



ALGEBRA: CONCEPTS AND APPLICATIONS ©2004
 Minnesota
 Minnesota Academic Standards for Mathematics
 Grades 9, 10, 11

CONTENT STANDARDS	PAGE REFERENCES
D. MATHEMATICAL REASONING	
Standard: Apply skills of mathematical representation, communication and reasoning throughout the remaining three content strands.	
Note about assessment of this Standard: The Mathematical Reasoning standards will primarily be assessed within the context of the standards in the remaining four content strands. The depth of mathematical reasoning will increase as the skill level in the four other strands increases.	
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: 25, 48, 85, 224, 259, 289, 315, 340, 362–365, 371, 376–377, 469–470, 485, 580 TWE: 25, 48, 85, 224, 259, 289, 315, 340, 362–365, 371, 376–377, 469–470, 485, 580
2. Appropriately use examples and counterexamples to make and test conjectures, justify solutions, and explain results.	See Glencoe <i>Algebra 1</i> , 2003 SE: 38–39, 41 #36–43, 83 #67–68, 210 #49, 414 #55–57, 733 #1
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: 4–5, 6–7, 10, 13, 44, 48, 119, 122–123, 127, 145, 151, 164, 167–169, 173–174, 179, 182, 332–333 TWE: 4–5, 6–7, 10, 13, 44, 48, 119, 122–123, 127, 145, 151, 164, 167–169, 173–174, 179, 182, 332–333
4. Support mathematical results by explaining why the steps in a solution are valid and why a particular solution method is appropriate.	SE: 27–29, 120–121, 126–127, 133–134, 167–168, 169–170, 291–292, 333, 477, 605, 613 TWE: 27–29, 120–121, 126–127, 133–134, 167–168, 169–170, 291–292, 333, 477, 605, 613
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.	See Glencoe <i>Algebra 1</i> , 2003 SE: 37–39, 52, 54 #10–11, 121, 605–607, 623–626, 630 #65, 636 TWE: ICE 123
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: 30–31 TWE: 30–31

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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.	SE: 8, 64, 70, 100, 154, 188, 204, 218, 238, 256, 270, 296, 302, 346, 357, 399, 405, 434, 458, 464, 478, 488, 524, 591, 644, 650, 668 TWE: 8, 64, 70, 100, 154, 188, 204, 218, 238, 256, 270, 296, 302, 346, 357, 399, 405, 434, 458, 464, 478, 488, 524, 591, 644, 650, 668
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: 8–9, 11, 45, 47, 91, 114, 168, 176–178, 338 TWE: 8–9, 11, 45, 47, 91, 114, 168, 176–178, 338
2. Know, use and translate calculator notational conventions to mathematical notation.	SE: 26, 106, 167, 214, 271–272, 317, 338–339, 421, 491, 551, 558, 625, 638–639 TWE: 26, 106, 167, 214, 271–272, 317, 338–339, 421, 491, 551, 558, 625, 638–639
3. Recognize the impact of units such as degrees and radians on calculations.	See Glencoe <i>Algebra 1</i> , 2003 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.	See Glencoe <i>Algebra 1</i> , 2003 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: 26, 106, 167, 214, 271–272, 317, 338–339, 421, 491, 551, 558, 625, 638–639 TWE: 26, 106, 167, 214, 271–272, 317, 338–339, 421, 491, 551, 558, 625, 638–639
6. Understand that use of a calculator requires appropriate mathematical reasoning and does not replace the need for mental computation.	SE: 26, 106, 167, 214, 271–272, 317, 338–339, 421, 491, 551, 558, 625, 638–639 TWE: 26, 106, 167, 214, 271–272, 317, 338–339, 421, 491, 551, 558, 625, 638–639

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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: 283–289, 290–295, 296–300, 310–315, 316–320, 458–462, 464–467, 468–472, 474–477, 478–482, 483–486 TWE: 283–289, 290–295, 296–300, 310–315, 316–320, 458–462, 464–467, 468–472, 474–477, 478–482, 483–486
2. Model exponential growth and decay, numerically, graphically and symbolically, using exponential functions with integer inputs.	SE: 489–493, 496 TWE: 489–493, 496
3. Analyze the effects of coefficient changes on linear and quadratic functions and their graphs.	SE: 310–315, 316–320, 458–468, 464–467, 468–472 TWE: 310–315, 316–320, 458–468, 464–467, 468–472
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: 283–289, 290–295, 296–300, 310–315, 316–320, 458–462, 464–467, 468–472, 474–477, 478–482, 483–493, 496 TWE: 283–289, 290–295, 296–300, 310–315, 316–320, 458–462, 464–467, 468–472, 474–477, 478–482, 483–493, 496
5. Distinguish functions from other relations using graphic and symbolic methods.	SE: 238–243, 244–249, 250–255, 256–261 TWE: 238–243, 244–249, 250–255, 256–261
B. Algebra (Algebraic Thinking)	
Standard: 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: 4–7, 14–19, 20, 23, 26, 45, 47, 63, 67, 74, 79, 85, 101, 176–177, 182, 206–207, 342, 389–390, 399–404, 420–425, 429, 439, 448, 562–563, 620–621, 638–640, 644, 657–659, 661, 664, 668–670 TWE: 4–7, 14–19, 20, 23, 26, 45, 47, 63, 67, 74, 79, 85, 101, 176–177, 182, 206–207, 342, 389–390, 399–404, 420–425, 429, 439, 448, 562–563, 620–621, 638–640, 644, 657–659, 661, 664, 668–670

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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: 55–56, 65–67, 128–131, 134–135, 193, 301, 409, 530, 532–533, 545, 585, 617 TWE: 55–56, 65–67, 128–131, 134–135, 193, 301, 409, 530, 532–533, 545, 585, 617
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: 290–295, 296–300, 301, 311–312, 322–325, 327–329, 331, 454, 524 TWE: 290–295, 296–300, 301, 311–312, 322–325, 327–329, 331, 454, 524
4. Translate among equivalent forms of linear equations and inequalities.	SE: 290–295, 296–300, 301, 311–312, 322–325, 327–329, 331, 454, 504–508, 509–513, 514–517, 519–523, 524–529 TWE: 290–295, 296–300, 301, 311–312, 322–325, 327–329, 331, 454, 504–508, 509–513, 514–517, 519–523, 524–529
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: 64, 70, 100, 120–121, 154, 188, 204, 218, 238, 256, 270, 296, 302, 346, 357, 388–389, 399, 405, 434, 458, 464, 478, 488, 524, 591, 644, 650 TWE: 64, 70, 100, 120–121, 154, 188, 204, 218, 238, 256, 270, 296, 302, 346, 357, 388–389, 399, 405, 434, 458, 464, 478, 488, 524, 591, 644, 650
6. Apply the laws of exponents to perform operations on expressions with integer exponents.	SE: 336–337, 348, 374–375, 455 TWE: 336–337, 348, 374–375, 455
7. Solve linear equations and inequalities in one variable with numeric, graphic and symbolic methods.	SE: 117–121, 122–126, 128–131, 160–164, 165–170, 171–174, 509–513, 514–517, 519–523, 524–529, 530–533, 535–539 TWE: 117–121, 122–126, 128–131, 160–164, 165–170, 171–174, 509–513, 514–517, 519–523, 524–529, 530–533, 535–539
8. Find real solutions to quadratic equations in one variable with numeric, graphic and symbolic methods.	SE: 468–473, 474–477, 478–482, 483–486, 498–499, 508, 611, 623, 649, 661, 673 TWE: 468–473, 474–477, 478–482, 483–486, 498–499, 508, 611, 623, 649, 661, 673
9. Use appropriate terminology and mathematical notation to define and represent recursion.	SE: 111 TWE: 111
10. Create and use recursive formulas to model and solve real-world and mathematical problems.	SE: 111 TWE: 111

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11. Solve systems of two linear equations and inequalities with two variables using numeric, graphic and symbolic methods.	SE: 550–553, 554–559, 560–564, 566–571, 572–577, 586–591, 592, 595, 649 TWE: 550–553, 554–559, 560–564, 566–571, 572–577, 586–591, 592, 595, 649
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: 290–295, 296–300, 322–327, 387, 635 TWE: 290–295, 296–300, 322–327, 387, 635
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: 39, 41–43, 57, 74, 137, 185, 200, 210, 283, 302–306, 321, 328–329, 333, 361, 404, 417, 623 TWE: 39, 41–43, 57, 74, 137, 185, 200, 210, 283, 302–306, 321, 328–329, 333, 361, 404, 417, 623
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: 104–107, 116, 133–135, 158, 184–185, 209–211, 235, 281, 295 TWE: 104–107, 116, 133–135, 158, 184–185, 209–211, 235, 281, 295
3. Determine an approximate best-fit line from a given scatter plot and use the line to draw conclusions.	SE: 283, 302–309, 321, 328–329, 623 TWE: 283, 302–309, 321, 328–329, 623
4. Know the influence of outliers on various measures and representations of data about real-world and mathematical problems.	See Glencoe <i>Algebra 1</i> , 2003 SE: 733, 747-748 TWE: OEA 742 UM 738 <i>Reading to Learn Mathematics</i> 741
5. Understand the relationship between correlation and causation.	See Glencoe <i>Algebra 1</i> , 2003 SE: 298-300, 304 #29-30, 312 <i>Graphing Calculator Investigation</i> 306-307 <i>Reading to Learn Mathematics</i> 303
6. Interpret data credibility in the context of measurement error and display distortion.	SE: 35, 104–107, 109, 133, 135, 158, 185 TWE: 35, 104–107, 109, 133, 135, 158, 185
7. Compare outcomes of voting methods such as majority, plurality, ranked by preference, run-off and pair-wise comparison.	See Glencoe <i>Algebra 1</i> , 2003 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.	

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The student will:	
1. Select and apply appropriate counting procedures to solve real-world and mathematical problems, including probability problems.	SE: 146–147, 149, 180–181, 187, 280–281 TWE: 146–147, 149, 180–181, 187, 280–281
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: 146–150, 180–181, 219–223, 234–230, 232–233, 242–243, 280–281, 327, 333, 407–408, 467 TWE: 146–150, 180–181, 219–223, 234–230, 232–233, 242–243, 280–281, 327, 333, 407–408, 467
3. Use probability models, including area and binomial models, in real-world and mathematical problems.	SE: 219–222, 224–229, 242, 279–281, 407–409, 649 TWE: 219–222, 224–229, 242, 279–281, 407–409, 649
4. For simple probability models, determine the expected values of random variables.	SE: 185, 220, 222–223, 226–227, 229, 232, 280, 409 TWE: 185, 220, 222–223, 226–227, 229, 232, 280, 409
5. Know the effect of sample size on experimental and simulation probabilities.	SE: 32–37, 46 TWE: 32–37, 46
6. Use a variety of experimental, simulation and theoretical methods to calculate probabilities.	SE: 146–150, 180–181, 219–223, 234–230, 232–233, 242–243, 280–281, 327, 333, 407–408 TWE: 146–150, 180–181, 219–223, 234–230, 232–233, 242–243, 280–281, 327, 333, 407–408

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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: 25, 477, 584, 599 TWE: 25, 477, 584, 599
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:	
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.	See Glencoe <i>Algebra 1, 2003</i> SE: 292, 296 #25, 369-370, 373 #48-50, 616-618, 620 #31-32, 628 #18, 629 #61-62 <i>Algebra Activity 626</i> and Glencoe <i>Geometry 2004</i> .
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.	See Glencoe <i>Algebra 1 2003</i> SE: 448 #62, 601 #50-53, 815-816 and Glencoe <i>Geometry 2004</i> for details on the relationships of circles, lines and angles.
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: 366-369, 373-374, 376, 378-379, 605, 609, 619, 623, 680-681 TWE: 366-369, 373-374, 376, 378-379, 605, 609, 619, 623, 680-681
4. Apply the basic concepts of right triangle trigonometry including sine, cosine and tangent to solve real-world and mathematical problems.	See Glencoe <i>Algebra 1, 2003</i> SE: 623-626, 628 #18, 629 #61-62, 630 #63-64, 636 <i>Algebra Activity 622</i> and Glencoe <i>Geometry 2004</i> .
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: 607-609, 612-613, 673 TWE: 607-609, 612-613, 673

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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: 77–79, 546 TWE: 77–79, 546
7. Perform basic constructions with a straightedge and compass.	See Glencoe <i>Algebra 1, 2003</i> SE: 808-809 and Glencoe <i>Geometry 2004</i> for additional constructions of geometric figures
8. Draw accurate representations of planar figures using a variety of tools.	See Glencoe <i>Algebra 1, 2003</i> SE: 813-816 <i>Algebra Activity 626</i> and Glencoe <i>Geometry 2004</i> for additional representations of planar figures.
C. Measurement	
Standard: Use the interconnectedness of geometry, algebra and measurement to explore real-world and mathematical problems.	SE: 14, 160, 284, 322, 366, 458, 464, 488, 606, 624, 644, 650 TWE: 14, 160, 284, 322, 366, 458, 464, 488, 606, 624, 644, 650