

Medina County Schools'

Course of Study

For

Math

Algebra II (Cloverleaf)
Algebra II Honors (Cloverleaf)

June 2008

STANDARD 1: Number, Number Sense and Operations

Algebra II-C
(ALG-C)

Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper and pencil, technology-supported and mental methods.

Ohio Benchmarks
Grades 10

Instructional
Organization

Grade Level Indicators

Notes

<p>By the end of the 8-10 program:</p> <p>A. Use scientific notation to express large numbers and numbers less than one.</p> <p>B. Identify subsets of the real number system.</p> <p>C. Apply properties of operations and the real number system and justify when they hold for a set of numbers.</p> <p>D. Connect physical, verbal and symbolic representations of integers, rational numbers and irrational numbers.</p> <p>E. Compare, order and determine equivalent forms of real numbers.</p> <p>F. Explain the effects of operations on the magnitude of quantities.</p>	<p>M.1.D.ALG-C.1 <i>Use Measurement Techniques and Tools</i></p> <p>M.1.D.ALG-C.2</p>	<p>1. Connect physical, verbal and symbolic representations of irrational numbers; e.g., construct $\sqrt{2}$ as a hypotenuse or on a number line.</p> <p>2. Explain the meaning of the nth root.</p>	
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**STANDARD 1: Number, Number Sense and Operations
(Cont.)**

Algebra II-C
(ALG-C)

Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper and pencil, technology-supported and mental methods.

Ohio Benchmarks Grades 10	Instructional Organization	Grade Level Indicators	Notes
<p>By the end of the 8-10 program:</p> <p>G. Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.</p> <p>H. Find the square root of perfect squares, and approximate the square root of non-perfect squares.</p> <p>I. Estimate, compute and solve problems involving scientific notation, square roots and numbers with integer exponents.</p> <p><i>Note: There are instances where a grade-level indicator is linked to a benchmark for a grade band that does not include the grade level of the indicator. See Grade 11.</i></p>	<p>M.1.I.ALG-C.4</p>	<p>4. Approximate the nth root of a given number greater than zero between consecutive integers when n is an integer; e.g., the 4th root of 50 is between 2 and 3.</p>	

**STANDARD 1: Number, Number Sense and Operations
(Cont.)**

Algebra II-C
(ALG-C)

Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper and pencil, technology-supported and mental methods.

Ohio Benchmarks
Grades 11

Instructional
Organization

Grade Level Indicators

Notes

<p>By the end of the 11-12 program:</p> <p>A. Demonstrate that vectors and matrices are systems having some of the same properties of the real number system.</p> <p>B. Develop an understanding of properties of and representations for addition and multiplication of vectors and matrices.</p>	<p>M.1.A.ALG-C.1 <i>Number and Number Systems</i></p> <p>M.1.B.ALG-C.1 <i>Number and Number Systems</i></p>	<p>1. Determine what properties hold for matrix addition and matrix multiplication; e.g., use examples to show addition is commutative and when multiplication is not commutative.</p> <p>1. Determine what properties hold for matrix addition and matrix multiplication; e.g., use examples to show addition is commutative and when multiplication is not commutative.</p>	
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**STANDARD 1: Number, Number Sense and Operations
(Cont.)**

Algebra II-C
(ALG-C)

Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper and pencil, technology-supported and mental methods.

Ohio Benchmarks Grades 11	Instructional Organization	Grade Level Indicators	Notes
By the end of the 11-12 program:			
C. Apply factorials and exponents, including fractional exponents, to solve practical problems.	M.1.C.ALG-C.3	3. Use factorial notation and computations to represent and solve problem situations involving arrangements. (Grade 10)	
	M.1.C.ALG-C.8	8. Use fractional and negative exponents as optional ways of representing and finding solutions for problem situations; e.g., $(27^{2/3})^2 = (27^{1/3})^4 = 9$.	
D. Demonstrate fluency in operations with real numbers, vectors and matrices, using mental computation or paper and pencil calculations for simple cases, and technology for more complicated cases.	M.1.D.ALG-C.4 <i>Meaning of Operations</i>	4. Use matrices to represent given information in a problem situation.	
	M.1.D.ALG-C.6 <i>Computation and Estimation</i>	6. Compute sums, differences and products of matrices using paper and pencil calculations for simple cases, and technology for more complicated cases.	
E. Represent and compute with complex numbers.	M.1.E.ALG-C.3	3. Represent complex numbers on the complex plane.	
	M.1.E.ALG-C.7	7. Compute sums, differences, products and quotients of complex numbers.	

STANDARD 2: Measurement

Algebra II-C
(ALG-C)

Students estimate and measure to a required degree of accuracy and precision by selecting and using appropriate units, tools and technologies.

Ohio Benchmarks
Grade 10

Instructional
Organization

Grade Level Indicators

Notes

<p>By the end of the 8-10 program:</p> <p>A. Solve increasingly complex non-routine measurement problems and check for reasonableness of results.</p> <p>F. Write and solve real-world, multi-step problems involving money, elapsed time and temperature, and verify reasonableness of solutions.</p>			
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STANDARD 2: Measurement (Cont.)

Students estimate and measure to a required degree of accuracy and precision by selecting and using appropriate units, tools and technologies.

Ohio Benchmarks
Grade 11

Instructional
Organization

Grade Level Indicators

Notes

<p>By the end of the 11-12 program:</p> <p>A. Explain differences among accuracy, precision and error, and describe how each of those can affect solutions in measurement situations.</p> <p>B. Apply various measurement scales to describe phenomena and solve problems.</p>	<p>M.2.A.ALG-C.1 <i>Use Measurement Techniques and Tools</i></p> <p>M.2.A.ALG-C.2</p> <p>M.2.A.ALG-C.3</p> <p>M.2.A.ALG-C.4</p> <p>M.2.A.ALG-C.1 <i>Measurement Units</i></p>	<p>1. <i>Explain how a small error in measurement may lead to a large error in calculated results. (Grade 10)</i></p> <p>2. <i>Calculate relative error. (Grade 10)</i></p> <p>3. <i>Explain the difference between absolute error and relative error in measurement. (Grade 10)</i></p> <p>4. <i>Give examples of how the same absolute error can be problematic in one situation but not in another; e.g., compare “accurate to the nearest foot” when measuring the height of a person versus when measuring the height of a mountain. (Grade 10)</i></p> <p>1. Determine the number of significant digits in a measurement.</p>	
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STANDARD 3: Geometry and Spatial Sense

Algebra II-C
(ALG-C)

Students identify, classify, compare and analyze characteristics, properties and relationships of one-, two- and three-dimensional geometric figures and objects. Students use spatial reasoning, properties of geometric objects, and transformations to analyze mathematical situations and solve problems.

Ohio Benchmarks
Grade 10

Instructional
Organization

Grade Level Indicators

Notes

<p>By the end of the 8-10 program:</p> <p>A. Formally define geometric figures.</p> <p>B. Describe and apply the properties of similar and congruent figures; and justify conjectures involving similarity and congruence.</p>	<p>M.3.A.ALG-C.6 <i>Transformation and Symmetry</i></p>	<p>6. Identify the reflection and rotation symmetries of two- and three-dimensional figures.</p>	
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STANDARD 4: Patterns, Functions and Algebra

Algebra II-C
(ALG-C)

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

Ohio Benchmarks Grade 10	Instructional Organization	Grade Level Indicators	Notes
<p>By the end of the 8-10 program:</p> <p>A. Generalize and explain patterns and sequences in order to find the next term and the nth term.</p> <p>B. Identify and classify functions as linear or nonlinear, and contrast their properties using tables, graphs or equations.</p> <p>C. Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.</p>	<p>M.4.A.ALG-C.1 <i>Use Patterns, Relations and Functions</i></p> <p>M.4.A.ALG-C.2</p>	<p>1. Define function formally and with $f(x)$ notation.</p> <p>2. Describe and compare characteristics of the following families of functions: square root, cubic, absolute value and basic trigonometric functions; e.g., general shape, possible number of roots, domain and range.</p>	

STANDARD 4: Patterns, Functions and Algebra (Cont.)

Algebra II-C
(ALG-C)

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

Ohio Benchmarks Grade 10	Instructional Organization	Grade Level Indicators	Notes
<p>By the end of the 8-10 program:</p> <p>D. Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.</p> <p>E. Analyze and compare functions and their graphs using attributes, such as rates of change, intercepts and zeros.</p> <p>F. Solve and graph linear equations and inequalities.</p>	<p>M.4.D.ALG-C.3 <i>Use Algebraic Representations</i></p> <p>M.4.D.ALG-C.4</p> <p>M.4.D.ALG-C.5</p> <p>M.4.D.ALG-C.6</p> <p>M.4.E.ALG-C.10</p>	<p>3. Solve equations and formulas for a specified variable; e.g., express the base of a triangle in terms of the area and height.</p> <p>4. Use algebraic representations and functions to describe and generalize geometric properties and relationships.</p> <p>5. Solve simple linear and nonlinear equations and inequalities having square roots as coefficients and solutions.</p> <p>6. Solve equations and inequalities having rational expressions as coefficients and solutions.</p> <p>10. Solve real-world problems that can be modeled using linear, quadratic, exponential or square root functions.</p>	

STANDARD 4: Patterns, Functions and Algebra (Cont.)

Algebra II-C
(ALG-C)

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

Ohio Benchmarks Grade 10	Instructional Organization	Grade Level Indicators	Notes
<p>By the end of the 8-10 program:</p> <p>G. Solve quadratic equations with real roots by graphing, formula and factoring.</p> <p>H. Solve systems of linear equations involving two variables graphically and symbolically.</p> <p>I. Model and solve problem situations involving direct and inverse variation.</p> <p>J. Describe and interpret rates of change from graphical and numerical data.</p>	<p>M.4.H.ALG-C.7</p> <p>M.4.H.ALG-C.11</p>	<p>7. Solve systems of linear inequalities.</p> <p>11. Solve real-world problems that can be modeled, using systems of linear equations and inequalities.</p>	

STANDARD 4: Patterns, Functions and Algebra (Cont.)

Algebra II-C
(ALG-C)

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

Ohio Benchmarks Grade 11	Instructional Organization	Grade Level Indicators	Notes
<p>By the end of the 11-12 program:</p> <p>A. Analyze functions by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior.</p>	<p>M.4.A.ALG-C.3 <i>Use Patterns, Relations and Functions</i></p> <p>M.4.A.ALG-C.4</p> <p>M.4.A.ALG-C.5</p> <p>M.4.A.ALG-C.6 <i>Use Algebraic Representations</i></p> <p>M.4.A.ALG-C.10</p> <p>M.4.A.ALG-C.11 <i>Analyze Change</i></p>	<p>3. Describe and compare the characteristics of the following families of functions: quadratics with complex roots, polynomials of any degree, logarithms, and rational functions; e.g., general shape, number of roots, domain and range, asymptotic behavior.</p> <p>4. Identify the maximum and minimum points of polynomial functions graphically and with technology.</p> <p>5. Identify families of functions with graphs that have rotation symmetry or reflection symmetry about the y-axis, x-axis or $y = x$.</p> <p>6. Represent the inverse of a function symbolically and graphically as a reflection about $y = x$.</p> <p>10. Describe the characteristics of the graphs of conic sections.</p> <p>11. Describe how a change in the value of a constant in an exponential, logarithmic or radical equation affects the graph of the equation.</p>	

STANDARD 4: Patterns, Functions and Algebra (Cont.)

Algebra II-C
(ALG-C)

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

Ohio Benchmarks Grade 11	Instructional Organization	Grade Level Indicators	Notes
By the end of the 11-12 program:			
B. Use the quadratic formula to solve quadratic equations that have complex roots.	M.4.B.ALG-C.8 <i>Use Algebraic Representatives</i>	8. Solve equations involving radical expressions and complex roots.	
C. Use recursive functions to model and solve problems; e.g., home mortgages, annuities.	M.4.C.ALG-C.1 <i>Use Patterns, Relations and Functions</i>	1. Identify and describe problem situations involving an iterative process that can be represented as a recursive function; e.g., compound interest.	
	M.4.C.ALG-C.2	2. Translate a recursive function into a closed form expression or formula for the n th term to solve a problem situation involving an iterative process; e.g., find the value of an annuity after 7 years.	
D. Apply algebraic methods to represent and generalize problem situations involving vectors and matrices.	M.4.D.ALG-C.7 <i>Use Algebraic Representatives</i>	7. Model and solve problems with matrices.	
	M.4.D.ALG-C.9	9. Solve 3 by 3 systems of linear equations by elimination and using technology, and interpret graphically what the solution means (a point, line, plane, or no solution).	

STANDARD 5: Data Analysis and Probability

Algebra II-C
(ALG-C)

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

Ohio Benchmarks Grade 10	Instructional Organization	Grade Level Indicators	Notes
<p>By the end of the 8-10 program:</p> <p>A. Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatter plots, measures of center and variability.</p> <p>B. Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose.</p>			

STANDARD 5: Data Analysis and Probability (Cont.)

Algebra II-C
(ALG-C)

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

Ohio Benchmarks Grade 10	Instructional Organization	Grade Level Indicators	Notes
<p>By the end of the 8-10 program:</p> <p>C. Compare the characteristics of the mean, median and mode for a given set of data, and explain which measure of center best represents the data.</p> <p>D. Find, use and interpret measures of center and spread, such as mean and quartiles, and use those measures to compare and draw conclusions about sets of data.</p> <p>E. Evaluate the validity of claims and predictions that are based on data by examining the appropriateness of the data collection and analysis.</p> <p>F. Construct convincing arguments based on analysis of data and interpretation of graphs.</p>			

STANDARD 5: Data Analysis and Probability (Cont.)

Algebra II-C
(ALG-C)

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

Ohio Benchmarks Grade 10	Instructional Organization	Grade Level Indicators	Notes
<p>By the end of the 8-10 program:</p> <p>G. Describe sampling methods and analyze the effects of method chosen on how well the resulting sample represents the population.</p> <p>H. Use counting techniques, such as permutations and combinations, to determine the total number of options and possible outcomes.</p> <p>I. Design an experiment to test a theoretical probability, and record and explain results.</p> <p>J. Compute probabilities of compound events, independent events, and simple dependent events.</p> <p>K. Make predictions based on theoretical probabilities and experimental results.</p>			

STANDARD 5: Data Analysis and Probability (Cont.)

Algebra II-C
(ALG-C)

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

Ohio Benchmarks Grade 11	Instructional Organization	Grade Level Indicators	Notes
<p>By the end of the 11-12 program:</p> <p>A. Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.</p> <p>B. Use descriptive statistics to analyze and summarize data, including measures of center, dispersion, correlation and variability.</p>	<p>M.5.A.ALG-C.4 <i>Statistical Methods</i></p> <p>M.5.A.ALG-C.5</p> <p>M.5.A.ALG-C.8</p> <p>M.5.B.ALG-C.8</p>	<p>4. Create a scatterplot of bivariate data, identify trends, and find a function to model the data.</p> <p>5. Use technology to find the regression coefficient, and the correlation coefficient for bivariate data with a linear trend, and interpret each of these statistics in the context of the problem situation.</p> <p>8. Analyze and interpret univariate and bivariate data to identify patterns, note trends, draw conclusions, and make predictions.</p> <p>8. Analyze and interpret univariate and bivariate data to identify patterns, note trends, draw conclusions, and make predictions.</p>	

STANDARD 6: Mathematical Processes (Cont.)

Students use mathematical processes and knowledge to solve problems. Students apply problem-solving and decision-making techniques, and communicate mathematical ideas.

Ohio Benchmarks Grade 10	Instructional Organization	Grade Level Indicators	Notes
<p>By the end of the 8-10 program:</p> <p>D. Apply reasoning processes and skills to construct logical verifications or counter-examples to test conjectures and to justify and defend algorithms and solutions.</p> <p>E. Use a variety of mathematical representations flexibly and appropriately to organize, record and communicate mathematical ideas.</p> <p>F. Use precise mathematical language and notations to represent problem situations and mathematical ideas.</p> <p>G. Write clearly and coherently about mathematical thinking and ideas.</p> <p>H. Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.</p>	<p>M.6.D.ALG-C</p> <p>M.6.E.ALG-C</p> <p>M.6.F.ALG-C</p> <p>M.6.G.ALG-C</p> <p>M.6.H.ALG-C</p>		