



# MathMatters 3

An Integrated Program

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STANDARDS	PAGE REFERENCES
<p><b>Standard 4.1 (Number and Numerical Operations)</b> All students will develop number sense and will perform standard numerical operations and estimations on all types of numbers in a variety of ways.</p>	
<p>Building upon knowledge and skills gained in preceding grades, by the end of Grade 12, students will:</p>	
<p><b>A. Number Sense</b></p>	
<p>1. Extend understanding of the number system to all real numbers.</p>	<p><b>Student Edition:</b> 10-13, 19 #35-#46, 208 #16, 426-429, 430-433, 436-439 <i>Are You Ready?</i> 243, 613 #13-#20 <b>Annotated Teacher Edition:</b> AA 10; ETL 13 <b>Teacher Resources:</b> <i>Chapter 1 Resource Masters 6</i></p>
<p>2. Compare and order rational and irrational numbers.</p>	<p><b>Student Edition:</b> 10-13, 19 #43-#46, 20-23, 55 #23-#28, 426-429 <i>Are You Ready?</i> 243 <b>Annotated Teacher Edition:</b> ETL 13</p>

STANDARDS	PAGE REFERENCES
3. Develop conjectures and informal proofs of properties of number systems and sets of numbers.	<b>Student Edition:</b> 10-13 (#30), 16-19, 37 #45-#46, 69 #43, 75 #35-#36, 426-429 (#41-#43), 433 #24 <b>Annotated Teacher Edition:</b> AA 10, 19; ETL 13; FG 16
<b>B. Numerical Operations</b>	
1. Extend understanding and use of operations to real numbers and algebraic procedures.	<b>Student Edition:</b> 20-23, 26-29, 34-37, 38-41, 72-75, 264-267, 268-271, 426-429 <i>MathWorks</i> 33 <b>Annotated Teacher Edition:</b> ETL 21, 29; FG 27, 28 <b>Teacher Resources:</b> <i>Chapter 1 Resource Masters</i> 12, 15
2. Develop, apply, and explain methods for solving problems involving rational and negative exponents.	<b>Student Edition:</b> 38-41 Rational exponents fall outside the scope of this textbook. <b>Teacher Resources:</b> <i>Chapter 1 Resource Masters</i> 23
3. Perform operations on matrices. <ul style="list-style-type: none"> <li>• Addition and subtraction</li> <li>• Scalar multiplication</li> </ul>	<b>Student Edition:</b> 358-361, 362-365, 368-371 <b>Annotated Teacher Edition:</b> AA 365; FG 363, 371 <b>Teacher Resources:</b> <i>Chapter 8 Resource Masters</i> 259, 260
4. Understand and apply the laws of exponents to simplify expressions involving numbers raised to powers.	<b>Student Edition:</b> 34-37, 38-41 <b>Annotated Teacher Edition:</b> ETL 36, 37, 41; FG 35 <b>Teacher Resources:</b> <i>Chapter 1 Resource Masters</i> 19, 20, 22, 23
<b>C. Estimation</b>	
1. Recognize the limitations of estimation, assess the amount of error resulting from estimation, and determine whether the error is within acceptable tolerance limits.	<b>Student Edition:</b> 20-23, 208 #16 <i>MathWorks</i> 33 <b>Annotated Teacher Edition:</b> ETL 22; TT 427

STANDARDS	PAGE REFERENCES
<p><b>Standard 4.2 (Geometry and Measurement) All students will develop spatial sense and the ability to use geometric properties, relationships, and measurement to model, describe and analyze phenomena.</b></p>	
<p><b>A. Geometric Properties</b></p>	
<p>1. Use geometric models to represent real-world situations and objects and to solve problems using those models (e.g., use Pythagorean theorem to decide whether an object can fit through a doorway).</p>	<p><b>Student Edition:</b> 107 #19, 166 #20, 175 #31-#33, 303 #11, #15, 306-309, 326-327, 430-433, 439 #14, 618-621 <i>Chapter Investigation</i> 147, 157 #10, 167 #24 <i>MathWorks</i> 305, 435 <b>Annotated Teacher Edition:</b> ETL 161</p>
<p>2. Draw perspective views of 3D objects on isometric dot paper, given 2D representations (e.g., nets or projective views).</p>	<p><b>Student Edition:</b> 221 Example 3, 222 #9-#10 <b>Teacher Resources:</b> <i>Chapter 5 Resource Masters</i> 159 Also see Glencoe's <i>MathMatters 2</i> © 2006 422-425, 426-429, 436-439, 442-445, 446-449</p>
<p>3. Apply the properties of geometric shapes.</p> <ul style="list-style-type: none"> <li>• Parallel lines - transversal, alternate interior angles, corresponding angles</li> <li>• Triangles <ul style="list-style-type: none"> <li>a. Conditions for congruence</li> <li>b. Segment joining midpoints of two sides is parallel to and half the length of the third side</li> <li>c. Triangle inequality</li> </ul> </li> <li>• Minimal conditions for a shape to be a special quadrilateral</li> <li>• Circles - arcs, central and inscribed angles, chords, tangents</li> <li>• Self-similarity</li> </ul>	<p><b>Student Edition:</b> 118-121, 154-157, 160-163, 172-175, 182-185, 188-191, 316-319, 320-323, 440-443, 448-451 <i>MathWorks</i> 159 <b>Annotated Teacher Edition:</b> ETL 160, 183</p>
<p>4. Use reasoning and some form of proof to verify or refute conjectures and theorems.</p> <ul style="list-style-type: none"> <li>• Verification or refutation of proposed proofs</li> <li>• Simple proofs involving congruent triangles</li> <li>• Counterexamples to incorrect conjectures</li> </ul>	<p><b>Student Edition:</b> 134-137, 150-153, 154-157, 160-163, 170-171, 185 #25 <i>MathWorks</i> 159 <b>Annotated Teacher Edition:</b> AA 135; ETL 160 <b>Teacher Resources:</b> <i>Chapter 3 Resource Masters</i> 91, 92 <i>Chapter 4 Resource Masters</i> 110, 111, 113, 114, 115, 118</p>

STANDARDS	PAGE REFERENCES
<b>B. Transforming Shapes</b>	
<p>1. Determine, describe, and draw the effect of a transformation, or a sequence of transformations, on a geometric or algebraic object, and, conversely, determine whether and how one object can be transformed to another by a transformation or a sequence of transformations.</p>	<p><b>Student Edition:</b> 338-341, 342-345, 348-351, 368-371, 628-631 248, 524 (introductions) <i>MathWorks</i> 347</p> <p><b>Annotated Teacher Edition:</b> ETL 345, 368; TT 343, 369</p> <p><b>Teacher Resources:</b> <i>Chapter 12 Resource Masters</i> 385</p>
<p>2. Recognize three-dimensional figures obtained through transformations of two-dimensional figures (e.g., cone as rotating an isosceles triangle about an altitude), using software as an aid to visualization.</p>	<p><b>Student Edition:</b> 220-223, 342-345 (can be used when integrated into the lesson)</p>
<p>3. Determine whether two or more given shapes can be used to generate a tessellation.</p>	<p><b>Teacher Resources:</b> <i>Chapter 1 Resource Masters</i> 21 <i>Chapter 4 Resource Masters</i> 127 <i>Chapter 8 Resource Masters</i> 249, 258</p>
<p>4. Generate and analyze iterative geometric patterns.</p> <ul style="list-style-type: none"> <li>• Fractals (e.g., Sierpinski's Triangle)</li> <li>• Patterns in areas and perimeters of self-similar figures</li> <li>• Outcome of extending iterative process indefinitely</li> </ul>	<p><b>Student Edition:</b> 52-55, 308-309</p> <p><b>Annotated Teacher Edition:</b> DI 55; ETL 53</p> <p><b>Teacher Resources:</b> <i>Chapter 2 Resource Masters</i> 35, 36</p>
<b>C. Coordinate Geometry</b>	
<p>1. Use coordinate geometry to represent and verify properties of lines.</p> <ul style="list-style-type: none"> <li>• Distance between two points</li> <li>• Midpoint and slope of a line segment</li> <li>• Finding the intersection of two lines</li> <li>• Lines with the same slope are parallel</li> <li>• Lines that are perpendicular have slopes whose product is -1</li> </ul>	<p><b>Student Edition:</b> 244-247, 248-251, 545-547 <i>MathWorks</i> 253, 549</p> <p><b>Annotated Teacher Edition:</b> ETL 251; FG 547</p> <p><b>Teacher Resources:</b> <i>Chapter 6 Resource Masters</i> 177, 178, 180, 181 <i>Chapter 12 Resource Masters</i> 398, 399</p>
<p>2. Show position and represent motion in the coordinate plane using vectors.</p> <ul style="list-style-type: none"> <li>• Addition and subtraction of vectors</li> </ul>	<p>Vectors fall outside the scope of this text but can be covered during teacher/class discussion.</p>

STANDARDS	PAGE REFERENCES
<b>D. Units of Measurement</b>	
1. Understand and use the concept of significant digits.	<b>Student Edition:</b> 38-41 can be integrated to meet this standard, 208 #16
2. Choose appropriate tools and techniques to achieve the specified degree of precision and error needed in a situation. <ul style="list-style-type: none"> <li>• Degree of accuracy of a given measurement tool</li> <li>• Finding the interval in which a computed measure (e.g., area or volume) lies, given the degree of precision of linear measurements</li> </ul>	<b>Student Edition:</b> 206 can be integrated to meet this standard
<b>E. Measuring Geometric Objects</b>	
1. Use techniques of indirect measurement to represent and solve problems. <ul style="list-style-type: none"> <li>• Similar triangles</li> <li>• Pythagorean theorem</li> <li>• Right triangle trigonometry (sine, cosine, tangent)</li> </ul>	<b>Student Edition:</b> 300-303, 310-313, 316-319, 320-323, 326-327, 430-433, 614-617, 618-621 <i>MathWorks</i> 305, 325 <b>Annotated Teacher Edition:</b> ETL 303, 314, 319, 322
2. Use a variety of strategies to determine perimeter and area of plane figures and surface area and volume of 3D figures. <ul style="list-style-type: none"> <li>• Approximation of area using grids of different sizes</li> <li>• Finding which shape has minimal (or maximal) area, perimeter, volume, or surface area under given conditions using graphing calculators, dynamic geometric software, and/or spreadsheets</li> <li>• Estimation of area, perimeter, volume, and surface area</li> </ul>	<b>Student Edition:</b> 206-209, 212-215, 216-217, 224-227, 230-233 <i>MathWorks</i> 211, 229 <b>Annotated Teacher Edition:</b> DI 230; ETL 208, 217; FG 209, 226, 231 <b>Teacher Resources:</b> <i>Chapter 2 Resource Masters</i> 55 <i>Chapter 5 Resource Masters</i> 150, 153

STANDARDS	PAGE REFERENCES
<p><b>Standard 4.3 (Patterns and Algebra) All students will represent and analyze relationships among variable quantities and solve problems involving patterns, functions, and algebraic concepts and processes.</b></p>	
<p><b>A. Patterns</b></p>	
<p>1. Use models and algebraic formulas to represent and analyze sequences and series.</p> <ul style="list-style-type: none"> <li>• Explicit formulas for <math>n^{\text{th}}</math> terms</li> <li>• Sums of finite arithmetic series</li> <li>• Sums of finite and infinite geometric series</li> </ul>	<p><b>Student Edition:</b> 52-55, 127 #11, 175 #35-#36</p> <p><b>Annotated Teacher Edition:</b> ETL 53; FG 52</p> <p><b>Teacher Resources:</b> <i>Chapter 2 Resource Masters 35, 36, 58</i> <i>Chapter 12 Resource Masters 388</i></p>
<p>2. Develop an informal notion of limit.</p>	<p><b>Student Edition:</b> The introduction on 426, 584-587</p> <p><b>Annotated Teacher Edition:</b> ETL 53; FG 224</p>
<p>3. Use inductive reasoning to form generalizations.</p>	<p><b>Student Edition:</b> 124-127</p> <p>The introductions on pages 134, 150, 178, 248, 430, 448, 492, 524</p> <p><b>Annotated Teacher Edition:</b> ETL 127; FG 124, 125</p> <p><b>Teacher Resources:</b> <i>Chapter 3 Resource Masters 85, 86, 87</i></p>
<p><b>B. Functions and Relationships</b></p>	
<p>1. Understand relations and functions and select, convert flexibly among, and use various representations for them, including equations or inequalities, tables, and graphs.</p>	<p><b>Student Edition:</b> 56-59, 62-65, 76-79, 520-523, 566-569, 580-583, 584-587, 594-597, 624-627</p> <p><b>Annotated Teacher Edition:</b> AA 59; ETL 58</p> <p><b>Teacher Resources:</b> <i>Chapter 2 Resource Masters 38, 39</i> <i>Chapter 12 Resource Masters 383, 384</i></p>

STANDARDS	PAGE REFERENCES
<p>2. Analyze and explain the general properties and behavior of functions of one variable, using appropriate graphing technologies.</p> <ul style="list-style-type: none"> <li>• Slope of a line or curve</li> <li>• Domain and range</li> <li>• Intercepts</li> <li>• Continuity</li> <li>• Maximum/minimum</li> <li>• Estimating roots of equations</li> <li>• Intersecting points as solutions of systems of equations</li> <li>• Rates of change</li> </ul>	<p><b>Student Edition:</b> 56-59, 62-65, 244-247, 248-251, 258-261, 520-523, 524-527, 530-533, 580-583, 584-587, 594-597 <i>MathWorks</i> 529</p> <p><b>Annotated Teacher Edition:</b> AA 244</p>
<p>3. Understand and perform transformations on commonly-used functions.</p> <ul style="list-style-type: none"> <li>• Translations, reflections, dilations</li> <li>• Effects on linear and quadratic graphs of parameter changes in equations</li> <li>• Using graphing calculators or computers for more complex functions</li> </ul>	<p><b>Student Edition:</b> 628-631 Introductions on pages 248, 524 <i>MathWorks</i> 347, 367</p> <p><b>Teacher Resources:</b> <i>Chapter 2 Resource Masters</i> 43 <i>Chapter 6 Resource Masters</i> 182, 188 <i>Chapter 12 Resource Masters</i> 385, 391</p>
<p>4. Understand and compare the properties of classes of functions, including exponential, polynomial, rational, and trigonometric functions.</p> <ul style="list-style-type: none"> <li>• Linear vs. non-linear</li> <li>• Symmetry</li> <li>• Increasing/decreasing on an interval</li> </ul>	<p><b>Student Edition:</b> 62-65, 244-247, 520-523, 524-527, 580-583, 584-587, 594-597, 600-603, 628-631</p> <p><b>Annotated Teacher Edition:</b> AA 65; FG 582</p> <p><b>Teacher Resources:</b> <i>Chapter 12 Resource Masters</i> 391</p>

STANDARDS	PAGE REFERENCES
<b>C. Modeling</b>	
<p>1. Use functions to model real-world phenomena and solve problems that involve varying quantities.</p> <ul style="list-style-type: none"> <li>Linear, quadratic, exponential, periodic (sine and cosine), and step functions (e.g., price of mailing a first-class letter over the past 200 years)</li> <li>Direct and inverse variation</li> <li>Absolute value</li> <li>Expressions, equations and inequalities</li> <li>Same function can model variety of phenomena</li> <li>Growth/decay and change in the natural world</li> <li>Applications in mathematics, biology, and economics (including compound interest)</li> </ul>	<p><b>Student Edition:</b> 21 Example 3, 28 #30, 59 #21-#22, 65 #17-#19, 75 #32, 256 #14, 264-267, 268-271, 282-285, 524-527, 530-533, 594-597, 631 #30</p> <p><b>Annotated Teacher Edition:</b> ETL 39</p>
<p>2. Analyze and describe how a change in an independent variable leads to change in a dependent one.</p>	<p><b>Student Edition:</b> 62-65, 520-523, Introduction on 562, 580-583, 584-587, 594-597</p> <p><b>Annotated Teacher Edition:</b> AA 523; FG 588; TT 520, 589</p> <p><b>Teacher Resources:</b> <i>Chapter 2 Resource Masters 43</i></p>
<p>3. Convert recursive formulas to linear or exponential functions (e.g., Tower of Hanoi and doubling).</p>	<p><b>Student Edition:</b> 52-55</p> <p><b>Annotated Teacher Edition:</b> ETL 53 can be extended to meet this requirement</p> <p><b>Teacher Resources:</b> <i>Chapter 2 Resource Masters 58 (if extended)</i> <i>Chapter 11 Resource Masters 353</i> <i>Chapter 12 Resource Masters 388</i></p>
<b>D. Procedures</b>	
<p>1. Evaluate and simplify expressions.</p> <ul style="list-style-type: none"> <li>Add and subtract polynomials</li> <li>Multiply a polynomial by a monomial or binomial</li> <li>Divide a polynomial by a monomial</li> </ul>	<p><b>Student Edition:</b> 468-471, 472-475, 478-481, 482-485 <i>MathWorks 477</i></p> <p><b>Annotated Teacher Edition:</b> AA 475; DI 469, 485; ETL 483; TT 472, 482</p> <p><b>Teacher Resources:</b> <i>Chapter 11 Resource Masters 350, 356</i></p>

STANDARDS	PAGE REFERENCES
<p>2. Select and use appropriate methods to solve equations and inequalities.</p> <ul style="list-style-type: none"> <li>Linear equations - algebraically</li> <li>Quadratic equations - factoring (when the coefficient of <math>x^2</math> is 1) and using the quadratic formula</li> <li>All types of equations using graphing, computer, and graphing calculator techniques</li> </ul>	<p><b>Student Edition:</b> 66-69, 72-75, 76-79, 296-299, 498-501, 530-533, 534-537, 540-543 <i>MathWorks</i> 81</p> <p><b>Annotated Teacher Edition:</b> DI 69; ETL 73, 299</p>
<p>3. Judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology.</p>	<p><b>Student Edition:</b> 34-37, 38-41, 72-75, 468-471, 472-475, 478-481, 482-485, 488-491</p> <p><b>Annotated Teacher Edition:</b> AA 40; DI 469, 492; ETL 41, 479; FG 35; PE 471</p>
<p><b>Standard 4.4 (Data Analysis, Probability, and Discrete Mathematics) All students will develop an understanding of the concepts and techniques of data analysis, probability, and discrete mathematics, and will use them to model situations, solve problems, and analyze and draw appropriate inferences from data.</b></p>	
<p><b>A. Data Analysis</b></p>	
<p>1. Use surveys and sampling techniques to generate data and draw conclusions about large groups.</p> <ul style="list-style-type: none"> <li>Advantages/disadvantages of sample selection methods (e.g., convenience sampling, responses to survey, random sampling)</li> </ul>	<p><b>Student Edition:</b> 82-85 (especially #16), 387 #18 <i>Chapter Investigation</i> 49, 89 #20 <i>Think About It</i> 82</p>
<p>2. Evaluate the use of data in real-world contexts.</p> <ul style="list-style-type: none"> <li>Accuracy and reasonableness of conclusions drawn</li> <li>Bias in conclusions drawn (e.g., influence of how data is displayed)</li> <li>Statistical claims based on sampling</li> </ul>	<p><b>Student Edition:</b> 88 #12, 92-93</p> <p><b>Annotated Teacher Edition:</b> ETL 93</p> <p><b>Teacher Resources:</b> <i>Chapter 2 Resource Masters</i> 59, 60</p>
<p>3. Design a statistical experiment, conduct the experiment, and interpret and communicate the outcome.</p>	<p><b>Student Edition:</b> 388-389 <i>Chapter Investigation</i> 381, 386 #9, 395 #30, 399 #31, 409 #12, 414 #20</p> <p><b>Annotated Teacher Edition:</b> FG 391; TT 388</p>

STANDARDS	PAGE REFERENCES
<p>4. Estimate or determine lines of best fit (or curves of best fit if appropriate) with technology, and use them to interpolate within the range of the data.</p>	<p><b>Student Edition:</b> 406-409</p> <p><b>Annotated Teacher Edition:</b> AA 409; FG 408</p> <p><b>Teacher Resources:</b> <i>Chapter 9 Resource Masters 296, 297, 298</i></p>
<p>5. Analyze data using technology, and use statistical terminology to describe conclusions.</p> <ul style="list-style-type: none"> <li>• Measures of dispersion: variance, standard deviation, outliers</li> <li>• Correlation coefficient</li> <li>• Normal distribution (e.g., approximately 95% of the sample lies between two standard deviations on either side of the mean)</li> </ul>	<p><b>Student Edition:</b> 412-415</p> <p><b>Annotated Teacher Edition:</b> FG 415; TT 412</p> <p><b>Teacher Resources:</b> <i>Chapter 9 Resource Masters 298, 299, 300</i></p>
<p><b>B. Probability</b></p>	
<p>1. Calculate the expected value of a probability-based game, given the probabilities and payoffs of the various outcomes, and determine whether the game is fair.</p>	<p>Use the following references to help meet this standard.</p> <p><b>Student Edition:</b> 384-387, 392-395, 396-399</p> <p><b>Annotated Teacher Edition:</b> DI 397; ETL 386, 387, 395, 399; FG 385, 398; PE 384, 394</p>
<p>2. Use concepts and formulas of area to calculate geometric probabilities.</p>	<p><b>Student Edition:</b> 212-215, 261 #23-#25, 327 #12-#14</p> <p><b>Annotated Teacher Edition:</b> AA 213; ETL 215; FG 214; TT 212</p> <p><b>Teacher Resources:</b> <i>Chapter 5 Resource Masters 151, 152</i></p>
<p>3. Model situations involving probability with simulations (using spinners, dice, calculators and computers) and theoretical models, and solve problems using these models.</p>	<p><b>Student Edition:</b> 384-387, 388-389</p> <p><b>Annotated Teacher Edition:</b> AA 390; ETL 386; FG 385, 391; TT 388, 389</p> <p><b>Teacher Resources:</b> <i>Chapter 9 Resource Masters 285, 286</i></p>

STANDARDS	PAGE REFERENCES
4. Determine probabilities in complex situations. <ul style="list-style-type: none"> <li>• Conditional events</li> <li>• Complementary events</li> <li>• Dependent and independent events</li> </ul>	<b>Student Edition:</b> 392-395, 396-399 <b>Annotated Teacher Edition:</b> DI 397; ETL 395, 399; FG 398; PE 394; TT 392, 393 <b>Teacher Resources:</b> <i>Chapter 9 Resource Masters 290, 291, 293, 294, 295</i>
5. Estimate probabilities and make predictions based on experimental and theoretical probabilities.	<b>Student Edition:</b> 384 Example 1, 385 Example 3, 386 #3, 387 #17, 390 #29
6. Understand and use the “law of large numbers” (that experimental results tend to approach theoretical probabilities after a large number of trials).	<b>Student Edition:</b> 384-387 <b>Annotated Teacher Edition:</b> FG 385
<b>C. Discrete Mathematics -- Systematic Listing and Counting</b>	
1. Calculate combinations with replacement (e.g., the number of possible ways of tossing a coin 5 times and getting 3 heads) and without replacement (e.g., number of possible delegations of 3 out of 23 students).	<b>Student Edition:</b> 392-395, 396-399, 402-405 <i>MathWorks 411</i> <b>Annotated Teacher Edition:</b> DI 397; ETL 399, 403; FG 398 <b>Teacher Resources:</b> <i>Chapter 9 Resource Masters 290, 291, 293, 294</i>
2. Apply the multiplication rule of counting in complex situations, recognize the difference between situations with replacement and without replacement, and recognize the difference between ordered and unordered counting situations.	<b>Student Edition:</b> 396-399, 402-405 <b>Annotated Teacher Edition:</b> DI 397; ETL 399, 403, 405; FG 398; TT 404
3. Justify solutions to counting problems.	<b>Student Edition:</b> 402-405 <b>Annotated Teacher Edition:</b> AA 405; ETL 403
4. Recognize and explain relationships involving combinations and Pascal’s Triangle, and apply those methods to situations involving probability.	<b>Teacher Resources:</b> <i>Chapter 9 Resource Masters 295</i>

STANDARDS	PAGE REFERENCES
<b>D. Discrete Mathematics-Vertex -- Edge Graphs and Algorithms</b>	
<p>1. Use vertex-edge graphs and algorithmic thinking to represent and solve practical problems.</p> <ul style="list-style-type: none"> <li>• Circuits that include every edge in a graph</li> <li>• Circuits that include every vertex in a graph</li> <li>• Scheduling problems (e.g., when project meetings should be scheduled to avoid conflicts) using graph coloring</li> <li>• Applications to science (e.g., who-eats-whom graphs, genetic trees, molecular structures)</li> </ul>	<p>See Glencoe's <i>MathMatters 2</i> © 2006</p> <p><b>Student Edition:</b> 358-359</p>
<p>2. Explore strategies for making fair decisions.</p> <ul style="list-style-type: none"> <li>• Combining individual preferences into a group decision (e.g., determining winner of an election or selection process)</li> <li>• Determining how many Student Council representatives each class (9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> grade) gets when the classes have unequal sizes (apportionment)</li> </ul>	<p>This standard can be met during teacher/classroom discussion of making fair decisions.</p>
<p><b>Standard 4.5 (Mathematical Processes) All students will use mathematical processes of problem solving, communication, connections, reasoning, representations, and technology to solve problems and communicate mathematical ideas.</b></p>	
<p><b>Cumulative Progress Indicators</b> At each grade level, with respect to content appropriate for that grade level, students will:</p>	
<p><b>A. Problem Solving</b></p>	
<p>1. Learn mathematics through problem solving, inquiry, and discovery.</p>	<p><b>Student Edition:</b> 107 #19, 124-127, 166 #20</p> <p>See the introductions found on pages: 38, 52, 104, 150, 178, 212, 248, 316, 320, 426</p> <p><b>Annotated Teacher Edition:</b> DI 230; FG 209</p>
<p>2. Solve problems that arise in mathematics and in other contexts (cf. workplace readiness standard 8.3).</p> <ul style="list-style-type: none"> <li>• Open-ended problems</li> <li>• Non-routine problems</li> <li>• Problems with multiple solutions</li> <li>• Problems that can be solved in several ways</li> </ul>	<p><b>Student Edition:</b> 13 #34, 23 #29, 37 #45-#46, 75 #35-#36, 79 #35, 85 #16, 185 #25, 303 #16-#17</p> <p><i>MathWorks</i> 61</p> <p><b>Annotated Teacher Edition:</b> ETL 41, 191, 208, 251, 259, 315</p>

STANDARDS	PAGE REFERENCES
3. Select and apply a variety of appropriate problem-solving strategies (e.g., try a simpler problem or make a diagram) to solve problems.	<b>Student Edition:</b> 30-31, 138-139, 170-171, 216-217, 274-275, 326-327, 372-373, 388-389, 502-503, 572-573 <b>Annotated Teacher Edition:</b> ETL 31, 217 <b>Teacher Resources:</b> <i>Chapter 4 Resource Masters 121</i>
4. Pose problems of various types and levels of difficulty.	<b>Annotated Teacher Edition:</b> AA 273; ETL 22, 23; FG 26, 63, 71, 74, 77, 253, 256; TT 34
5. Monitor their progress and reflect on the process of their problem-solving activity.	<b>Student Edition:</b> Use the <i>Practice Exercises</i> throughout the text to monitor students' progress and meet this standard.
<b>B. Communication</b>	
1. Use communication to organize and clarify their mathematical thinking. <ul style="list-style-type: none"> <li>• Reading and writing</li> <li>• Discussion, listening, and questioning</li> </ul>	<b>Student Edition:</b> 28 #16, 33 #10, 59 #34, 75 #37, 89 #19, 166 #8, 190 #15 <b>Annotated Teacher Edition:</b> AA 10, 19, 40, 59, 65; FG 109, 125, 151
2. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.	<b>Student Edition:</b> 31 #5, 85 #16, 121 #8, 166 #8, 171 #6, 185 #19-#21, 227 #16 <b>Annotated Teacher Edition:</b> AA 19, 40, 168, 219; ETL 22, 181; FG 16, 209
3. Analyze and evaluate the mathematical thinking and strategies of others.	<b>Student Edition:</b> 8 #7, 54 #13, 69 #24, 107 #20, 121 #20, 162 #9, 175 #30, 184 #13-#18, 208 #17, 215 #17, 299 #33, 405 #10, 475 #44, 491 #38 <i>MathWorks 61</i> <b>Annotated Teacher Edition:</b> ETL 73
4. Use the language of mathematics to express mathematical ideas precisely.	<b>Student Edition:</b> 8 #16, 19 #32, 37 #48, 79 #35, 107 #19, 127 #11, 134-137, 157 #12, 163 #18, 170-171 <i>MathWorks 33</i> <b>Annotated Teacher Edition:</b> AA 135; ETL 117; FG 125

STANDARDS	PAGE REFERENCES
<b>C. Connections</b>	
1. Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).	<p><b>Student Edition:</b> 52-55, 124-127, 436-439 Introductions on pages 38, 134, 224, 248, 300, 426, 448, 472, 478, 482, 524</p> <p><b>Teacher Resources:</b> <i>Chapter 12 Resource Masters 385</i></p>
2. Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).	<p><b>Student Edition:</b> 66 Example 1, 72 Example 1, 258-261 (#16), 282-285, 534 Example 1, Introductions on pages 38, 52, 62, 248, 472, 478, 482, 492</p> <p><b>Annotated Teacher Edition:</b> FG 125</p>
3. Recognize that mathematics is used in a variety of contexts outside of mathematics.	<p><b>Student Edition:</b> 21 Example 3, 55 #21, 85 #16, 86-89, 121 #15-#18, 202-203, 233 #23, 256 #14, 282-285, 299 #28, 326-327</p> <p><b>Annotated Teacher Edition:</b> ETL 29, 31, 202, 217</p>
4. Apply mathematics in practical situations and in other disciplines.	<p><b>Student Edition:</b> <i>MathWorks</i> 33, 61, 81, 113, 133, 159, 177, 211, 229, 253, 273</p> <p><b>Annotated Teacher Edition:</b> ETL 39, 83, 205, 217</p>
5. Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).	<p><b>Student Edition:</b> 433 #25 <i>Math: Who, Where, When</i> 17, 207, 250, 359</p> <p><b>Annotated Teacher Edition:</b> ETL 119, 614; FG 224</p>
6. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.	<p><b>Student Edition:</b> 160-163, 179, 264-267, 268-271, 282-285, 316-319, 320-323, 326-327, 368-371, 436-439 Introduction on 468</p> <p><b>Annotated Teacher Edition:</b> ETL 54, 75</p>

STANDARDS	PAGE REFERENCES
<b>D. Reasoning</b>	
1. Recognize that mathematical facts, procedures, and claims must be justified.	<b>Student Edition:</b> 66 Example 1, 72 Example 1, 163 #18, 167 #21, 175 #29, 184 #13-#18, 316 Example 1, 395 #27, 451 #21 <b>Annotated Teacher Edition:</b> ETL 117; TT 134
2. Use reasoning to support their mathematical conclusions and problem solutions.	<b>Student Edition:</b> 107 #19, 138-139, 175 #29, 185 #19-#21, 257 #24, 319 #10, 433 #25 <b>Annotated Teacher Edition:</b> AA 135; ETL 181; FG 151, 165; TT 134
3. Select and use various types of reasoning and methods of proof.	<b>Student Edition:</b> 134-137, 150-153, 154-157, 160-163, 170-171, 185 #22 <b>Annotated Teacher Edition:</b> AA 135; ETL 117; TT 134 <b>Teacher Resources:</b> <i>Chapter 3 Resource Masters 91, 92</i> <i>Chapter 4 Resource Masters 110, 111, 113, 114</i>
4. Rely on reasoning, rather than answer keys, teachers, or peers, to check the correctness of their problem solutions.	The teacher will meet this standard by encouraging students throughout the learning process. <b>Annotated Teacher Edition:</b> TT 158
5. Make and investigate mathematical conjectures. <ul style="list-style-type: none"> <li>• Counterexamples as a means of disproving conjectures</li> <li>• Verifying conjectures using informal reasoning or proofs</li> </ul>	<b>Student Edition:</b> 124-127, 128-131, 134-137, 154-157 Introductions on pages: 104, 150 <b>Annotated Teacher Edition:</b> AA 135; DI 152; TT 134 <b>Teacher Resources:</b> <i>Chapter 3 Resource Masters 85, 86, 87, 88, 89, 90</i>
6. Evaluate examples of mathematical reasoning and determine whether they are valid.	<b>Student Edition:</b> 8 #7, 54 #13, 69 #24, 107 #20, 121 #20, 162 #9, 175 #30, 184 #13-#18, 208 #17, 215 #17, 299 #33, 405 #10, 475 #44, 491 #38 <i>MathWorks 61</i> <b>Annotated Teacher Edition:</b> ETL 73

STANDARDS	PAGE REFERENCES
<b>E. Representations</b>	
<p>1. Create and use representations to organize, record, and communicate mathematical ideas.</p> <ul style="list-style-type: none"> <li>Concrete representations (e.g., base-ten blocks or algebra tiles)</li> <li>Pictorial representations (e.g., diagrams, charts, or tables)</li> <li>Symbolic representations (e.g., a formula)</li> <li>Graphical representations (e.g., a line graph)</li> </ul>	<p><b>Student Edition:</b> 10-13, 16-19, 56-59, 66 Example 2, 72 Example 1, 76-79, 258-261, 372-373, 475 #54, 624-627 Introductions on pages 62, 472, 482, 492</p> <p><b>Annotated Teacher Edition:</b> ETL 183</p>
<p>2. Select, apply, and translate among mathematical representations to solve problems.</p>	<p><b>Student Edition:</b> 38-41, 52-55, 56-59, 66-69, 72-75, 248-251, 254-257, 258-261, 274-275, 276-279, 358-361, 362-365, 368-371, 530-533</p>
<p>3. Use representations to model and interpret physical, social, and mathematical phenomena.</p>	<p><b>Student Edition:</b> 16-19, 37 #47, 38-41, 55 #20, 63 Example 3, 124-127, 138-139, 267 #18-20, 270 #7, 282-285, 296-299, 306-309, 372-373, 446-447</p> <p><b>Annotated Teacher Edition:</b> ETL 183</p>
<b>F. Technology</b>	
<p>1. Use technology to gather, analyze, and communicate mathematical information.</p>	<p><b>Student Edition:</b> 84 Example 3, 87 Example 3, 261 #8-#12, 283 Example 2, Introduction on 520, 521, 522 #15</p> <p><b>Teacher Resources:</b> <i>Chapter 9 Resource Masters 298</i></p>
<p>2. Use computer spreadsheets, software, and graphing utilities to organize and display quantitative information.</p>	<p><b>Student Edition:</b> 30-31, 87 Example 3, 395 #30, 399 #31</p> <p><i>Technology Note 531</i></p> <p><b>Annotated Teacher Edition:</b> ETL 33</p> <p><b>Teacher Resources:</b> <i>Chapter 1 Resource Masters 16, 17</i></p>
<p>3. Use graphing calculators and computer software to investigate properties of functions and their graphs.</p>	<p><b>Student Edition:</b> 64 Example 4, 246 #19-#21, 521, 522 #15, 566, 594 Example 1</p> <p>Introductions on 520, 524, 530</p> <p><b>Teacher Resources:</b> <i>Chapter 12 Resource Masters 385, 391</i></p>

STANDARDS	PAGE REFERENCES
<p>4. Use calculators as problem-solving tools (e.g., to explore patterns, to validate solutions).</p>	<p><b>Student Edition:</b>            246 #19-#21, 283 Example 2, 364 #20-#26,            370 #11-#14, 522 #15, 523 #21-#22            Introduction on 248, 320, 524, 530</p> <p><b>Teacher Resources:</b>  <i>Chapter 12 Resource Masters</i> 385, 391</p>
<p>5. Use computer software to make and verify conjectures about geometric objects.</p>	<p><b>Student Edition:</b>            121 #7, 153 #14-#17, 157 #8-#9, 165 Example 3,            166 #7, 174 #22, 371 #24, 431, 433 #15, 441,            443 #8, 451 #18            Introduction on pages 154, 320</p>
<p>6. Use computer-based laboratory technology for mathematical applications in the sciences.</p>	<p>This standard can be met during teacher/classroom discussion.</p>