



MINNESOTA
Mathematics Academic Standards
Grades 9, 10, 11
Algebra 1 © 2005

CONTENT STANDARDS	PAGE REFERENCES
I. MATHEMATICAL REASONING Standard: Apply skills of mathematical representation, communication and reasoning throughout the remaining three content strands. The student will:	
1. Assess the reasonableness of a solution by comparing the solution to appropriate graphical or numerical estimates or by recognizing the feasibility of solutions in a given context and rejecting extraneous solutions.	SE: 16-18, 89-91, 105-106, 535, 599, 693, 700 <i>Study Tip</i> 50, 130 <i>Study Guide and Intervention</i> 19
2. Appropriately use examples and counterexamples to make and test conjectures, justify solutions, and explain results.	SE: 38-39, 41 #36-43, 83 #67-68, 210 #49, 414 #55-57, 733 #1 <i>Algebra Activity</i> 141, 480 <i>Spreadsheet Investigation</i> 232 <i>Reading to Learn Mathematics</i> 40
3. Translate a problem described verbally or by tables, diagrams or graphs, into suitable mathematical language, solve the problem mathematically and interpret the result in the original context.	SE: 6-7, 11-13, 16-18, 120-123, 124 #21, 133 #58-61, 629 #61-62, 652 #53-54 <i>Reading Mathematics</i> 10 <i>Skills Practice</i> 8
4. Support mathematical results by explaining why the steps in a solution are valid and why a particular solution method is appropriate.	SE: 26-29, 74-75, 96-97, 135-137, 256-258, 417-419, 481-483, 546-549, 605-607, 769-772
5. Determine whether or not relevant information is missing from a problem and if so, decide how to best express the results that can be obtained without that information.	SE: 37-39, 52, 54 #10-11, 121, 605-607, 623-626, 630 #65, 636 TWE: ICE 123 <i>Skills Practice</i> 125
6. Know and use the relationship that exists among a logical implication of the form "if A, then B," its converse "if B, then A," its inverse "if not A, then not B," and its contrapositive "if not B, then not A."	SE: 37-39, 40 #10-12, 41 #30-35, 61, 605-607 <i>Study Guide and Intervention</i> 40, 609

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II. NUMBER SENSE, COMPUTATION, AND OPERATIONS	
A. Number Sense Standard: Use real numbers, represented in a variety of ways, to quantify information and to solve real-world and mathematical problems. The student will:	SE: 68-69, 72 #58-59, 73-75, 76 #16, 77 #60-62, 79-81, 82 #52, 84-85, 425-427, 429 #59
B. Computation and Operation Standard: Appropriately use calculators and other technologies to solve algebraic, geometric, probabilistic and statistical problems. The student will:	
1. Apply the correct order of operations and grouping symbols when using calculators and other technologies.	SE: 11-12, 15 #48-50, 148 #59-64, 337 #56-58, 343 #57 <i>Graphing Calculator Investigation</i> 333, 654 <i>Spreadsheet Investigation</i> 178 TWE: UM 13 <i>Study Guide and Intervention</i> 14
2. Know, use and translate calculator notational conventions to mathematical notation.	SE: 624 <i>Graphing Calculator Investigation</i> 224-225, 306-307, 729-730 TWE: GCI 358, 395, 531, 545, 556, 600, 604
3. Recognize the impact of units such as degrees and radians on calculations.	SE: 167, 656, 657 #10, 658 #28-31, 661 TWE: ICE 625
4. Recognize that applying an inverse function with a calculator may lead to extraneous or incomplete solutions.	SE: 599, 693 <i>Graphing Calculator Investigation</i> 604
5. Understand the limitations of calculators such as missing or additional features on graphs due to viewing parameters or misleading representations of zero or very large numbers.	SE: <i>Graphing Calculator Investigation</i> 224-225 <i>Study Tip</i> 294 TWE: GCI 395, 531, 604 UM 13
6. Understand that use of a calculator requires appropriate mathematical reasoning and does not replace the need for mental computation.	SE: 148 #59-64, 787 #36-38 <i>Graphing Calculator Investigation</i> 418, 729-730 TWE: GCI 375, 531
III. PATTERNS, FUNCTIONS, AND ALGEBRA	
A. Patterns and Functions Standard: Represent and analyze real-world and mathematical problems using numeric, graphic and symbolic methods for a variety of functions. The student will:	
1. Know the numeric, graphic and symbolic properties of linear, step, absolute value and quadratic functions. Graphic properties may include rates of change, intercepts, maxima and minima.	SE: 218-220, 256-259, 264-266, 272-274, 280-283, 286-288, 524-527 <i>Graphing Calculator Investigation</i> 224-225, 545
2. Model exponential growth and decay, numerically, graphically and symbolically, using exponential functions with integer inputs.	SE: 554-557, 558 #11-12, 559 #33-35, 561-563, 564 #18, 565 #25-28 <i>Reading Mathematics</i> 566
3. Analyze the effects of coefficient changes on linear and quadratic functions and their graphs.	SE: <i>Graphing Calculator Investigation</i> 265, 278-279, 531-532, 545, 556

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4. Apply basic concepts of linear, quadratic and exponential expressions or equations in real-world problems such as loans, investments and the path of a projectile.	SE: 260 #13-14, 261 #57, 269 #54-55, 276 #45-46, 282-283, 529 #44-46, 536 #35-39, 537 #43-46, 559 #40-41, 565 #25-28
5. Distinguish functions from other relations using graphic and symbolic methods.	SE: 43-45, 48 #25, 205-207, 208 #14-17, 209 #38-40, 212-214, 226-228 <i>Algebra Activity 49</i> <i>Graphing Calculator Investigation 204, 729-730</i>
B. Algebra (Algebraic Thinking)	
<u>Standard:</u> Solve simple equations and inequalities numerically, graphically, and symbolically. Use recursion to model and solve real-world and mathematical problems. The student will:	
1. Translate among equivalent forms of expressions, such as: simplify algebraic expressions involving nested pairs of parentheses and brackets, simplify rational expressions, factor a common term from an expression and apply associative, commutative and distributive laws.	SE: 13 #7, 14 #27-28, 26-29, 31 #42-53, 32-34, 481-483, 649-650, 736 #42-44 <i>Graphing Calculator Investigation 654</i> <i>Reading Mathematics 10</i>
2. Understand the relationship between absolute value and distance on the number line and graph simple expressions involving absolute value such as $ x - 3 = 6$ or $ x + 2 < 5$.	SE: 69-70, 78 #67-69, 345-348, 349 #7-10, 350 #36-39, 361-362 TWE: OEA 351 <i>Skills Practice 71</i> <i>Study Guide and Intervention 350</i>
3. Find equations of a line given two points on the line, a point and the slope of the line or the slope and the y-intercept of the line.	SE: 272-274, 275 #4-5, 276 #23-25, 280-283, 284 #11-12, 285 #46, 286-288, 290 #54, 291 #61-63 <i>Algebra Activity 271</i>
4. Translate among equivalent forms of linear equations and inequalities.	SE: 287-288, 289 #3, 290 #53, 291 #61-63, 318-320, 325-328 TWE: UM 321 <i>Skills Practice 322</i>
5. Use a variety of models such as equations, inequalities, algebraic formulas, written statements, tables and graphs or spreadsheets to represent functions and patterns in real-world and mathematical problems.	SE: 50-52, 82 #50, 124 #21, 133 #62-64, 139 #43-45, 269 #52-53, 322 #48 <i>Algebra Activity 49</i> <i>Graphing Calculator Investigation 224-225</i> <i>Spreadsheet Investigation 56</i>
6. Apply the laws of exponents to perform operations on expressions with integer exponents.	SE: 7, 410-412, 413 #39-40, 414 #51-52, 417-420, 421 #4-12, 425-427, 429 #44-55 <i>Skills Practice 429</i> <i>Study Guide and Intervention 422</i>
7. Solve linear equations and inequalities in one variable with numeric, graphic and symbolic methods.	SE: 120-123, 124 #22, 125 #45-47, 128-131, 133 #62-64, 135-137, 139 #43-45, 318-320, 325-328 <i>Algebra Activity 324</i>
8. Find real solutions to quadratic equations in one variable with numeric, graphic and symbolic methods.	SE: 533-535, 536 #35-36, 539-541, 542 #8-13, 543 #51, 546-549, 551 #49, 552 #51-53, 742 #53-55, 767 #69-71

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9. Use appropriate terminology and mathematical notation to define and represent recursion.	SE: 234-235, 236 #8-11, 237 #27-36, 240-242, 243 #9-11 <i>Study Tip</i> 234 <i>Study Guide and Intervention</i> 237, 244
10. Create and use recursive formulas to model and solve real-world and mathematical problems.	SE: 234-235, 237 #47-49, 242, 244 #27-28, 245 #31-33, 250 <i>Algebra Activity</i> 241 <i>Spreadsheet Investigation</i> 232 <i>Skills Practice</i> 244
11. Solve systems of two linear equations and inequalities with two variables using numeric, graphic and symbolic methods.	SE: 369-371, 372 #14, 373 #51-54, 376-378, 382-384, 387-389, 394-396, 397 #29-30 <i>Graphing Calculator Investigation</i> 375 <i>Spreadsheet Investigation</i> 368
12. Understand how slopes can be used to determine whether lines are parallel or perpendicular. Given a line and a point not on the line, find the equations for the lines passing through that point and parallel or perpendicular to the given line.	SE: 292-295, 296 #13-24, 311, 369-370, 373 #48-50, 399 TWE: OEA 297 <i>Skills Practice</i> 296
IV. DATA ANALYSIS, STATISTICS, AND PROBABILITY	
A. Data and Statistics	
<u>Standard:</u> Represent data and use various measures associated with data to draw conclusions and identify trends. Understand the effects of display distortion and measurement error on the interpretation of data. The student will:	
1. Construct and analyze circle graphs, bar graphs, histograms, box-and-whisker plots, scatter plots and tables, and demonstrate the strengths and weaknesses of each format by choosing appropriately among them for a given situation.	SE: 50-51, 54 #14-15, 62, 722-724, 737-739, 806-809 <i>Spreadsheet Investigation</i> 56 TWE: OEA 55 <i>Study Guide and Intervention</i> 741
2. Use measures of central tendency and variability, such as, mean, median, maximum, minimum, range, standard deviation, quartile and percentile, to describe, compare and draw conclusions about sets of data.	SE: 90-91, 92 #16-19, 94 #39-41, 731-733, 747-748, 818-819 <i>Algebra Activity</i> 743-744 <i>Skills Practice</i> 735
3. Determine an approximate best-fit line from a given scatter plot and use the line to draw conclusions.	SE: 298-301, 304 #29-30, 305 #40-44, 312, 323 #59 <i>Graphing Calculator Investigation</i> 306-307, 729-730 <i>Study Guide and Intervention</i> 303
4. Know the influence of outliers on various measures and representations of data about real-world and mathematical problems.	SE: 733, 747-748 TWE: OEA 742 UM 738 <i>Reading to Learn Mathematics</i> 741
5. Understand the relationship between correlation and causation.	SE: 298-300, 304 #29-30, 312 <i>Graphing Calculator Investigation</i> 306-307 <i>Reading to Learn Mathematics</i> 303

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6. Interpret data credibility in the context of measurement error and display distortion.	SE: 52, 55 #17, 709-710 <i>Reading Mathematics</i> 95 <i>Spreadsheet Investigation</i> 56 TWE: UM 91 <i>Reading to Learn Mathematics</i> 54
7. Compare outcomes of voting methods such as majority, plurality, ranked by preference, run-off and pair-wise comparison.	SE: 50, 708-710, 722-724, 731-733, 737-739 <i>Algebra Activity</i> 743-744
B. Probability Standard: Use appropriate counting procedures, calculate probabilities in various ways and apply theoretical probability concepts to solve real-world and mathematical problems. The student will:	
1. Select and apply appropriate counting procedures to solve real-world and mathematical problems, including probability problems.	SE: 754-756, 758 #26, 760-763, 765 #36-38, 769-772, 779 #4-6, 789-790 <i>Algebra Activity</i> 759 <i>Skills Practice</i> 757
2. Use area, trees, unions and intersections to calculate probabilities and relate the results to mutual exclusiveness, independence and conditional probabilities, in real-world and mathematical problems.	SE: 96-98, 754-756, 769-772, 773 #13-15, 790-791 <i>Algebra Activity</i> 102 <i>Skills Practice</i> 774
3. Use probability models, including area and binomial models, in real-world and mathematical problems.	SE: 769-772, 775 #44-47 <i>Algebra Activity</i> 102 <i>Skills Practice</i> 780
4. For simple probability models, determine the expected values of random variables.	SE: 777, 779 #14 TWE: ICE 778 <i>Study Guide and Intervention</i> 780
5. Know the effect of sample size on experimental and simulation probabilities.	SE: 782-784, 785 #2, 792 <i>Study Guide and Intervention</i> 787
6. Use a variety of experimental, simulation and theoretical methods to calculate probabilities.	SE: 96-98, 769-772, 773 #13-15, 774 #32-34, 776 #53, 782-784, 785 #9-12, 787 #32, 792 <i>Algebra Activity</i> 102
V. SPATIAL SENSE, GEOMETRY AND MEASUREMENT	
A. Spatial Sense Standard: Use models to represent and understand two- and three-dimensional shapes and how various motions affect them. Recognize the relationship between different representations of the same shape. The student will:	
1. Use models and visualization to understand and represent three-dimensional objects and their cross sections from different perspectives.	SE: 9 #44, 124 #24, 126 #52, 414 #46-48, 415 #60, 456 #43-44, 513 #41, 670 #39, 812, 817

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<p>B. Geometry Standard: Apply basic theorems of plane geometry, right triangle trigonometry, coordinate geometry and a variety of visualization tools to solve real-world and mathematical problems. The student will:</p>	
<p>1. Know and use theorems about triangles and parallel lines in elementary geometry to justify facts about various geometrical figures and solve real-world and mathematical problems. These theorems include criteria for two triangles to be congruent or similar and facts about parallel lines cut by a transversal.</p>	<p>SE: 292, 296 #25, 369-370, 373 #48-50, 616-618, 620 #31-32, 628 #18, 629 #61-62 <i>Algebra Activity</i> 626</p>
<p>2. Know and use theorems about circles to justify geometrical facts and solve real-world and mathematical problems. These theorems include the relationships involving tangent lines and radii, the relationship between inscribed and central angles and the relationship between the measure of a central angle and arc length.</p>	<p>SE: 448 #62, 601 #50-53, 815-816 Note: See Glencoe's <i>Geometry</i> for details on the relationships of circles, lines and angles.</p>
<p>3. Know and use properties of two- and three-dimensional figures to solve real-world and mathematical problems such as: finding area, perimeter, volume and surface area; applying direct or indirect methods of measurement; the Pythagorean theorem and its converse; and properties of 45°-45°-90° and 30°-60°-90° triangles.</p>	<p>SE: 9 #44, 124 #24, 415 #60, 456 #43-44, 513 #41, 605-607, 609 #45, 620 #31-32, 670 #39, 812-817</p>
<p>4. Apply the basic concepts of right triangle trigonometry including sine, cosine and tangent to solve real-world and mathematical problems.</p>	<p>SE: 623-626, 628 #18, 629 #61-62, 630 #63-64, 636 <i>Algebra Activity</i> 622</p>
<p>5. Use coordinate geometry to represent and examine geometric concepts such as the distance between two points, the midpoint of a line segment, the slope of a line and the slopes of parallel and perpendicular lines.</p>	<p>SE: 256-259, 264-267, 272-274, 292-295, 308, 423 #62-65, 530 #72-74, 611-613 <i>Study Guide and Intervention</i> 296, 614</p>
<p>6. Use numeric, graphic and symbolic representations of transformations such as reflections, translations and change of scale in one, two and three dimensions to solve real-world and mathematical problems.</p>	<p>SE: 197-200, 201 #9-10, 202 #27-29, 203 #44-46, 211 #57-59, 247, 415 #71-73</p>
<p>7. Perform basic constructions with a straightedge and compass.</p>	<p>SE: 808-809 Note: See Glencoe's <i>Geometry</i> for additional constructions of geometric figures.</p>
<p>8. Draw accurate representations of planar figures using a variety of tools.</p>	<p>SE: 813-816 <i>Algebra Activity</i> 626 Note: See Glencoe's <i>Geometry</i> for additional representations of planar figures.</p>

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C. Measurement Standard: Use the interconnectedness of geometry, algebra and measurement to explore real-world and mathematical problems.	SE: 256-259, 260 #35-36, 261 #57, 305 #40-44, 435 #55-56, 620 #31-32 <i>Algebra Activity</i> 271, 299, 416, 626

Codes Used for TWE Pages

GCI	Graphing Calculator Investigation
ICE	In-Class Example
OEA	Open-Ended Assignment
UM	Unlocking Misconceptions