

ALGEBRA II

Teachable Units



Northern Michigan Learning Consortium

Revised Fall 2007

Reflects MDE Expectation and Code Changes
for Algebra II Content Expectations

ALGEBRA II FUNCTIONS

Suggested Percentage of
Instructional Time - 35%



Recommended Instructional Sequence	Suggested Instructional Strategies/Intervention
A1.2.9 *A2.2.5 *A2.2.4 A3.6.1 L2.1.3 L2.3.2 A1.1.1 A3.2.3 A1.1.6 A1.2.7 A3.2.2 A2.3.1 A2.3.3 A2.4.1 L2.1.5 A2.1.1 A2.1.2 A2.1.3 A2.1.6 A2.1.7 A2.2.1 A2.2.2 A2.2.3 A3.6.2 A2.4.2 A2.4.3	<p>On-line Resources</p> <p>http://www.themathpage.com/aPreCalc/logarithmic-exponential-functions.htm - Examples and review of exponential and logarithmic functions and equations.</p> <p>http://id.mind.net/~zona/mmts/functionInstitute/rationalFunctions/rationalFunctions.html - Gives an overview of rational functions.</p> <p>http://www.thefutureschannel.com/algebra/quadratic-equations_functions.php - Highlights quadratic functions and equations used in the real world.</p> <p>http://www.learner.org/channel/courses/learningmath/algebra/session7/part_a/intro.html - Gives notes, solutions, and a video related to exponential functions.</p> <p>Optional Instructional Strategies</p> <ul style="list-style-type: none">• To reinforce the formulas that students are expected to know, have students work in pairs to design a context in which each formula may be used. Have students describe the situation (real-world situation if possible) and apply the mathematics appropriately to the situation. Create a rubric for grading that includes both a solid mathematics understanding as well as applicable contextual application.• Use calculators to reinforce the connection between the symbolic form and the graphic form of a function. Give students the symbolic form of a function and have them predict the graphic form of the function. After predicting, students can use calculators to see how close their predictions were. If their prediction is correct, students can write a short statement of what they looked for when predicting the graphic form. If their prediction is incorrect, students can write a short statement about their misconception and how to “fix” their prediction.• Develop a summary sheet of laws and properties. For example, $\log(ab) = \log a + \log b$, and $(x^a)^b = x^{ab}$.• Develop a summary page that places a graphical visual image of a function next to the symbolic form. <p>Possible Recommendations for Struggling Learners</p> <ul style="list-style-type: none">• When solving exponential equations, start first with just simple equations (such as $2^x = 8$). Increase the level of difficulty step-wise. ($3 \cdot 2^x = 24$, $3 \cdot 2^x + 4 = 28$) and relate this to the steps for solving simple linear equations.• Provide students with different real-world situations. Have the students classify which family of functions the real-world situation describes. Have students create a chart with each real world situation listed under the appropriate family of functions. Discuss the similarities within each family and the differences across families.

ALGEBRA II Polynomials

Suggested Percentage of
Instructional Time – 5 %



Recommended Instructional Sequence	Suggested Instructional Strategies/Intervention
A1.2.2 A1.2.5 A1.1.5 A1.1.4 A1.2.8 A1.2.9	<p>On-line Resources http://oakroadsystems.com/math/polyso1.htm - Gives step-by-step methods for solving polynomial equations. http://www.sparknotes.com/math/algebra2/rationalexpressions/ - Gives an introduction and problems for adding, subtracting, multiplying, and dividing rational expressions. http://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut35_div.htm - Provides a tutorial for dividing a polynomial by a monomial and a polynomial by a polynomial using long division. http://www.purplemath.com/modules/quadform.htm - Derives and applies the quadratic formula. http://www.purplemath.com/modules/distform.htm - Derives and applies the distance formula.</p>
	<p>Optional Instructional Strategies</p> <ul style="list-style-type: none">• Give one group of students addition of polynomials to master, another group subtraction of polynomials to master, and another group multiplication of polynomials to master. After mastering each specific operation, have students teach what they have mastered to students from the other groups, in groups of three. Reinforce concepts with whole group discussions. Have students correctly do 3 problems (one of each type) before leaving the classroom.• Apply the Pythagorean Theorem on graphs to develop the Distance Formula. Have students explain the connection between the Pythagorean Theorem and the Distance Formula. Have the students find the distance between two points using both the Pythagorean Theorem and the Distance Formula.
	<p>Recommendations for Struggling Learners</p> <ul style="list-style-type: none">• Review long division, using just numbers, with students. Relate this to the method for dividing a polynomial by a monomial and a polynomial by a polynomial. Use scaffolding to reinforce the similarities in the two processes.• Encourage students to look for patterns in exponents. Discuss with students the reasonableness of their answers.

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* Denotes *recommended HSCE*

ALGEBRA II CONICS



Suggested Percentage of
Instructional Time – 6 %

Recommended Instructional Sequence	Suggested Instructional Strategies/Intervention
G1.7.1 G1.7.2 G1.7.3 *G1.7.4	<p>On-line Resources</p> <p>http://math2.org/math/algebra/conics.htm - Shows how parabolas, circles, ellipses and hyperbolas are related to cones. Nice visuals and summaries of equations for students.</p> <p>http://faculty.ed.umuc.edu/~swalsh/Math%20Articles/circle.html - Derives the equation of a circle from the distance formula.</p> <p>http://www.krellinst.org/UCES/archive/resources/conics/newconics.html - Gives an overview of conic sections with applications to the real world.</p> <p>http://www.analyzemath.com/CircleEq/CircleEq.html - Tutorial for the equation of a circle with links for tutorials to ellipses, parabolas, and hyperbolas.</p> <p>http://www.krellinst.org/UCES/archive/resources/conics/nodes5.html - Gives the historical view of conic sections.</p> <p>Optional Instructional Strategies</p> <ul style="list-style-type: none">• Use the tutorial at http://www.analyzemath.com/CircleEq/CircleEq.html to determine how changing h, k, and r changes the size and location of a circle on a graph. Links from this website will allow you to change h, k, a, or b to examine changes in hyperbolas, parabolas, and ellipses.• Provide many visual examples of the geometric representations of parabolas, circles, ellipses, and hyperbolas and how they are related to cones. Provide the graph and the equation in the same color. <p>Possible Recommendations for Struggling Learners</p> <ul style="list-style-type: none">• Organize the equations for students in a table. Highlight the differences between the equations so they stand out for students.• Have students match the equations of parabolas, circles, ellipses, and hyperbolas to their graphs using cards. Games such as “Mathematics Go Fish” or “Mathematics War” can be played with these cards.

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ALGEBRA II Trigonometry

Suggested Percentage of
Instructional Time – 14 %



Recommended Instructional Sequence	Suggested Instructional Strategies/Intervention
<p>A3.7.2 A3.7.3 A3.7.1 A3.7.4 A1.2.10 *A1.1.7 A3.7.5</p>	<p>On-line Resources http://catcode.com/trig/trig08.html - Graphs sine and cosine based on motion about the unit circle (good visual). http://members.shaw.ca/ron.blond/sc.APPLET/index.html - Allows students to see how changing constants (a, b, h, and k) transforms sine and cosine graphs. http://home.alltel.net/okrebs/page73.html - Uses the unit circle to determine exact values for sine and cosine at $\pi/6$, $\pi/4$, $\pi/3$, $\pi/2$. Demonstrated reference angles and sine and cosine graphs. http://college.hmco.com/mathematics/larson/calculus/early/3e/shared/downloads/clc7eap0d03.pdf - Extensive review of trigonometry http://www.shodor.org/interactivate/activities/SkewDistribution/?version=1.5.0_06&browser=MSIE&vendor=Sun_Microsystems_Inc. - relates the normal curve to histograms.</p> <p>Optional Instructional Strategies</p> <ul style="list-style-type: none"> Use http://members.shaw.ca/ron.blond/sc.APPLET/index.html and have students explore how changing constants in an equation changes the graph of the equation. Have students explain how changing each constant changes the graph. (This may be thought of as writing “rules” for how each variable changes the graph.) Then, give students various equations and have them use the “rules” to show how the graphs change. Lastly, have students explain why changing each constant changes the graphs. Team up with the physics teacher in your school to co-create units that apply sine and cosine relationships to physics concepts. <p>Optional Recommendations for Struggling Learners</p> <ul style="list-style-type: none"> Differentiate instruction. Give slower learners just one change in a constant at a time, but give quicker learners multiple changes in the constants at once. <p style="text-align: right;">(Algebra II – Trigonometry Continued)</p>

- Using the above websites, make the instruction visual for students. Provide hands-on experiences with the websites so students can change the constants themselves.
- Show students patterns in the relationship between the unit circle and radian measures. Help them to THINK about the relationship as opposed to trying to memorize the relationships.
- Provide “tricks” for remembering when values are positive. For example All (Quadrant I) Students (Quadrant II) Take (Quadrant III) Calculus (Quadrant IV) is a shortcut for remembering that All trig values are positive in Quadrant I, Sine (same S as Students) is positive in Quadrant II, Tangent (same T as Take) is positive in Quadrant III, and Cosine (Same C as Calculus) is positive in Quadrant IV.

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ALGEBRA II

Counting Principles

Suggested Percentage of Instructional Time – 9 %



Recommended Instructional Sequence	Suggested Instructional Strategies/Intervention
<p>L1.3.2 S4.1.1 S4.2.1 L1.3.1 S4.1.2 L1.3.3 S4.2.2 *S4.1.3</p>	<p>On-line Resources http://mathforum.org/dr.math/faq/comb.perm.html - Combinations and permutations made simple and linked to Pascal's Triangle. http://regentsprep.org/Regents/math/math-topic.cfm?TopicCode=tree – Provides lessons, practice, and teacher resources related to tree diagrams. http://www.gomath.com/htdocs/lesson/probability_lesson1.htm - Has math mini-lessons on counting techniques. http://teachers.teach-nology.com/web_tools/graphic_org/venn_diagrams/ - Allows teachers to create Venn Diagrams quickly for use in the classroom. http://math.about.com/od/statistics/Statistics_Tutorials_and_Resources.htm - Tutorial for statistics.</p> <p>Optional Instructional Strategies</p> <ul style="list-style-type: none"> • Give students expressions for probability and statistics (mutually exclusive events, independent events, etc) and have the students create a situation that would fit into that category. • Have students determine the probability of another student randomly determining their locker code, their PIN number, their computer password, or their student ID. • Provide hands-on opportunities for students using decks of cards, coins, and number cubes. Start with simple single events and advance to more complex situations. <p>Possible Recommendations for Struggling Learners</p> <ul style="list-style-type: none"> • Provide opportunities for students to explore statistics within their areas of interest. • Describe various situations to students. Have students determine if the situation is a permutation or combination without doing calculations initially. Once the difference is understood by students, move toward doing calculations.

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ALGEBRA II Statistics

Suggested Percentage of
Instructional Time – 25 %



Recommended Instructional Sequence	Suggested Instructional Strategies/Intervention
<p>S1.2.1 S1.2.2 S1.3.2 S1.1.1 S1.1.2 S1.2.3 S1.3.1 S1.3.3 S1.3.4 L2.4.3 L2.4.1 L2.4.2 S3.1.2 *S3.1.6 *S3.1.5 S3.1.1 *S3.2.2 *S3.2.1 S3.1.3 *S3.1.4</p>	<p>On-line Resources http://www.quia.com/rr/51667.html - Rags to Riches game for mean, median, mode, and range. http://www-stat.stanford.edu/~naras/jsm/NormalDensity/NormalDensity.html - Allows students to look at the curve of a normal distribution and change the mean and standard deviation. http://psych-www.colorado.edu/~mcclella/java/normal/normz.html - This website is interactive. Students can change variables and see conversions between raw scores and z-scores with a display of various areas of probability. http://openlearn.open.ac.uk/mod/resource/view.php?id=46448 – Describes symmetry and skewness. http://course1.winona.edu/cblumberg/islpsecclass.htm - Provides statistics lessons for teachers.</p> <p>Optional Instructional Strategies</p> <ul style="list-style-type: none"> • Have students create histograms and bar graphs using Excel as well as by hand. • When interpreting dot plots, histograms, bar graphs, control charts, and box plots, first give students just the chart (or graph) without any questions. Have them write what they know based on the data. Have students compare with a partner the information they can gather just by looking at the data. In pairs, have students answer questions at various depths of knowledge. Discuss the answers as a whole group. • Connect with the teachers at your local career and technical education center to provide students with real-world examples of error tolerance in manufacturing settings. <p>Recommendations for Struggling Learners</p> <ul style="list-style-type: none"> • Use statistics that is relevant to students' lives. (For example, have students investigate the correlation between the number of hours playing video games and the average grade points of students.) • Have students collect data on an area of interest in their life. Students are expected to represent the data using appropriate methods. Display the data that students generate around the room.

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ALGEBRA II Sequences and Series

Suggested Percentage of



Instructional Time – 6 %

Recommended Instructional Sequence	Suggested Instructional Strategies/Intervention
<p>L1.2.1 L2.2.1 L2.2.2 L2.2.3 *L2.2.4</p>	<p>On-line Resources http://home.alltel.net/okrebs/page131.html - Gives definitions and examples of arithmetic and geometric sequences. http://www.funbrain.com/cracker/index.html - Games for determining the next number in a series. http://www.mathsnet.net/asa2/modules/p15gp.html - Allows students to practice with geometric sequences. http://www.mathsnet.net/asa2/modules/p15ap.html - Allows students to practice with arithmetic sequences. http://www.netsoc.tcd.ie/~jgilbert/maths_site/applets/sequences_and_series/ - Provides resources on sequences and series. http://www.bbc.co.uk/education/asguru/maths/13pure/03sequences/index.shtml - Provides information for students on series and sequences.</p> <p>Optional Instructional Strategy</p> <ul style="list-style-type: none"> • Investing is an important strategy to learn for money management. Have students compare the amount of money earned over a period of time if investing in a compound interest-bearing account and a simple interest-bearing account. • Have students create 10 arithmetic or geometric series. After creating their series, have students pair up and exchange series. The partner needs to continue the next 3 numbers of the series for each problem and identify the series as arithmetic or geometric. <p>Recommendations for Struggling Learners</p> <ul style="list-style-type: none"> • Work both directions. To teach students how to use mathematical symbols to represent quantitative relationships and situations, start with the sum and have students write the summation notation. Then, reverse the process. Start with the summation notation and have students write out the sum. The same can be done with interval notation. • Use the iterative process to calculate the interest on compound interest accounts. Have students compare the amount of money they would make on a compound interest account and a simple interest account. Discuss with students the financial importance of paying off credit card debts.

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