

# ALGEBRA I

## Teachable Units



© *northern Michigan Learning Consortium* ©

# Revised Fall 2007

Reflects MDE Expectation and Code Changes  
for Algebra I Content Expectations



# ALGEBRA I

## Linear Expressions, Equations, and Inequalities

Suggested Percentage of Instructional Time - 35 %

| Recommended Instructional Sequence   | Suggested Instructional Strategies/Intervention  |
|--|--|
| <p>L1.1.5</p> <p>*A1.1.1</p> <p>*A2.1.3</p> <p>A1.2.1</p> <p>L2.1.1</p> <p>A1.2.8</p> <p>A1.2.4</p> <p>L1.1.1</p> <p>L1.1.3</p> <p>L1.1.2</p> <p>A3.1.1</p> <p>A3.1.3</p> <p>A3.1.2</p> <p>A3.1.4</p> <p>*A2.1.7</p> <p>*A2.4.2</p> <p>*A2.4.3</p> <p>*A1.2.2</p> <p>*A2.1.2</p> <p>*A2.2.1</p> <p>*A2.1.6</p> <p>*A1.1.3</p> <p>*A1.2.3</p> <p>L1.2.2</p> | <p><b>Resources</b></p> <ol style="list-style-type: none"> <li>1. <a href="http://edweb.tusd.k12.az.us/bowmang/Alg1PwrPnt.htm">http://edweb.tusd.k12.az.us/bowmang/Alg1PwrPnt.htm</a> - Lesson Plans: offer activities for multiple ability levels.</li> <li>2. <a href="http://education.jlab.org/solquiz/">http://education.jlab.org/solquiz/</a> - Virginia DOE on-line practice for high school mathematics (Jefferson Lab): offers a quiz builder with immediate feedback.</li> <li>3. <a href="http://www.thefutureschannel.com/algebra_real_world.php">http://www.thefutureschannel.com/algebra_real_world.php</a> - Real World Applications</li> <li>4. Classzone.com (McDougal/Littell) – Interactive Lesson Plan (computer lab needed)</li> <li>5. Teachers.net – Interactive Lesson Plans for Algebra and Higher Level Mathematics</li> <li>6. <a href="http://www.analyzemath.com/">http://www.analyzemath.com/</a> - Tutorials</li> <li>7. <a href="http://www.freemathhelp.com/algebra-help.html">http://www.freemathhelp.com/algebra-help.html</a> - Tutorials</li> <li>8. <a href="http://www.rwlo.org">www.rwlo.org</a> Visit the Real World Learning Objectives website - click on Reference Library, then the Real World Learning Objectives folder</li> </ol> <p><b>Suggested Instructional Strategy</b></p> <p>Use graphing calculators to boost critical thinking and allow for learner-centered instruction. Calculators give students the opportunity to compare tabular, graphic, and symbolic forms of data. Technology is especially useful when teaching slope and examining what happens when there is change in the <math>y</math> value over the <math>x</math> value. Technology can free time for problem solving and higher-order thinking.</p> <p><b>The Struggling Mathematical Mind</b></p> <p><b>Structures of “Best Practice Teaching”: Small-Group Activities</b></p> <p>Best practice calls for much less emphasis on teacher presentation and far more emphasis on highly-interactive student centered learning. Research suggests that teaching approaches, which encourage exploration of misconceptions through discussion, result in longer-term learning than approaches which try to avoid mistakes by explaining the “right way” to see things from the start. Consider:</p> <p><b>Study Teams:</b> where students form interdependent groups that parcel out tasks, share the work, stop to help members from falling behind, discuss errors and misconceptions, and provide an interlocking system where everyone gets maximum benefits.</p> <p><b>Group Investigations:</b> The whole class discusses, shares prior knowledge, and poses questions on a topic. Plans are made for studying the topic and tasks are parceled out to groups of students. The teacher serves as facilitator as guide. Teams reconvene to share findings.</p> <p><a href="http://www.enhancelearning.ca/">www.enhancelearning.ca/</a> provides information and ideas on strategies for differentiating learning during group investigations.</p> |

\* = Content expectations that occur in more than one unit  
 Shaded = quantitative literacy expectations that are covered throughout the course  
 The percentage of time and sequence is meant to be used as a starting point which should be altered according to you student’s and district’s needs.



# ALGEBRA I

## Bivariate Data - Examining Relationships

Suggested Percentage of Instructional Time - 8 %

| Recommended Instructional Sequence                        | Suggested Instructional Strategies/Intervention   |
|---|---|
| *S2.1.1<br>S2.1.2<br>S2.1.3<br>S2.1.4<br>S2.2.1<br>S2.2.2 | <p><b>Resources</b></p> <ol style="list-style-type: none"> <li><a href="http://illuminations.nctm.org/ActivityDetail.aspx?ID=82">http://illuminations.nctm.org/ActivityDetail.aspx?ID=82</a> - Least Squares Regression Line (line of best fit)</li> <li><a href="http://illuminations.nctm.org/LessonDetail.aspx?ID=L454">http://illuminations.nctm.org/LessonDetail.aspx?ID=L454</a> - Least Squares Regression Line</li> <li><a href="http://illuminations.nctm.org/LessonDetail.aspx?ID=L298">http://illuminations.nctm.org/LessonDetail.aspx?ID=L298</a> - Real Life Example of Regression Lines</li> <li><a href="http://www.explorelarning.com/index.cfm?method=cResource.dspDetail&amp;ResourceID=144">http://www.explorelarning.com/index.cfm?method=cResource.dspDetail&amp;ResourceID=144</a> - Least Square Regression Line – Teacher Resource</li> <li><a href="http://www.analyzemath.com/">http://www.analyzemath.com/</a> - Tutorials</li> <li><a href="http://www.freemathhelp.com/algebra-help.html">http://www.freemathhelp.com/algebra-help.html</a> - Tutorial</li> <li><a href="http://www.rwlo.org">www.rwlo.org</a> Visit the Real World Learning Objectives website - click on Reference Library, then the Real World Learning Objectives folder</li> </ol> <p><b>Suggested Instructional Strategy</b></p> <p>Use a Microsoft Excel/Spreadsheet Program where students can collect data on a specific topic, put information into the spreadsheet, and create a chart. Spreadsheets demand both abstract and concrete reasoning and enable learners to model complex and real-world events. Boost critical thinking when you ask students to make assumptions and then code them as variables, manipulate variables, and to display data both quantitatively and visually.</p> <p>Sample Excel Activity <a href="http://www.northcanton.sparce.org/~technology/excel/files/scatterplots.html">http://www.northcanton.sparce.org/~technology/excel/files/scatterplots.html</a></p> <p><b>The Struggling Mathematical Mind</b></p> <p><b>Structures of “Best Practice Teaching”:</b> <b>Using Assessment for Learning</b></p> <p>In the most effective classrooms assessment and instruction are inextricably linked and all aspects of mathematical knowledge and its connections are assessed. Use a variety of ongoing, <b>daily</b>, formative assessment methods to monitor student learning, provide corrective instruction, and to make instructional changes.</p> <p>Consider:</p> <ol style="list-style-type: none"> <li><i>Meaningful Feedback:</i> Rather than providing just the number right or wrong give students an opportunity to compare different results and allow students to realize why they get different answers and which ones make sense.</li> <li><i>Make It Large:</i> Use whiteboards for warm-ups so it is easy to see who is understanding the concept, who needs extra help, and what the common misconceptions are.</li> <li><i>Teacher Observation:</i> Observe students as they work and jot down misconceptions or error patterns for leading discussion with the whole class.</li> <li><i>Questions that Reveal Mathematical Thinking:</i> Improve teacher questioning skills to inform instruction.       <ul style="list-style-type: none"> <li>• Is that true? Always true? Under what conditions?</li> <li>• Why does that work? (NOT how!)</li> <li>• How can we get two expressions for the same quantity from the given information?</li> <li>• How can this situation be represented in different ways? What are the correspondences between representations?</li> </ul> </li> </ol> |



# ALGEBRA I

## Family of Functions

Suggested Percentage of Instructional Time - 12 %

| Recommended Instructional Sequence   | Suggested Instructional Strategies/Intervention   |
|--|---|
| L1.1.5, L1.1.3, L1.1.1<br>L1.2.4<br>A2.3.2<br>A2.3.3<br>A2.1.1<br>*A2.1.7<br>*A2.1.6<br>A2.3.1<br>*A1.1.1<br>A2.1.4<br>A2.4.1<br>A2.1.5<br>*S2.1.1 | <p><b>Resources</b></p> <ol style="list-style-type: none"> <li><a href="http://illuminations.nctm.org/LessonDetail.aspx?ID=L300">http://illuminations.nctm.org/LessonDetail.aspx?ID=L300</a> - Real-world Applications (lesson plans/worksheets) for functions</li> <li><a href="http://mathforum.org/library/drmath/sets/high_functions.html">http://mathforum.org/library/drmath/sets/high_functions.html</a> - Math Vocabulary in layman's terms</li> <li><a href="http://mathmachines.net/activities/Function%20Modeling/index.htm">http://mathmachines.net/activities/Function%20Modeling/index.htm</a> - Recursive Functions</li> <li><a href="http://www.analyzemath.com/">http://www.analyzemath.com/</a> - Tutorials</li> <li><a href="http://www.freemathhelp.com/algebra-help.html">http://www.freemathhelp.com/algebra-help.html</a> - Tutorials</li> <li><a href="http://www.rwlo.org">www.rwlo.org</a> Visit the Real World Learning Objectives website - click on Reference Library, then the Real World Learning Objectives folder</li> </ol> <p><b>Suggested Instructional Strategy</b><br/>           These expectations integrate well with other units of instruction. Please refer to each of the other units in Algebra I for resources.</p>  |
| L1.1.2<br>L1.2.2   | <p><b>The Struggling Mathematical Mind</b></p> <p><b>Structures of “Best Practice Teaching”: Reading as Thinking</b><br/>           Reading in mathematics means the ability to make sense of everything that is on a page – whether the page is a worksheet, a spreadsheet, an overhead, a computer screen, or a page in a textbook or journal. In order for students to reach their full potential, as mathematicians, they must be able to comprehend the resources used to learn and apply mathematics. The best place to teach the specific reading skills necessary for mathematics is in the mathematics classroom.</p> <p><b>Pre-Reading:</b> Discovering what students already know about a topic helps both teachers and students to design learning around missing knowledge. Misconceptions are a part of prior knowledge!</p> <p>Consider: (<i>Word Sorts</i>) (<i>Anticipation/Prediction Guides</i>) (<i>K-W-L</i>) (<i>Learning Logs</i>) (<i>Graphic Organizers</i>)</p> <p><b>During-Reading:</b> <i>Text Coding</i>, using post-it notes or highlighters when possible, allows students to attack a page and dig out meaning. Students need a useful set of response codes, which are consistent across the class. The teacher models and instructs in their use.</p> <p>Consider using “Insert” Text Codes” where:<br/>           (a check- Confirms Thinking); (X - Contradicts Thinking); (Q - Raises a Question); (?? - Denotes Confusion); (* - Marks an Important Concept); (! - Notes Interesting),</p> <p><i>Pairs Read</i> is a strategy that requires collaborative learning. Students help each other by reading paragraphs or sections of text aloud to each other. While one student reads the other listens. The listener then orally summarizes the essential learning.</p> <p><b>After-Reading :</b> Writing to learn supports retention of learning, construction of meaning, and encourages use of high-level thinking skills.</p> <p><i>Written Conversation</i> replaces oral class discussion after reading or presentation. Students work with a partner and engage in written conversation with all students writing simultaneously for about three minutes. Notes are then swapped, read, and responded to, by partners, at the teacher’s command. A total of two or three exchanges are suggested.</p> <p><i>Error Analysis:</i> Give students examples of mistakes and examine or identify what or why it is incorrect. Students work with a partner and write about what is wrong and what needs to be changed.</p> |



# ALGEBRA I

## Exponential & Power Functions

Suggested Percentage of Instructional Time - 15 %

| Recommended Instructional Sequence  | Suggested Instructional Strategies/Intervention  |
|---|--|
| <p>L1.1.1, L1.1.5<br/>L2.1.2<br/>L1.1.4<br/>A1.1.2<br/>A1.2.6<br/>A3.4.2<br/>*A2.2.3<br/>*A1.1.1<br/>*A2.4.2<br/>*A2.4.3<br/>*A2.1.2<br/>*A2.1.3<br/>A3.2.1<br/>A3.2.4<br/>*A2.1.6<br/>*A2.1.7<br/>A3.4.1<br/>A3.4.3<br/>A3.2.5</p> | <p><b>Resources</b></p> <ol style="list-style-type: none"> <li><a href="http://www.dansmath.com/lessons/precalc.html#anchor495743">http://www.dansmath.com/lessons/precalc.html#anchor495743</a> - Dan's Math explains exponential functions and gives real-world examples (e.g. compound interest).</li> <li><a href="http://mathworld.wolfram.com/ExponentialFunction.html">http://mathworld.wolfram.com/ExponentialFunction.html</a> - Exponential Function Growth Calculator</li> <li><a href="http://www.inquiry.uiuc.edu/xml_units/u11733/log_lab1.pdf">http://www.inquiry.uiuc.edu/xml_units/u11733/log_lab1.pdf</a> - Logarithm Lesson Plan (PDF)</li> <li><a href="http://www.analyzemath.com/">http://www.analyzemath.com/</a> - Tutorials</li> <li><a href="http://www.freemathhelp.com/algebra-help.html">http://www.freemathhelp.com/algebra-help.html</a> - Tutorials</li> <li><a href="http://www.rwlo.org">www.rwlo.org</a> Visit the Real World Learning Objectives website - click on Reference Library, then the Real World Learning Objectives folder</li> </ol> <p><b>Suggested Instructional Strategy</b></p> <p>Use graphing calculators to boost critical thinking and allow for learner-centered instruction. Calculators give students the opportunity to compare tabular, graphic, and symbolic forms of data within a given function.</p> <p>Integrate this unit with science expectations. For example, refer to Biology B3.5 Populations and B3.5x Environmental Factors for cross curricular connections.</p> <p><b>The Struggling Mathematical Mind</b></p> <p><b>Structures of “Best Practice Teaching”:</b> <b>Integrative Units</b><br/>Relevance leads to motivation for learning. Teachers help students make connections to their prior knowledge, between related mathematical concepts, and between concepts and procedures. Using real-world scenarios and reorganizing material into meaningful and coherent chunks also promotes sense making for students.</p> |

\* = Content expectations that occur in more than one unit      Shaded = quantitative literacy expectations that are covered throughout the course  
The percentage of time and sequence is meant to be used as a starting point which should be altered according to you student's and district's needs.



# ALGEBRA I

## Polynomial Functions

Suggested Percentage of Instructional Time - 15 %

| Recommended Instructional Sequence  | Suggested Instructional Strategies/Intervention  |
|---|--|
| L1.1.5<br>*A2.2.1<br>L1.1.2<br>L1.1.3<br>L1.1.1                                   | <b>Resources</b><br>1. <a href="http://algebrahelp.com/worksheets/view/factoring/trinomial.quiz">http://algebrahelp.com/worksheets/view/factoring/trinomial.quiz</a> - Algebrahelp.com presents factoring trinomials/binomials: intended for student use<br>2. <a href="http://www.analyzemath.com/">http://www.analyzemath.com/</a> - Tutorials<br>3. <a href="http://www.freemathhelp.com/algebra-help.html">http://www.freemathhelp.com/algebra-help.html</a> - Tutorials<br>4. <a href="http://www.rwlo.org">www.rwlo.org</a> Visit the Real World Learning Objectives website - click on Reference Library, then the Real World Learning Objectives folder  |
| *A1.1.3<br>*A1.1.1<br>A3.5.1<br>*A2.4.3<br>*A2.4.2<br>*A2.1.3                     | <b>Suggested Instructional Strategy</b><br><br>Use algebraic manipulatives to create hands-on lab(s) for conceptual development of algebraic concepts. These tools allow constants and variables to be represented in three dimensions.  |
| L1.2.4<br>A3.5.2<br>*A2.1.7<br>*A1.2.2<br>A3.5.3<br>*A2.1.6<br>*A2.2.2<br>*A2.1.2 | <b>The Struggling Mathematical Mind</b><br><br><b>Structures of “Best Practice Teaching”:</b> Representing to Learn<br>Drawing, sketching, mapping, and other artistic and graphic representations, when combined with words, powerfully leverage students’ thinking about mathematical content. The five critical strategies, on which representing to learn is based, are: <ul style="list-style-type: none"> <li>✓ Discuss problems in small groups (language representations)</li> <li>✓ Use manipulatives (concrete, physicals representations, tactile sense)</li> <li>✓ Act it out (representations of sequential actions, bodily kinesthetic sense)</li> <li>✓ Draw a picture, diagram, or graph (visual, pictorial representations)</li> <li>✓ Make a list or table (symbolic representations)</li> </ul> <a href="http://www.outreach.utk.edu/urban/mentoring/resources/files/vocabstrats.pdf">http://www.outreach.utk.edu/urban/mentoring/resources/files/vocabstrats.pdf</a><br>Provides lesson guides using representation to support vocabulary acquisition. (Marzano. <u>Classroom Instruction that Works</u> . 2001) |

\* = Content expectations that occur in more than one unit      Shaded = quantitative literacy expectations that are covered throughout the course  
 The percentage of time and sequence is meant to be used as a starting point which should be altered according to you student’s and district’s needs.



# ALGEBRA I

## Quadratic Functions

Suggested Percentage of Instructional Time – 15 %

| Recommended Instructional Sequence  | Suggested Instructional Strategies/Intervention  |
|---|--|
| L1.1.5<br>*A2.1.2<br>L1.1.1<br>*A1.1.1<br>L1.1.2<br>L1.1.3<br>*A1.1.3<br>*A2.4.2<br>*A2.1.3<br>L1.2.4<br>*A1.2.2<br>A3.3.2<br>*A2.1.6<br>*A2.1.7<br>A3.3.1<br>*A2.2.2<br>A3.3.4<br>*A2.2.1<br>*A1.2.3<br>A3.3.5<br>A3.3.3<br>*A2.4.3<br>*A2.2.3<br>L2.1.4 | <p><b>Resources</b></p> <ol style="list-style-type: none"> <li><a href="http://www.anlyzmath.com/">http://www.anlyzmath.com/</a> - Tutorial</li> <li><a href="http://www.freemathhelp.com/algebra-help.html">http://www.freemathhelp.com/algebra-help.html</a> - Tutorial</li> <li><a href="http://www.themathpage.com/alg/complete-the-square.htm#formula">http://www.themathpage.com/alg/complete-the-square.htm#formula</a> - Tutorial</li> <li><a href="http://teachersnetwork.org/teachnet/mathematics.cfm">http://teachersnetwork.org/teachnet/mathematics.cfm</a> - Cross Curricular Activities</li> <li><a href="http://www.rwlo.org">www.rwlo.org</a> Visit the Real World Learning Objectives website - click on Reference Library, then the Real World Learning Objectives folder</li> </ol> <p><b>Suggested Instructional Strategy</b></p> <p><a href="http://distance-ed.math.tamu.edu/peic/lesson_plans.htm">http://distance-ed.math.tamu.edu/peic/lesson_plans.htm</a> - Provides lesson plans/activities, which incorporate kinesthetic, cooperative learning, and cross-curricular strategies.</p> <p><b>The Struggling Mathematical Mind</b></p> <p><b>Structures of “Best Practice Teaching”: Classroom Workshop</b></p> <p>A workshop is a regularly scheduled, recurrent chunk of time (thirty minutes to an hour), during which the main activity is to “do” mathematics. While there is choice within the workshop time, students follow a carefully crafted set of behavioral expectations. Conferencing with the teacher is a critical component. Workshops allow creation of time and space to sit down with a student, or a small group of students, and work on exactly what they personally need. Research suggests that remedial curricula should be expanded to include about 50% corrective instruction for skill building, while the other half of the corrective instruction focuses on problem solving and application.</p> <p>A sample workshop schedule might be:</p> <ul style="list-style-type: none"> <li>Five Minutes: Status of the Class for organization and focus</li> <li>Ten Minutes: Mini Lesson focusing on information or leaning needed by everyone</li> <li>Twenty Minutes: Work Time and Conferencing with the Teacher</li> <li>Ten Minutes: Reporting Out on learning and tasks completed</li> </ul> |

\* = Content expectations that occur in more than one unit  
 Shaded = quantitative literacy expectations that are covered throughout the course  
 The percentage of time and sequence is meant to be used as a starting point which should be altered according to you student’s and district’s needs.