

Oakwood High School Precalculus Course of Study
Initiated 2001-2002 School Year

PRECALCULUS
COURSE OF STUDY
OAKWOOD BOARD OF EDUCATION

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STATEMENT OF APPROVAL

This PRECALCULUS Course of Study
was approved by the
Board of Education
Oakwood City School District
Dayton, Ohio

June 11, 2001
Date



Superintendent



Board President

PRECALCULUS

Roman numeral headings indicate NCTM Standards for grades 9-12. A correlation between the course of study and the Ohio competencies for the revised (2000) twelfth grade proficiencies test for mathematics is included at the end of the course of study.

I. Numbers and Operations

- a. Students will be able to know the different systems of numbers, including whole numbers, integers, and real numbers, and understand when each is appropriate for giving the solution to a problem. This includes the understanding of whether a situation or function is discrete or continuous
- b. Students will be able to perform mathematical operations on the above systems of numbers.
- c. Students will be able to understand relationships among various operations, such as exponentiation as repeated multiplication and multiplication as repeated addition.

II. Patterns, Functions, and Algebra

- a. Students will be able to develop an understanding of and the ability to solve problems involving multiple-variable relations where one equation relates more than two variables.
- b. Students will be able to develop the ability to solve multiple-variable equations for one variable in terms of the other variables.
- c. Students will be able to develop a more formal understanding of functions and function notation.
- d. Students will be able to develop greater facility with algebraic operations with polynomials, including adding, subtracting, multiplying, factoring, and solving.
- e. Students will be able to solve linear and quadratic equations and inequalities by reasoning with their symbolic forms.
- f. Students will be able to describe the table and graph patterns expected in linear, direct power, inverse power, exponential, logarithmic, absolute value, root, and trigonometric functions, especially with the use of the graphing calculator.
- g. Students will be able to model and solve problems with real world data using the above functions.
- h. Students will be able to identify a function as a variation of a basic family of functions.
- i. Students will be able to recognize how the patterns in graphs, tables, and rules of functions relate to the functions' transformed graphs, tables, and rules.
- k. Students will be able to understand and apply arithmetic and geometric sequences and series.
- l. Students will be able to combine, find inverses of and transformations for the above functions.

- m. Students will be able to understand and apply recursion equations.
- n. Students will be able to draw reasonable conclusions about a situation being modeled.

III. Geometry and Spatial Sense

- a. Students will be able to develop an understanding of and the ability to solve problems involving trigonometric relations where one equation relates more than two variables.
- b. Students will be able to know and be able to use triangle similarity and congruence theorems.
- c. Students will have an understanding of right triangle definitions of trigonometric functions, and be able to use those trigonometric functions to solve problems.

IV. Measurement

- a. Students will be able to collect data by means of measurement; in doing so they will be able to determine a consistent method of measurement.
- b. Students will be able to know the differences between various systems and methods of measurements.
- c. Students will be able to apply concepts of and find perimeter, area, surface area, and volume of various shapes.
- d. Students will be able to measure angles in degrees or radians and will be able to convert between the two units.
- e. Students will be able to apply trigonometric functions to determine distances and angles.

V. Data Analysis and Probability

- a. Students will be able to collect, organize, and interpret data.
- b. Students will be able to find, interpret, and understand properties of measures of center and variability.
- c. Students will be able to describe and compare distributions of data (e.g., center, variability, skewness).
- d. Students will be able to construct, interpret, and understand various plots of data. These would include histograms, stem and leaf, box and whisker, number line, and scatterplot. Students will recognize which plots are appropriate in given situations.
- e. Students will be able to use various plots and measures to make comparisons of two sets of data.
- f. Students will be able to use various plots and measures to find relationships between sets of data.
- g. Students will be able to simulate real world phenomena as a way of making predictions and determining probability.

- h. Students will be able to conduct simulations in a variety of ways, including using technology.
- i. Students will be able to explore, in depth, the geometric distribution.
- j. Students will be able to understand some fundamental ideas of probability, such as independent events, the multiplication rule, and the expected value of a probability distribution.
- k. Students will be able to construct simulated distributions of sample proportions and to use sampling distributions to identify which proportions are likely to be found in a sample of a given size.
- l. Students will be able to construct and interpret margin of error and confidence intervals for population proportions.
- m. Students will be able to understand the standard deviation as a measure of variability in a distribution.
- n. Students will be able to understand the normal distribution as a model of variability.
- o. Students will be able to understand and be able to use the number of standard deviations from the mean as a measure of the position of a value in a normal distribution.
- p. Students will be able to understand and apply the Addition Rule for mutually exclusive events.

VI. Problem Solving

- a. Students will be able to build new mathematical knowledge through their work with problems.
- b. Students will be able to develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics.
- c. Students will be able to apply a wide variety of strategies to solve problems and adapt the strategies to new situations
- d. Students will be able to monitor and reflect on their mathematical thinking in solving problems.
- e. Students will be able to recognize when estimation is an appropriate means of determining whether a solution or measurement is reasonable.
- f. Students will be able to create and use algorithms in a variety of discrete contexts.
- g. Students will be able to model situations with systems of equations and inequalities where two or more output variables are related to the same input variable, and to apply those systems to solve problems.
- h. Students will be able to critically analyze elections in everyday life and as reported in the media.
- i. Students will be able to use iteration and recursion as tools to represent, analyze, and solve problems involving sequential change.
- j. Students will be able to review linear, exponential, and polynomial models from a recursive perspective.

VII. Reasoning and Proof

- a. Students will be able to understand that the solution to a problem and the justification of that solution are equally important, and that a problem is not solved until it is justified.
- b. Students will be able to develop a variety of formal and informal types of reasoning skills.
- c. Students will be able to reason about algebraic expressions by applying the basic algebraic properties of commutativity, associativity, identity, inverse, and distributivity.
- d. Students will be able to prove important mathematical patterns by writing algebraic expressions, equations, and inequalities in equivalent forms and applying algebraic reasoning.
- e. Students will be able to recognize the differences between, as well as the complementary nature of, inductive and deductive reasoning.
- f. Students will be able to use examples and counterexamples in order to support and disprove conjectures. Furthermore, they will recognize that multiple examples do not constitute a proof, and that more formal reasoning is necessary to prove a conjecture.
- g. Students will be able to use the graphing calculator to make and verify conjectures about patterns.

VIII. Communication

- a. Students will be able to work in collaborative groups and understand their responsibilities to themselves and each other when working in this setting.
- b. Students will be able to engage in mathematical discussions with one another. This includes not only contributing one's own ideas, but also carefully considering and making sense of the thinking and strategies of others.
- c. Students will be able to use the language of mathematics as a precise means of mathematical expression in their writing, discussions, and presentations.
- d. Students will be able to write coherently about their mathematical thinking for a variety of audiences, including peers, teachers, and those unfamiliar with the content of this course.

IX. Connections

- a. Students will be able to approach mathematics as a connected body of knowledge in which understanding is deepened as they see and work with relationships among mathematical concepts.
- b. Students will be able to recognize, use, and learn about the mathematical ideas that become necessary as they deal with various contexts.
- c. Students will be able to make connections among various areas of mathematics (e.g., geometry, measurement, and algebra).

X. Representations

- a. Students will be able to represent situations in multiple ways and understand the relationships among those representations. These representations could include graphs, tables, symbolic expressions, equations, inequalities, matrices, and diagrams.
- b. Students will be able to solve equations, including systems of equations, using the above representations.
- c. Students will be able to use a graphing calculator as a tool for modeling and solving real world problems.