

Dover-Sherborn High School
Mathematics Curriculum
Pre-Calculus and Applied Topics Level 2/CP

A. DESCRIPTION

This course is designed to explore trigonometry and expand the student's knowledge of some Algebra II topics.

B. OBJECTIVES

The student will:

1. develop an understanding of functions
2. understand and apply the six trigonometric functions
3. prove and utilize trigonometric identities
4. apply the Law of Sines and the Law of Cosines
5. solve trigonometric equations
6. review exponential and logarithmic functions and applications
7. review quadratic functions
8. review rational functions
9. explore probability (covered with juniors after seniors graduate)

C. OUTLINE

1. Trigonometric Functions. [G.SRT.6]; [G.SRT.7]; [G.SRT.8]; [F.TF.2]; [F.TF.3]; [F.TF.4];
 - a. definition of the trig functions
 - b. solution of right triangles
 - c. word problems using right triangles including angles of elevation and depression
 - d. reciprocal functions and co-functions
 - e. trig functions of special angles, quadrantal angles, and angles with special reference angles
2. Radian Measure [F.TF.1]; [G.C.5]
 - a. measuring angles in degrees and radians
 - b. conversion from degrees to radians and vice versa
 - c. length of an arc
3. Solution of Oblique Triangles [G.SRT.9]; [G.SRT.10]; [G.SRT.11];
 - a. Law of Sines including the ambiguous case
 - b. Law of Cosines
 - c. area of a triangle including Heron's Formula

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4. Graphs of Trig Functions [F.TF.5];
 - a. graphs of sine and cosine functions, their domain, range, period and amplitude
 - b. utilizing sine and cosine to model harmonic motion

5. Trig Identities and Trig Equations [F.TF.8]; [F.TF.9]
 - a. basic trig identities
 - b. Pythagorean identities and their derivations
 - c. verifying identities using specific angles
 - d. proving trig identities
 - e. utilizing identities such as sum, difference, and half-angle.
 - f. solutions of trig equations

6. Exponential and Logarithmic Functions [F.IF.8b]; [F.IF.10]; [F.BF.5]; [F.LE.2]; [F.LE.4]
 - a. Evaluate logarithms
 - b. Solve exponential equations
 - c. Applications of exponential and logarithmic functions including:
Growth/Decay Models, Compound Interest, Newton's Law of Cooling, Richter Scale, Sound, Logistic Growth

7. Quadratic Functions [A.SSE.3a]; [A.CED.1]; [A.REI.4]
 - a. Solve quadratic equations
 - b. Graph quadratic functions
 - c. Quadratic Modeling and analysis.

8. Rational Functions [A.APR.7]; [A.REI.2]; [F.IF.7d];
 - a. Add, subtract, multiply, and divide rational expressions
 - b. Determine all key characteristics and create a graph: domain, intercepts, vertical asymptotes, holes, horizontal asymptotes

9. Probability and Statistics [S.ID.4]; [S.IC.1]; [S.IC.2]; [S.IC.3]; [S.IC.4]; [S.IC.5]; [S.IC.6]; [S.MD.6]; [S.MD.7]; [S.CP.6]
 - a. sequential counting
 - b. permutations and combinations
 - c. probability
 - d. data visual representation and analysis

D. TEXT

Trigonometry, Hayden and Hall - Prentice Hall, 1990
ISBN 0139308350

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E. SUPPLEMENTARY MATERIALS

- Worksheets prepared by teacher
- Handouts from Algebra 2 textbooks
- Graphical calculators
- Mathematics Teacher

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Course Title: Pre-Calculus Level 2/CP

Grade: 11/12

Unit: Review and Expand Knowledge of Functions

Month Presented: _____

Unit Length (in weeks): _____

Essential Question(s):

- What is a function?
- What are the key characteristics of various functions?

Learning Objectives:

- Identify domain, range, and inverse of a function.
- Perform basic operations on functions including evaluating functions.
- Classify functions.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: Trigonometry of Right Angles

Month Presented: _____

Unit Length (in weeks): _____

Essential Question(s):

- How can one find the trig value of an acute angle?
- How can one find any missing values from a right triangle?

Learning Objectives:

- Use co-functions, given trig value or side lengths, reciprocal functions, identities.
- Evaluate trig functions for special angles (30° , 45° , 60°) using special triangles.
- Solve right triangles including word problems such as angles of depression or elevation.
- Use calculator to find trig values.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games
- Clinometer Project: Constructing a device used to measure angles of elevation and calculate height.

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: Trigonometry of General Angles

Month Presented: _____

Unit Length (in weeks): _____

Essential Question(s):

- How can one use his/her knowledge of acute angles to find the trig value of any angle?

Learning Objectives:

- Evaluate trig values of quadrantal angles.
- Use complementary angles/reference angles and knowledge of the sign of trig functions depending on quadrants to evaluate trig functions.
- Use calculators to find trig values.
- Utilize identities such as Pythagorean Identities, double-angle formulas, half-angle formulas, sum and difference formulas.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: Radian Measure

Month Presented: _____

Unit Length (in weeks): _____

Essential Question(s):

- How can one sketch an angle?
- In what various methods, can one use to give an angle measurement?

Learning Objectives:

- Convert degree measurement to radian measure and vice versa.
- Sketch an angle in standard position.
- Find the length of an arc using central angle measure.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: Solutions to Oblique Triangles

Month Presented: _____

Unit Length (in weeks): _____

Essential Question(s):

- How can one solve oblique triangles to find any missing parts?
- How can apply trigonometry to solve for the area of a triangle?

Learning Objectives:

- Be able to distinguish when to use Law of Sines verses Law of Cosines.
- Use Law of Sines.
- Solve ambiguous case triangles and identify solutions to none, one, or two possible triangles.
- Use Law of Cosines.
- Find the area of a triangle using Heron's formula and right triangle trigonometry.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: Graphs of Trigonometric Functions

Month Presented: _____

Unit Length (in weeks): _____

Essential Question(s):

- What are the characteristics of the graphs of the trigonometric functions sine and cosine?

Learning Objectives:

- Determine domain, range, intercepts, amplitude, period, vertical shift, phase shift of the graph of a function when given an equation.
- Determine the equation when given a graph.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games
- Biorhythm Project: Use days lived to predict and evaluate the accuracy of the biorhythm Theory.

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: Trig Identities and Equations

Month Presented: _____

Unit Length (in weeks): _____

Essential Question(s):

- How does one know that an identity is valid?
- How can one solve an equation involving trigonometric functions?

Learning Objectives:

- Verify identities using special angles.
- Derive various forms of the fundamental identities such as the Pythagorean Identities.
- Prove identities.
- Solve trig equations using graphs of trig functions, techniques for solving quadratics (such as factoring), and using calculators.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: Exponential and Logarithmic Functions

Month Presented: _____

Unit Length (in weeks): _____

Essential Question(s):

- Why do logarithms exist?
- How can I solve an exponential or logarithmic equation?

Learning Objectives:

- Solve exponential equations by getting the same base and equating powers or by using logs
- Use the properties of logarithms to condense/expand expressions and solve equations.
- Solve application problems such as growth, decay, logistic models, interest, Newton's Law of Cooling.
- Graph exponential and logarithmic functions.
- Use the laws of exponents to simplify an expression.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games
- PASCO demonstration of cooling

Materials Utilized:

- Textbook
- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: Quadratic Functions

Month Presented: _____

Unit Length (in weeks): _____

Essential Question(s):

- How do I solve quadratic equations?
- How do I graph quadratic functions?
- How can I use quadratic equations to solve an application problem?

Learning Objectives:

- Solve a quadratic equation via factoring, square root method, and quadratic formula.
- Determine which method is most efficient to solve a quadratic equation.
- Determine the vertex, axis of symmetry, and intercepts to create a graph.
- Create a quadratic function that models a real life scenario and/or use a given quadratic model to solve a problem. Ex: When will the ball reach a max height? When will the ball hit the ground?

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: Rational Functions

Month Presented: _____

Unit Length (in weeks): _____

Essential Question(s):

- How do I add, subtract, multiply and divide rational expressions?
- How do I solve rational equations?
- How do I graph a rational function?

Learning Objectives:

- Add, subtract, multiply, and divide rational expressions.
- Solve a rational equation and identify any extraneous solutions.
- Identify domain, intercepts, asymptotes and removable discontinuities of a rational function and sketch a graph

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)

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Unit: Probability and Statistics

Month Presented: June (post seniors graduating) Unit Length (in weeks): _____

Essential Question(s):

- What is the probability of an event occurring?

Learning Objectives:

- Distinguish between permutation and combination.
- Determine how many ways an event can occur utilizing counting principle, permutations, and combinations.
- Calculate an experimental and theoretical probability.

Instructional Strategies & Activities:

- Note taking
- Group work/cooperative learning
- Guided exploration
- Solution sharing
- Independent Practice
- Competitive Review Games

Materials Utilized:

- Teacher generated notes, worksheets, and explorations
- Graphing calculators
- Teacher generated games and review activities
- Movie clips and question/responses from Ask Marilyn Column (Monty Hall problem)

Assessment Strategies:

- Discussion/Daily class performance
- Openers/Warm-Ups/Bell Work
- Daily homework/Error analysis
- Tests and quizzes
- Enrichment Problems (optional challenge problems, bonus questions on tests)