

Right triangle trigonometry (sine, cosine, tangent)

Similar triangles and the Pythagorean Theorem are covered in other courses. Right triangle trigonometry is covered in unit 4, proficiency 3

2. Use a variety of strategies to determine perimeter and area of plane figures and surface area and volume of

3D figures.

Approximation of area using grids of different sizes

Finding which shape has minimal (or maximal) area, perimeter, volume, or surface area under given conditions using graphing calculators,

dynamic geometric software, and/or spreadsheets

Estimation of area, perimeter, volume, and surface area

Covered in other courses

STANDARD 4.3 (PATTERNS AND ALGEBRA) ALL STUDENTS WILL REPRESENT AND ANALYZE RELATIONSHIPS AMONG VARIABLE QUANTITIES AND SOLVE PROBLEMS INVOLVING PATTERNS, FUNCTIONS, AND ALGEBRAIC CONCEPTS AND PROCESSES.

A. Patterns

- I. Use models and algebraic formulas to represent and analyze sequences and series.

Explicit formulas for n th terms

Sums of finite arithmetic series

Sums of finite and infinite geometric series

Unit 7, proficiencies 5, 6

2. Develop an informal notion of limit.

Unit 7, proficiency 6

Unit 8, proficiencies 1, 3

3. Use inductive reasoning to form generalizations.

This is done throughout the course when introducing concepts. Examples are:

Unit 1, proficiency 10: Students will study graphs of specific functions using the graphing calculator to find general rules for transformations, reflections, and dilations.

Unit 2, proficiencies 3, 8: Students will study graphs of specific polynomial and rational functions to find general rules for predicting end behavior and asymptotes.

Unit 4, proficiency 4: Students will study graphs of specific trigonometric functions to determine general characteristics of graphs.

Unit 6, proficiency 5: Students will study graphs of specific polar equations to determine general characteristics of polar graphs.

B. Functions and Relationships

1. Understand relations and functions and select, convert flexibly among, and use various representations for them, including equations or inequalities, tables, and graphs.
Unit 1, proficiency 2

2. Analyze and explain the general properties and behavior of functions of one variable, using appropriate graphing technologies.
Slope of a line or curve.
Domain and range
Intercepts
Continuity
Maximum/minimum
Estimating roots of equations
Intersecting points as solutions of systems of equations.
Rates of change

Graphing Calculators are used throughout this unit to study the properties above, which are covered in:

Unit 1, proficiencies 3, 4
Unit 2, Proficiencies 3, 5, 8
Unit 4, proficiency 4

3. Understand and perform transformations on commonly used functions.
Translations, reflections, dilations
Effects on linear and quadratic graphs of parameter changes in equations
Using graphing calculators or computers for more complex functions

Unit1, proficiency 10; these properties are then extended to each type of function studied.

4. Understand and compare the properties of classes of functions, including exponential, polynomial, rational, and trigonometric functions.
Linear vs. non-linear
Symmetry
Increasing/decreasing on an interval

Unit 1, proficiency 4

C. Modeling

1. Use functions to model real-world phenomena and solve problems that involve varying quantities-
Linear, quadratic, exponential, periodic (sine and cosine), and step functions (e.g., price of mailing a first-class letter over the past 200 years) .
Direct and inverse variation

Absolute value
 Expressions, equations and inequalities
 Same function can model variety of phenomena
 Growth/decay and change in the natural world
 Applications in mathematics, biology, and economics (including compound interest)

Applications for step functions, direct and inverse variation and absolute value are mainly covered in other courses. Applications for other functions are covered in:

Summer Assignment, proficiency 5
 Unit 1, proficiency 11
 Unit 2, proficiency 9
 Unit 3, proficiency 9
 Unit 4, proficiency 5
 Unit 5, proficiency 6

- Analyze and describe how a change in an independent variable leads to change in a dependent one.

Covered in other courses

- Convert recursive formulas to linear or exponential functions (e.g., Tower of Hanoi and doubling).

Unit 7, proficiency 6

D. Procedures

- Evaluate and simplify expressions.

Add and subtract polynomials

Multiply a polynomial by a monomial or binomial

Divide a polynomial by a monomial

Covered in other courses

- Select and use appropriate methods to solve equations and inequalities

Linear equations -algebraically

Quadratic equations -factoring (when the coefficient of X^2 is 1) and using the quadratic formula

All types of equations using graphing, computer, and graphing calculator techniques

Summer Assignment, proficiencies 5, 12

Unit 2, proficiency 7

Unit 3, proficiency 8

4. Judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology.

Reasonableness of answers and graphing “errors” on the graphing calculator are discussed throughout the course; for example, chapter 1.1, pp. 76, 77, ex. 46, 47

STANDARD 4.4 (DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS) ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE CONCEPTS AND TECHNIQUES OF DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS, AND WILL USE THEM TO MODEL SITUATIONS, SOLVE PROBLEMS, AND ANALYZE AND DRAW APPROPRIATE INFERENCES FROM DATA.

A. Data Analysis

- I. Use surveys and sampling techniques to generate data and draw conclusions about large groups.

Advantages/disadvantages of sample selection methods (e.g., convenience sampling, responses to survey, random sampling)

Covered in other courses

2. Evaluate the use of data in real-world contexts.

Accuracy and reasonableness of conclusions drawn

Bias in conclusions drawn (e.g., influence of how data is displayed)

Statistical claims based on sampling

Covered in other courses

3. Design a statistical experiment, conduct the experiment, and interpret and communicate the outcome.

Covered in other courses

4. Estimate or determine lines of best fit (or curves of best fit if appropriate) with technology, and use them to interpolate within the range of the data.

Unit 1, proficiency 12

5. Analyze data using technology, and use statistical terminology to describe conclusions.

Measures of dispersion: variance, standard deviation, outliers

Correlation coefficient

Normal distribution (e.g., approximately 95% of the sample lies between two standard deviations on either side of the mean)

Unit 7, proficiency 9

B. Probability

1. Calculate the expected value of a probability-based game, given the probabilities and payoffs of the various outcomes, and determine whether the game is fair.

Chapter 9.3, ex. 51, 52

2. Use concepts and formulas of area to calculate geometric probabilities.

Covered in other courses

3. Model situations involving probability with simulations (using spinners, dice, calculators and computers) and theoretical models, and solve problems using these models.

Covered in other courses

4. Determine probabilities in complex situations.

Conditional events

Complementary events

Dependent and independent events

Unit 7, proficiency 5

5. Estimate probabilities and make predictions based on experimental and theoretical probabilities.

Covered in other courses

6. Understand and use the "law of large numbers" (that experimental results tend to approach theoretical probabilities after a large number of trials).

Covered in other courses

C. Discrete Mathematics-Systematic Listing and Counting

1. Calculate combinations with replacement (e.g., the number of possible ways of tossing a coin 5 times and getting 3 heads) and without replacement (e.g., number of possible delegations of 3 out of 23 students).

Unit 7, proficiency 1

2. Apply the multiplication rule of counting in complex situations, recognize the difference between situations with replacement and without replacement, and recognize the difference between ordered and unordered counting situations.

Unit 7, proficiency 1

3. Justify solutions to counting problems.

Unit 7, proficiency 1

4. Recognize and explain relationships involving combinations and Pascal's Triangle, and apply those methods to situations involving probability.

Unit 7, proficiency 3

D. Discrete Mathematics-Vertex-Edge Graphs and Algorithms

1. Use vertex-edge graphs and algorithmic thinking to represent and solve practical problems.

Circuits that include every edge in a graph

Circuits that include every vertex in a graph

Scheduling problems (e.g., when project meetings should be scheduled to avoid conflicts) using graph coloring

Applications to science (e.g., who-eats-whom graphs, genetic trees, molecular structures)

Covered in other courses

2. Explore strategies for making fair decisions.

Combining individual preferences into a group decision (e.g., determining winner of an election or selection process)

Determining how many Student Council representatives each class (9th, 10th, 11th, and 12th grade) gets when the classes have unequal sizes (apportionment)

Covered in other courses

STANDARD 4.5 (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.

All of these skills are emphasized throughout the course. A few examples are given below.

At each grade level, with respect to content appropriate for that grade level, students will:

A. Problem Solving

1. Learn mathematics through problem solving, inquiry, and discovery.

Unit 2, p.189 Exploration, “Investigating End Behavior of $f(x) = ax^n$ ”

Unit 3, p.319 Exploration, “Increasing the Number of Compounding Periods”

Unit 5, p.457 Exploration, “Applications of Maximum and Minimum”

Unit 6, p.524 ex. 57, “Exploring Graphs of Polar Equations”

2. Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).

Open-ended problems
 Non-routine problems
 Problems with multiple solutions
 Problems that can be solved in several ways

Each section in the textbook contains applications based on real data, with sources cited. Information is presented algebraically, graphically and in tabular form so that the student sees the connection among them. Students are also asked to solve problems in various ways – algebraically, graphically and numerically.

Unit 2, p. 255 ex. 89, 91
 Unit 4, p. 407 Exploration 1
 Unit 4, Parking Space Problem
 Unit 7 p. 697 ex. 50

3. Select and apply a variety of appropriate problem-solving strategies (e.g., "try a simpler problem" or "make a diagram") to solve problems.

This is taught in previous courses and is used throughout the course.

4. Pose problems of various types and levels of difficulty.

Each section in the textbook contains a variety of problems of different levels.

5. Monitor their progress and reflect on the process of their problem solving activity.

Students are frequently asked to write a paragraph after the problem solving Explorations in each unit. Time is taken during class to discuss the problem solving process.

B. Communication

1. Use communication to organize and clarify their mathematical thinking.
 Reading and writing
 Discussion, listening, and questioning
2. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.
3. Analyze and evaluate the mathematical thinking and strategies of others.
4. Use the language of mathematics to express mathematical ideas precisely.

Class discussions, rather than lectures, are used to present new material. Students are required to explain material and methods of solving problems. There are several group activities listed in each unit in which students have to communicate with each other. In each section in the textbook, there are exercises that require students to communicate by writing.

Chapter 1.2, ex. 54
 Chapter 2.4, ex. 62, 68, 70
 Chapter 2.7, ex. 55, 66
 Chapter 3.5, ex. 54, 55, 57, 58

Chapter 4.2, ex. 55, 56

Chapter 6.5, ex. 58, 59, 60, 66

C. Connections

1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).

Done throughout the course; for example, the concept of transformations presented in the summer assignment (Chapter P) is referred to in each chapter as new functions (rational, exponential, logarithmic, trigonometric) are studied

2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).

All concepts are looked at algebraically and graphically; for example, algebraic solutions to equations are also studied as the x-intercepts on a graph.

3. Recognize that mathematics is used in a variety of contexts outside of mathematics.

When studying the Fibonacci Sequence, students explore how it is found in art, music and nature. There are also presentations in the textbook discussing how people use mathematics in their careers.

Chapter 4.7, mechanical engineering

Chapter 5.6, medicine

Chapter 7.5, electrical engineering

Chapter 9.7, Communications

4. Apply mathematics in practical situations and in other disciplines.

Each section in the textbook contains applications of the concepts from other disciplines.

Chapter 2.3, ex. 61, 63

Chapter 3.3, p. 289, ex. 11

Chapter 3.5, ex. 37 –45, 51-58

Chapter 4.8 ex. 22-43

Chapter 5.6 ex. 32 – 38

Chapter 9.5 ex. 71

5. Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).

History of mathematics is incorporated throughout the textbook.

Chapter 2, the development of the Complex Plane

Chapter 4, the development of Trigonometry

Chapter 6, the development of Polar coordinates

Chapter 9, the development of Probability Theory

Chapter 10, the development of Calculus

6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

This is done throughout the course.

D. Reasoning

1. Recognize that mathematical facts, procedures, and claims must be justified.
2. Use reasoning to support their mathematical conclusions and problem solutions.
3. Select and use various types of reasoning and methods of proof.
4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.
5. Make and investigate mathematical conjectures.
 - Counterexamples as a means of disproving conjectures
 - Verifying conjectures using informal reasoning or proofs.
6. Evaluate examples of mathematical reasoning and determine whether they are valid.

Reasoning, justification and proofs are integrated throughout the course.

Some examples are:

Chapter 1.2, ex. 63

Chapter 2.1, ex. 63, 68, 69, 71

Chapter 3.6, ex. 57, 58

Chapter 5.2, ex. 54 – 59, 71

Chapter 6.5, ex. 61, 62

E. Representations

1. Create and use representations to organize, record and communicate mathematical ideas.

Concrete representations (e.g., base ten blocks or algebra tiles)

Pictorial representations (e.g. diagrams, charts or tables)

Symbolic representations (e.g. a formula)

Graphical representations (e.g. a line graph)

2. Select, apply and translate among mathematical representations to solve problems.
3. Use representations to model and interpret physical, social and mathematical phenomena.

Diagrams, charts, tables, formulas and graphs are used throughout the course. Students are required to solve problems and prove statements algebraically, numerically and graphically. There are many applications to physical, social and mathematical situations throughout the course.

Chapter 1.4, ex. 53 – 58, 63, 64

Chapter 2.1, ex. 61

Chapter 2.7, ex. 51, 53

Chapter 3.6, ex. 44

Chapter 6 Review, ex. 74 – 82

F. Technology

1. Use technology to gather, analyze, and communicate mathematical information.
2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information (cf. workplace readiness standard 8.4-D).
3. Use graphing calculators and computer software to investigate properties of functions and their graphs.
4. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).
5. Use computer software to make and verify conjectures about geometric objects.
6. Use computer-based laboratory technology for mathematical applications in the sciences (cf. science standards).

Graphing calculator activities are listed in each unit and are integrated throughout the course.