



MINNESOTA
Mathematics Academic Standards
Grades 9, 10, 11
Algebra 2 © 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: 225 Example 7, 263-264 Example 2, 265 Example 4, 296 Example 4, 297 #3-#12, #14-#19, 534 Example 7 <i>Graphing Calculator Investigation</i> 268-269 TWE: A 269 IE 264, 296
2. Appropriately use examples and counterexamples to make and test conjectures, justify solutions, and explain results.	SE: 14 #3, 16 #59-#62, 32 #68-#71, 119 #2, 142 #2, 185 #4, 242 #2 <i>Algebra Activity</i> 19 #7-#9, 83 #4-#5, 252 #1-#2
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: 123-124, 140-141 Example 4, 384, 485, 644 Example 1 <i>Algebra Activity</i> 240, 252, 522 <i>Graphing Calculator Investigation</i> 163, 268-269
4. Support mathematical results by explaining why the steps in a solution are valid and why a particular solution method is appropriate.	SE: 14 Example 4, 71 #3, 92 Example 4, 329, 386 #3, 481 #1, 601 Example 3, 618-621 TWE: H 365 IE 619
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: 43 Example 6, 81-82 TWE: DI 82 Determining whether or not relevant information is missing can be done when approaching the problems throughout this book.
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: 15 #36-#39, 34, 42, 69, 195, 250, 301, 412, 485, 533

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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: 11-18, 32 #68-#71, 225, 245-249, 379, 440 #49-#51, 525 Example 3 <i>Algebra Activity 13</i> <i>Study Guide and Review 48 #18-#24</i> <i>Skills Practice 17</i>
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: 6-10, 18 #78-#86, 27, #81-#82, 32 #72-#73, 62 #70-#73 <i>Study Guide and Review 47-48 #11-#17</i> TWE: GCI 7 IE 7 <i>Skills Practice 9</i> <i>Study Guide and Intervention 9</i>
2. Know, use and translate calculator notational conventions to mathematical notation.	SE: 46 #58-#60, 444 Example 4, 680 #42-#43 <i>Graphing Calculator Investigation 87-88, 491, 552-553</i> TWE: GCI 241 <i>Study Tip 247, 613</i>
3. Recognize the impact of units such as degrees and radians on calculations.	SE: 555 Example 5, 562 Example 4, 709-715, 717-724 <i>Algebra Activity 716</i> <i>Enrichment 714</i>
4. Recognize that applying an inverse function with a calculator may lead to extraneous or incomplete solutions.	SE: 201 #47-#52 <i>Graphing Calculator Investigation 205</i> TWE: GCI 205 This concept can also be taught with lesson 7-8, Inverse Functions and Relations on pages 390 to 394.
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: 98 #2, 307 Example 2, 358 #43-#46, 431 #53-#56, 455-456 Example 1 <i>Graphing Calculator Investigation 457</i> TWE: A 208 GCI 457
6. Understand that use of a calculator requires appropriate mathematical reasoning and does not replace the need for mental computation.	SE: 289-290 Example 4, 455-456 Example 1, 512 #7-#12, 585 #2, 751 #56-#57 <i>Graphing Calculator Investigation 241</i>
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: 63, 89-95, 115 #61-#63, 286-287, 499 TWE: A 95 DI 65, 288 H 63 <i>Study Guide and Intervention 66, 94</i>

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2. Model exponential growth and decay, numerically, graphically and symbolically, using exponential functions with integer inputs.	SE: 524-525, 528 #19-#20, 560-565 <i>Study Guide and Review</i> 570 #62-#65 TWE: H 560 IE 525 TT 525 <i>Skills Practice</i> 529, 564
3. Analyze the effects of coefficient changes on linear and quadratic functions and their graphs.	SE: 65 Example 4, #9-#12, 86 #22-#30, 286-287, 293 #57, 322 Example 1 TWE: A 328 H 286 IE 323 <i>Reading to Learn Mathematics</i> 85
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: 67 #56-#59, 77 Example 3, 79 #44, 81-85, 291 #44-#45, 296 Example 5, 304 #42, 326 #14, 331 Example 4 <i>Graphing Calculator Investigation</i> 300
5. Distinguish functions from other relations using graphic and symbolic methods.	SE: 63, 64 Example 2, 89-94, 286-292 <i>Enrichment</i> 94 <i>Study Guide and Intervention</i> 66, 292
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 Example 3, 14 Example 4, 16 #49-#58, 17 #66-#67, 21, 32 #64-#67, 162-163 Example 5, 228 #79-#84 TWE: IE 14 <i>Enrichment</i> 17
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: 40-44, 97 Example 3, 299 #51-#56, 335 #53-#58 <i>Study Guide and Review</i> 50 #46-#51 TWE: DI 42 IE 41-73 <i>Skills Practice</i> 45 <i>Study Guide and Intervention</i> 45
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: 75-80, 86 #31-#32, 95 #56-#57 <i>Graphing Calculator Investigation</i> 70 <i>Study Guide and Review</i> 102 TWE: IE 76-77 <i>Skills Practice</i> 79 <i>Study Guide and Intervention</i> 79
4. Translate among equivalent forms of linear equations and inequalities.	SE: 96, 97 Example 2, 98 #3, #31-#32 <i>Study Guide and Review</i> 104 TWE: A 98 <i>Study Guide and Intervention</i> 99

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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: 56, 64 Example 2, 73 #37-#42, 77 Example 3, 79 #44, 81, 97 Example 2, 110 <i>Algebra Activity</i> 83
6. Apply the laws of exponents to perform operations on expressions with integer exponents.	SE: 222-227, 232 #58-#61, 257-262, 361-362 Example 3 TWE: DI 226 IE 222-224 <i>Skills Practice</i> 227, 261 <i>Study Guide and Intervention</i> 227, 261
7. Solve linear equations and inequalities in one variable with numeric, graphic and symbolic methods.	SE: 21-22 Example 4, 23 Example 8, 24 #10-#15, 25 #41-#46, 31 #29-#46, 37 #4-#11, #15-#38, 44 #27-#44, 95 #58-#59, 181 #59-#64 <i>Skills Practice</i> 26
8. Find real solutions to quadratic equations in one variable with numeric, graphic and symbolic methods.	SE: 294-299, 301-305, 306-307, 309-312, 314-319, 328 #57-#66 <i>Algebra Activity</i> 308 TWE: IE 295-296, 302 <i>Skills Practice</i> 298
9. Use appropriate terminology and mathematical notation to define and represent recursion.	SE: 606-607, 608-610, 617 #46-#47 <i>Algebra Activity</i> 607, 611 TWE: A 610 IE 607-608 <i>Reading to Learn Mathematics</i> 609 <i>Skills Practice</i> 609 <i>Study Guide and Intervention</i> 609
10. Create and use recursive formulas to model and solve real-world and mathematical problems.	SE: 606-607, 608-610, 617 #46-#47, 621 #38-#39 <i>Algebra Activity</i> 611 <i>Study Guide and Review</i> 625 TWE: IE 607-608 <i>Skills Practice</i> 609 <i>Study Guide and Intervention</i> 609
11. Solve systems of two linear equations and inequalities with two variables using numeric, graphic and symbolic methods.	SE: 110-115, 116-122, 123-127, 135 #46-#50, 144 #36-#38 <i>Graphing Calculator Investigation</i> 128 TWE: IE 111-112, 116-119, 124-125 <i>Study Guide and Intervention</i> 126
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: 70-74, 77-78 Example 4, #10, 79 #36-#38 <i>Graphing Calculator Investigation</i> 70 TWE: DI 71 IE 70-71

CONTENT STANDARDS	PAGE REFERENCES
IV. DATA ANALYSIS, STATISTICS, AND PROBABILITY	
A. Data and Statistics	
Standard: 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: 81 Example 1, 83 #4-#5, 86 #22, 95 #53, 99 #51, 428-429, 598 #59, 647 #13-#14, 669 #38 <i>Getting Started</i> 631 #7-#10
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: 663 #70-#75, 664 Example 1, 667 #7, #17-#18, 668-669 <i>Prerequisite Skills</i> 822-823 TWE: IE 665 <i>Reading to Learn Mathematics</i> 669 <i>Skills Practice</i> 669 <i>Study Guide and Intervention</i> 669
3. Determine an approximate best-fit line from a given scatter plot and use the line to draw conclusions.	SE: 82 Example 2, 83-86, 95 #53-#54 <i>Algebra Activity</i> 83 <i>Graphing Calculator Investigation</i> 87-88 <i>Study Guide and Review</i> 103 #40-#42 TWE: DI 82 TT 86 <i>Skills Practice</i> 85 <i>Study Guide and Intervention</i> 85
4. Know the influence of outliers on various measures and representations of data about real-world and mathematical problems.	SE: <i>Graphing Calculator Investigation</i> 666 #2-#3 <i>Prerequisite Skills</i> 827 Example 2 <i>Study Tip</i> 83 TWE: W 664
5. Understand the relationship between correlation and causation.	This concept could be included with a lesson on statistics.
6. Interpret data credibility in the context of measurement error and display distortion.	SE: 665, 671, 672 #1, 674 #12-#14 <i>Graphing Calculator Investigation</i> 666 TWE: A 675 W 664 <i>Reading to Learn Mathematics</i> 669
7. Compare outcomes of voting methods such as majority, plurality, ranked by preference, run-off and pair-wise comparison.	This concept could be included with a lesson on statistics.

CONTENT STANDARDS	PAGE REFERENCES
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: 632-637, 638-643, 644-650 TWE: DI 634 H 632 IE 633-634 <i>Enrichment 636</i> <i>Reading to Learn Mathematics 636</i> <i>Skills Practice 636</i> <i>Study Guide and Intervention 636</i>
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: 632 Example 1, 648 #31-#33, 652 Example 1, 659, 661 #23-#26, 670 #46 <i>Algebra Activity 651</i> TWE: IE 633 <i>Skills Practice 662</i> <i>Study Guide and Intervention 649</i>
3. Use probability models, including area and binomial models, in real-world and mathematical problems.	SE: 644 Example 1, 648-649, 652 Example 1, 659, 662 #44-#46, 676-680 <i>Algebra Activity 651, 681</i> TWE: IE 677 <i>Study Guide and Intervention 649, 679</i>
4. For simple probability models, determine the expected values of random variables.	SE: 644-649, 652-657, 659-663 TWE: A 650 AA 652 IE 645-646, 652-653 <i>Enrichment 649</i> <i>Reading to Learn Mathematics 649</i> <i>Skills Practice 649</i> <i>Study Guide and Intervention 649</i>
5. Know the effect of sample size on experimental and simulation probabilities.	SE: 682-685 <i>Study Guide and Review 692</i> TWE: H 682 IE 683 <i>Skills Practice 685</i> <i>Study Guide and Intervention 685</i>
6. Use a variety of experimental, simulation and theoretical methods to calculate probabilities.	SE: 645 Example 2, 647, 649 #66-#69, 652 Example 1, 654-656, 660-662 TWE: IE 652, 659-660 <i>Skills Practice 656</i> <i>Study Guide and Intervention 656</i>

CONTENT STANDARDS	PAGE REFERENCES
V. SPATIAL SENSE, GEOMETRY AND MEASUREMENT	
A. Spatial Sense	
<p>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.</p> <p>The student will:</p>	
1. Use models and visualization to understand and represent three-dimensional objects and their cross sections from different perspectives.	SE: 22 Example 6, 379 Example 2, 449, 450 #10-#11, 615 #31, 795 #12 <i>Algebra Activity</i> 417-418 <i>Standardized Test Practice</i> 759 #11
B. Geometry	
<p>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.</p> <p>The student will:</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.	SE: 70, 71 #9, 73 #43, #46-#48, 112, 184-185, 725-732 <i>Practice Test</i> 281 #32 <i>Study Guide and Review</i> 101 <i>Reading to Learn Mathematics</i> 767
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.	SE: 352 #53-#55, 415 #34, 426-431, 450, 460 #48-#49, 496 #24 TWE: IE 427-428 <i>Enrichment</i> 430 <i>Reading to Learn Mathematics</i> 430 <i>Skills Practice</i> 430 <i>Study Guide and Intervention</i> 430
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.	SE: 9 #50, 22 Example 6, 32 #72-#73, 184-185 Example 4, 186 #14, 187 #41-#42, 231 #15, 379 Example 2, 615 #31 <i>Getting Started</i> 699 #1-#8 TWE: IE 379
4. Apply the basic concepts of right triangle trigonometry including sine, cosine and tangent to solve real-world and mathematical problems.	SE: 701-708, 725-732, 733-738, 749 #14 <i>Algebra Activity</i> 716 TWE: IE 702-703, 726-728 <i>Enrichment</i> 707, 731 <i>Reading to Learn Mathematics</i> 707 <i>Skills Practice</i> 707, 731 <i>Study Guide and Intervention</i> 731
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.	SE: 412-416, 425 #50-#52, 431 #60-#62 <i>Algebra Activity</i> 417-418 <i>Study Guide and Review</i> 461-462 #11-#16 TWE: IE 413

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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.	SE: 175-181, 188 #56-#58, 194 #45-#47, 390 Example 1 <i>Study Guide and Review</i> 211-212 #23-#26 TWE: H 175 IE 176-178 <i>Enrichment</i> 180 <i>Reading to Learn Mathematics</i> 180 <i>Skills Practice</i> 180 <i>Study Guide and Intervention</i> 180
7. Perform basic constructions with a straightedge and compass.	SE: 609 #25-#26 <i>Algebra Activity</i> 19 A straightedge could be used in the Algebra Activity on page 487.
8. Draw accurate representations of planar figures using a variety of tools.	SE: 428, 429 #8-#13, 485-490 <i>Algebra Activity</i> 392, 432, 454 Activity 2 <i>Graphing Calculator Investigation</i> 300, 320-321
C. Measurement <u>Standard:</u> Use the interconnectedness of geometry, algebra and measurement to explore real-world and mathematical problems.	SE: 390, 394 #45, 664-669, 709-714, 745 #64-#69, 748 Example 3 TWE: DI 712 IE 665, 710-712 <i>Skills Practice</i> 669 <i>Study Guide and Intervention</i> 669

Codes Used for TWE Pages

A	Assess
AA	Algebra Activity
DI	Daily Intervention
GCI	Graphing Calculator Investigation
H	How
IE	In-Class Example
TT	Teacher to Teacher
W	What