



**MINNESOTA**  
**Mathematics Academic Standards**  
**Grades 9, 10, 11**  
**Geometry © 2005**

CONTENT STANDARDS	PAGE REFERENCES
<b>I. MATHEMATICAL REASONING</b> 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: 59 #11, 241 ex 3, 243 #7-#9, 244 #27, 616 #58, 742-743 <i>Graphing Calculator</i> 242
2. Appropriately use examples and counterexamples to make and test conjectures, justify solutions, and explain results.	SE: 62-66, 79 #40-#45, 80 #58-#61, 115 #9-#11, 121 #4-#6, 783 #1-#2 <i>Extra Practice Lesson 2-1</i> 756 <i>Reading Mathematics</i> 81 TWE: DI 64 OEA 66 <i>Reading to Learn Mathematics</i> 61 <i>Skills Practice</i> 59-60 <i>Study Guide &amp; Intervention</i> 57-58
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: 74 #55, 147 ex 5, 149 #45-#51, 171 #24, 331 #47, 501 ex 5, 509 #13-#14, 658 #29, 670 #35
4. Support mathematical results by explaining why the steps in a solution are valid and why a particular solution method is appropriate.	SE: 82-87, 89-93, 94-100, 118 #30-#38, 119 #39-#46 TWE: DI 96 OEA 100 <i>Reading to Learn Mathematics</i> 79, 85, 91 <i>Skills Practice</i> 77-78, 83-84, 89-90 <i>Study Guide &amp; Intervention</i> 75-76, 81-82, 87-88
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: 26 #46-#47, 143 #39-#41, 149 #50-#51, 173 #15, 244 #34, 287 #41, 303 #32, 310 ex 4, 339 #13, 355 #40-#43

CONTENT STANDARDS	PAGE REFERENCES
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: 75-80, 116-117 #18-#24, 121 #10-#11, 122 #7, 123 #10, 783 #6-#7 <i>Extra Practice Lesson 2-3 756</i> TWE: DI 77 OEA 80 <i>Reading to Learn Mathematics 73</i> <i>Skills Practice 71-72</i> <i>Study Guide &amp; Intervention 69-70</i>
<b>II. NUMBER SENSE, COMPUTATION, AND OPERATIONS</b>	
<b>A. Number Sense</b>	
<u>Standard:</u> 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 #60-#65, 23 ex 3, 26 #46-#47, 58 #2, 59 #15, 80 #66-#68, 94-99, 106 #31-#34, 119 #39-#46, 122 #1, 232 #1, 278 #1, 284 ex 4, 596 ex 2, 757 #1-#4
<b>B. Computation and Operation</b>	
<u>Standard:</u> 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: 5 #9-#12, 138 #55-#59, 338 #1, 341 #9-#12, 734-735, 736 <i>Study Tip 366, 667, 703</i>
2. Know, use and translate calculator notational conventions to mathematical notation.	SE: 366 ex 2 <i>Graphing Calculator Investigation 158</i> <i>Study Tip 703</i> <i>Graphing Calculator and Computer Masters 17, 19, 21, 27, 29, 41</i>
3. Recognize the impact of units such as degrees and radians on calculations.	SE: <i>Study Tip 366</i>
4. Recognize that applying an inverse function with a calculator may lead to extraneous or incomplete solutions.	Using a calculator to get an answer that is an approximation can be found in the <i>Graphing Calculator and Computer Masters Ancillary</i> on page 27.
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>Study Tip 576</i> TWE: T 158 <i>Graphing Calculator and Computer Masters 6, 7-11</i>
6. Understand that use of a calculator requires appropriate mathematical reasoning and does not replace the need for mental computation.	SE: <i>Study Tip 366, 667, 703</i>

CONTENT STANDARDS	PAGE REFERENCES
<b>III. PATTERNS, FUNCTIONS, AND ALGEBRA</b>	
<b>A. Patterns and Functions</b>	
<p><b>Standard:</b> Represent and analyze real-world and mathematical problems using numeric, graphic and symbolic methods for a variety of functions.</p> <p>The student will:</p>	
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.	<p>SE: 139-144, 145-150, 164 #39-#41, 169 #23-#34, 171 #12-#15 <i>Graphing Calculator Investigation</i> 158</p> <p>TWE: A 144 CC 141 DI 141 <i>Reading to Learn Mathematics</i> 141, 147 <i>Skills Practice</i> 139-140, 145-146 <i>Study Guide &amp; Intervention</i> 137-138, 143-144</p>
2. Model exponential growth and decay, numerically, graphically and symbolically, using exponential functions with integer inputs.	SE: Problems involving exponents can be found on pages 281 #11-#13 and 687 #11-#14
3. Analyze the effects of coefficient changes on linear and quadratic functions and their graphs.	SE: 149 #52, 172 #9 <i>Study Tip</i> 146
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: 142 #12-#14, 143 #39-#41, 148 #13-#14, 149 #46-#49, 171 #24, 173 #15 TWE: H 139, 145
5. Distinguish functions from other relations using graphic and symbolic methods.	SE: 567 #48
<b>B. Algebra (Algebraic Thinking)</b>	
<p><b>Standard:</b> Solve simple equations and inequalities numerically, graphically, and symbolically. Use recursion to model and solve real-world and mathematical problems.</p> <p>The student will:</p>	
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: 58 #3, 59 #10, 122 #8, 173 #10, 338 #1, 744-745, 746-747, 748-749, 750-751
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: Simplifying absolute value problems can be found on pages 338 #1, 735 #21-#28, and 736 #10-#17.
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: 145-150, 157 #47-#50, 164 #39-#43, 169 #29-#34, 171 #1, 172 #8 TWE: DI 146 OEA 150 <i>Reading to Learn Mathematics</i> 147 <i>Skills Practice</i> 145-146 <i>Study Guide &amp; Intervention</i> 143-144

CONTENT STANDARDS	PAGE REFERENCES
4. Translate among equivalent forms of linear equations and inequalities.	SE: 23 ex 5, 61 #7-#12, 94 ex 1, 97 #8, 122 #4, 125 #9-#11, 145-149, 173 #10, 177 #1-#6, 600 #38, 658 #29, 670 #35, 737-738, 739-740, 742-743
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: 58 #6, 74 #55, 147 ex 5, 149 #45-#51, 171 #24, 173 #14, 232 #3, 331 #47, 458 #1, 501 ex 5, 509 #13-#14, 511 #45-#46, 519 #10, 658 #29, 670 #35
6. Apply the laws of exponents to perform operations on expressions with integer exponents.	SE: 687 #11-#14, 746-747, 748-749
7. Solve linear equations and inequalities in one variable with numeric, graphic and symbolic methods.	SE: 23 ex 5, 61 #7-#12, 94 ex 1, 97 #8, 122 #4, 125 #9-#11, 145-149, 173 #10, 177 #1-#6, 600 #38, 658 #29, 670 #35, 737-738, 739-740, 742-743
8. Find real solutions to quadratic equations in one variable with numeric, graphic and symbolic methods.	SE: 305 #50, 348 #50, 445 #44, 521 #10-#13, 570 ex 3, 571 ex 4, 572 #12-#15, 573 #27-#28, 585 #47, 676 #40, 719 #39, 750-751
9. Use appropriate terminology and mathematical notation to define and represent recursion.	SE: 325-331, 336 #39-#43, 337 #18, 348 #51-#54, 356 #56-#59 TWE: CC 327 DI 327 <i>Reading to Learn Mathematics</i> 329 <i>Skills Practice</i> 327-328 <i>Study Guide &amp; Intervention</i> 325-326
10. Create and use recursive formulas to model and solve real-world and mathematical problems.	SE: 327 ex 5, 328 #10, 329 #38, 330 #39-#41 TWE: CC 327 DI 327 H 325 <i>Reading to Learn Mathematics</i> 329 <i>Skills Practice</i> 327-328 <i>Study Guide &amp; Intervention</i> 325-326
11. Solve systems of two linear equations and inequalities with two variables using numeric, graphic and symbolic methods.	SE: 59 #11, 241 ex 3, 243 #7-#9, 244 #27, 616 #58, 742-743 <i>Graphing Calculator</i> 242
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: 141 ex 3-ex 4, 142 #8-#9, 143 #29-#32, 148 #31-#34, 149 #54, 154 #11, 156 #38-#39, 157 #50, 164 #42-#43, 169 #23-#28, 171 #1, 172 #8 TWE: DI 141 <i>Reading to Learn Mathematics</i> 141 <i>Skills Practice</i> 139-140

CONTENT STANDARDS	PAGE REFERENCES
<b>IV. DATA ANALYSIS, STATISTICS, AND PROBABILITY</b>	
<b>A. Data and Statistics</b>	
<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: 20, 296 #56-#58, 626 #20-#23, 653 #34-#36 <i>WebQuest</i> 164
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: 114 #45, 183 #45, 245 #35-#36, 254 #60
3. Determine an approximate best-fit line from a given scatter plot and use the line to draw conclusions.	See Glencoe's <i>Algebra 2</i> © 2003. 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
4. Know the influence of outliers on various measures and representations of data about real-world and mathematical problems.	See Glencoe's <i>Algebra 2</i> © 2003. SE: <i>Graphing Calculator Investigation</i> 666 #2-#3 <i>Prerequisite Skills</i> 827 Example 2 <i>Study Tip</i> 83
5. Understand the relationship between correlation and causation.	SE: 296 #56-#58, 626 #20-#23, 653 #34-#36 <i>WebQuest</i> 65 TWE: TS 401
6. Interpret data credibility in the context of measurement error and display distortion.	SE: Graphs can be found on the following pages: <i>USA Today</i> 16, 63, 143, 259, 296, 347, 474, 531, 614, 653
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.
<b>B. Probability</b>	
<u>Standard:</u> 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: 265 #48-#49, 278 #4
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: 265 #48-#49

CONTENT STANDARDS	PAGE REFERENCES
3. Use probability models, including area and binomial models, in real-world and mathematical problems.	SE: 622-627, 630 #19-#20, 631 #13-#15, 648 #46, 700 #28, 705 #27, 792 #11 TWE: DI 624, 625 OEA 627 TT 623 <i>Enrichment</i> 640 <i>Reading to Learn Mathematics</i> 639 <i>Skills Practice</i> 637-638 <i>Study Guide &amp; Intervention</i> 635-636
4. For simple probability models, determine the expected values of random variables.	SE: 549 #7, 550 #31-#34 TWE: OEA 627
5. Know the effect of sample size on experimental and simulation probabilities.	See Glencoe's <i>Algebra 2</i> © 2003. SE: 682-685 <i>Study Guide and Review</i> 692 TWE: H 682 IE 683
6. Use a variety of experimental, simulation and theoretical methods to calculate probabilities.	SE: 164 #35 TWE: DI 624 OEA 627
<b>V. SPATIAL SENSE, GEOMETRY AND MEASUREMENT</b>	
<b>A. Spatial Sense</b>	
<u>Standard:</u> 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: 636-642, 643-648, 654 #47-#48, 659 #35-#36 TWE: DI 644 OEA 648 <i>Enrichment</i> 666, 672 <i>Reading to Learn Mathematics</i> 665, 671 <i>Skills Practice</i> 663-664, 669-670, 675-676 <i>Study Guide &amp; Intervention</i> 661-662, 667-668
<b>B. Geometry</b>	
<u>Standard:</u> 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.	SE: 126-131, 151-157, 164 #36-#38, 167 #8-#15, 170 #35-#40, 192-198, 200-206, 207-213 <i>Enrichment</i> 154 <i>Reading to Learn Mathematics</i> 129, 153 <i>Skills Practice</i> 127-128, 151-152 <i>Study Guide &amp; Intervention</i> 125-126, 149-150

CONTENT STANDARDS	PAGE REFERENCES
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: 529-535, 536-543, 544-551, 552-558 <i>Geometry Activity</i> 559 TWE: DI 531 OEA 535, 551, 558 <i>Reading to Learn Mathematics</i> 551, 563 <i>Skills Practice</i> 549-550, 561-562 <i>Study Guide &amp; Intervention</i> 547-548, 559-560
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 $45^\circ$ - $45^\circ$ - $90^\circ$ and $30^\circ$ - $60^\circ$ - $90^\circ$ triangles.	SE: 350-356, 357-363, 595-600, 601-609, 610-616, 643-648, 649-654, 655-659, 660-665 TWE: DI 358 <i>Reading to Learn Mathematics</i> 361, 367 <i>Skills Practice</i> 359-360, 365-366 <i>Study Guide &amp; Intervention</i> 357-358, 363-364
4. Apply the basic concepts of right triangle trigonometry including sine, cosine and tangent to solve real-world and mathematical problems.	SE: 364-370, 371-376, 377-383, 385-390 <i>Geometry Activity</i> 391 TWE: DI 372 OEA 370 <i>Reading to Learn Mathematics</i> 373, 379 <i>Skills Practice</i> 371-372, 377-378, 383-384 <i>Study Guide &amp; Intervention</i> 369-370, 375-376, 381-382
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: 21-27, 36 #52-#54, 43 #50-#55, 47 ex 3, 55 #20-#27, 139-144, 154 #11, 169 #23-#26 <i>Enrichment</i> 142 <i>Reading to Learn Mathematics</i> 17, 141 <i>Skills Practice</i> 15-16, 139-140 <i>Study Guide &amp; Intervention</i> 13-14, 137-138
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: 463-469, 470-475, 476-482, 488 #42-#45, 490-497, 506-511 TWE: DI 471, 478 OEA 482 <i>Reading to Learn Mathematics</i> 483, 489 <i>Skills Practice</i> 481-482, 487-488 <i>Study Guide &amp; Intervention</i> 479-480, 485-486
7. Perform basic constructions with a straightedge and compass.	SE: 314 #40-#41 <i>Construction</i> 15, 24, 31, 33, 151, 200, 202, 207, 311, 425, 433 <i>Geometry Activity</i> 32, 44, 236-237
8. Draw accurate representations of planar figures using a variety of tools.	SE: 435 #24-#25, 444 #37-#38, 542 #46-#47 <i>Construction</i> 200, 202, 207, 425, 433, 559 <i>Geometry Activity</i> 438
<b>C. Measurement</b> <u>Standard:</u> Use the interconnectedness of geometry, algebra and measurement to explore real-world and mathematical problems.	SE: 405 ex 3, 408 #27-#28, 415 #22-#31, 419 ex 4, 421 #19-#24, 423 #47-#50, 428 #10-#15, 432 ex 2, 488 #47-#49, 533 #20-#23, 535 #64-#65, 540 #34, 547 ex 4, 549 #13-#15, 605 #10-#11

## Codes Used for TWE Pages

A	Assess
CC	Concept Check
DI	Daily Intervention
H	How
OEA	Open-Ended Assessment
T	Teach
TS	Teaching Suggestions
TT	Teaching Tip