



MathMatters 2

An Integrated Program

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STANDARDS

PAGE REFERENCES

STRAND 1: QUANTITATIVE LITERACY AND LOGIC

“In an increasingly complex world, adults are challenged to apply sophisticated quantitative knowledge and reasoning in their professional and personal lives. The technological demands of the workplace, the abundance of data in the political and public policy context, and the array of information involved in making personal and family decisions of all types necessitate an unprecedented facility not only with fundamental mathematical, statistical, and computing ideas and processes, but with higher-order abilities to apply and integrate those ideas and processes in a range of areas.”¹

The Michigan Grade Level Content Expectations in Mathematics for grades K-8 prescribe a thorough treatment of number, including strong emphasis on computational fluency and understanding of number concepts, to be completed largely by the sixth grade. The expectations in this Quantitative Literacy and Logic strand provide a definition of secondary school quantitative literacy for all students and emphasize the importance of logic as part of mathematics and in everyday life. They assume fluency (that is, efficiency and accuracy) in calculation with the basic number operations involving rational numbers in all forms (including percentages and decimals), without calculators.

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Mathematical reasoning and logic are at the heart of the study of mathematics. As students progress through elementary and middle school, they increasingly are asked to explain and justify the thinking underlying their work. In high school, students peel away the contexts and study the language and thought patterns of formal mathematical reasoning. By learning logic and by constructing arguments and proofs, students will strengthen not only their knowledge and facility with mathematics, but also their ways of thinking in other areas of study and in their daily lives.

Connections and applications of number ideas and logic to other areas of mathematics, such as algebra, geometry, and statistics, are emphasized in this strand. Number representations and properties extend from the rational numbers into the real and complex numbers, as well as to other systems that students will encounter both in the workplace and in more advanced mathematics. The expectations for calculation, algorithms and estimation reflect important uses of number in a range of real-life situations. Ideas about measurement and precision tie closely to geometry.

STANDARD L1: REASONING ABOUT NUMBERS, SYSTEMS, AND QUANTITATIVE SITUATIONS

Based on their knowledge of the properties of arithmetic, students understand and reason about numbers, number systems, and the relationships between them. They represent quantitative relationships using mathematical symbols, and interpret relationships from those representations.

L1.1 Number Systems and Number Sense

<p>L1.1.1 Know the different properties that hold in different number systems, and recognize that the applicable properties change in the transition from the positive integers, to all integers, to the rational numbers, and to the real numbers.</p>	<p>Student Edition: 51, 52-55, 60-61</p> <p>Annotated Teacher's Edition: QA 103; TT 80</p>
<p>L1.1.2 Explain why the multiplicative inverse of a number has the same sign as the number, while the additive inverse of a number has the opposite sign.</p>	<p>Student Edition: 51, 72-74, 76-77, 93 #32, 348</p> <p><i>Think Back 73</i></p> <p>Annotated Teacher's Edition: ITL 348; QA 68; TT 67, 80</p>
<p>L1.1.3 Explain how the properties of associativity, commutativity, and distributivity, as well as identity and inverse elements, are used in arithmetic and algebraic calculations.</p>	<p>Student Edition: 66-69, 72-75, 76-79, 375, 390-393</p> <p><i>Check Understanding 67</i></p> <p><i>Think Back 66</i></p> <p>Annotated Teacher's Edition: 5MW 390; CE 67, 73, 77, 391; DI 77; ITL 76, 390; QA 78; TT 67, 72, 76, 80, 391</p>

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<p>L1.1.4 Describe the reasons for the different effects of multiplication by, or exponentiation of, a positive number by a number less than 0, a number between 0 and 1, and a number greater than 1.</p>	<p>Student Edition: 72-74, 82-85, 86-89, 90-91 <i>Think Back</i> 73</p> <p>Annotated Teacher's Edition: AA 84, 88; CE 83, 87, 90; DE 83; ETL 57; ITL 82; QA 88; TT 67, 80, 82, 86, 90, 91</p>
<p>L1.1.5 Justify numerical relationships (e.g., show that the sum of even integers is even; that every integer can be written as $3m+k$, where k is 0, 1, or 2, and m is an integer; or that the sum of the first n positive integers is $n(n+1)/2$).</p>	<p>Student Edition: 65, 538-539, 548-551 <i>Check Understanding</i> 549</p> <p>Annotated Teacher's Edition: AA 59; CE 243, 539, 546; ETL 11, 57, 79, 541; FG 351; ITL 456; QA 103; TT 173</p>
<p>L1.1.6 Explain the importance of the irrational numbers $\sqrt{2}$ and $\sqrt{3}$ in basic right triangle trigonometry; the importance of π because of its role in circle relationships; and the role of e in applications such as continuously compounded interest.</p>	<p>Student Edition: 504-507, 512, 513, 623 <i>Problem Solving Tip</i> 504</p> <p>Annotated Teacher's Edition: CE 505; DI 504; ETL 434; ITL 504; QA 506</p>
<p>L1.2 Representations and Relationships</p>	
<p>L1.2.1 Use mathematical symbols (e.g., interval notation, set notation, summation notation) to represent quantitative relationships and situations.</p>	<p>Student Edition: 51, 53-54, 60-61, 62-65, 70-71, 149, 520-523, 524-527, 528-529, 552, 555, 623-624 <i>Reading Math</i> 53, 226 <i>Think Back</i> 206</p> <p>Annotated Teacher's Edition: CE 60, 521, 525, 528; DI 212; TT 521</p>
<p>L1.2.2 Interpret representations that reflect absolute value relationships (e.g. $x - a \leq b$, or $a \pm b$) in such contexts as error tolerance.</p>	<p>Student Edition: 54-55, 60-61, 98 #4</p> <p>Annotated Teacher's Edition: CE 73; ETL 106</p>
<p>L1.2.3 Use vectors to represent quantities that have magnitude and direction; interpret direction and magnitude of a vector numerically, and calculate the sum and difference of two vectors.</p>	<p>This standard can be found in Glencoe's <i>Geometry</i> © 2008 on the following pages:</p> <p>Student Edition: 534-541</p>
<p>L1.2.4 Organize and summarize a data set in a table, plot, chart, or spreadsheet; find patterns in a display of data; understand and critique data displays in the media.</p>	<p>Student Edition: 3, 4-5, 10-12, 15, 16-19, 28-31, 42-44, 45, 61, 75, 92-93, 96, 97</p> <p>Annotated Teacher's Edition: 5MW 16; AA 34, 59; CE 17, 29, 93; ETL 35; QA 93</p>

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L1.3 Counting and Probabilistic Reasoning		
L1.3.1	Describe, explain, and apply various counting techniques (e.g., finding the number of different 4-letter passwords; permutations; and combinations); relate combinations to Pascal’s triangle; know when to use each technique.	Student Edition: 150-153, 154-155, 156-157, 158-161, 162-165, 166-167, 168-171, 172-175, 176-177, 178-181, 182-184, 185, 596-598 <i>MathWorks</i> 157 Annotated Teacher’s Edition: CE 151, 155, 159, 163, 169, 173, 179
L1.3.2	Define and interpret commonly used expressions of probability (e.g., chances of an event, likelihood, odds).	Student Edition: 150-153, 154-155, 158-161, 162-165, 166-167, 168-171, 176-177, 182-184, 185 <i>Check Understanding</i> 169 <i>MathWorks</i> 157 Annotated Teacher’s Edition: CE 155, 169; ITL 168; QA 164, 170; TT 170
L1.3.3	Recognize and explain common probability misconceptions such as “hot streaks” and “being due.”	Student Edition: 162-165, 171
STANDARD L2: CALCULATION, ALGORITHMS, AND ESTIMATION		
Students calculate fluently, estimate proficiently, and describe and use algorithms in appropriate situations (e.g., approximating solutions to equations.) They understand the basic ideas of iteration and algorithms.		
L2.1 Calculation Using Real and Complex Numbers		
L2.1.1	Explain the meaning and uses of weighted averages (e.g., GNP, consumer price index, grade point average).	Student Edition: 13 #25-#28, 59 #46
L2.1.2	Calculate fluently with numerical expressions involving exponents; use the rules of exponents; evaluate numerical expressions involving rational and negative exponents; transition easily between roots and exponents.	Student Edition: 56-59, 60, 82-85, 86-89, 90-91, 96, 129, 242, 497, 591-592 <i>Check Understanding</i> 86 <i>Mental Math Tip</i> 87 Annotated Teacher’s Edition: AA 84, 88; CE 57, 60, 67, 83, 87, 90, 242

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<p>L2.1.3 Explain the exponential relationship between a number and its base 10 logarithm, and use it to relate rules of logarithms to those of exponents in expressions involving numbers.</p>	<p>Exponential and logarithmic relationships could be introduced to the student when the following examples are covered.</p> <p>Student Edition: 82-85, 86-89 <i>Check Understanding</i> 86 <i>Mental Math Tip</i> 87</p> <p>Annotated Teacher's Edition: 5MW 82, 86; CE 83, 87; TT 86</p>
<p>L2.1.4 Know that the complex number i is one of two solutions to $x^2 = -1$.</p>	<p>This standard can be found in Glencoe's <i>Algebra 2</i> © 2008 on the following pages:</p> <p>Student Edition: 259-266</p>
<p>L2.1.5 Add, subtract, and multiply complex numbers; use conjugates to simplify quotients of complex numbers.</p>	<p>This standard can be found in Glencoe's <i>Algebra 2</i> © 2008 on the following pages:</p> <p>Student Edition: 259-266</p>
<p>L2.1.6 Recognize when exact answers aren't always possible or practical; use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).</p>	<p>Student Edition: 103, 432-435, 456-459, 505-507, 508-509 <i>Check Understanding</i> 505</p> <p>Annotated Teacher's Edition: 5MW 52; AA 84; CE 4, 433, 457, 507; ETL 51, 434; FG 58; TT 4, 456, 462</p>
<p>L2.2 Sequences and Iteration</p>	
<p>L2.2.1 Find the nth term in arithmetic, geometric, or other simple sequences.</p>	<p>Student Edition: 92-93, 99 #17, 215, 243</p> <p>Annotated Teacher's Edition: 5MW 92; CE 93; QA 93</p>
<p>L2.2.2 Compute sums of finite arithmetic and geometric sequences.</p>	<p>Student Edition: 92-93, 243</p> <p>Annotated Teacher's Edition: CE 93; QA 93</p>
<p>L2.2.3 Use iterative processes in such examples as computing compound interest or applying approximation procedures.</p>	<p>Student Edition: 92-93, 243</p> <p>Annotated Teacher's Edition: CE 93; QA 93</p>

STANDARDS	PAGE REFERENCES
STANDARD L3: MEASUREMENT AND PRECISION	
Students apply measurement units and calculations, and understand the concept of error.	
L3.1 Measurement Units, Calculations, and Scales	
L3.1.1 Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.	Student Edition: 136-139 Annotated Teacher's Edition: DE 381; ITL 136; TT 385
L3.1.2 Describe and interpret logarithmic relationships in such contexts as the Richter scale, the pH scale, or decibel measurements (e.g., explain why a small change in the scale can represent a large change in intensity); solve applied problems.	Student Edition: 564
L3.2 Understanding Error	
L3.2.1 Determine what degree of accuracy is reasonable for measurements in a given situation; express accuracy through use of significant digits, error tolerance, or percent of error; describe how errors in measurements are magnified by computation; recognize accumulated error in applied situations.	Student Edition: 508-509, 584 <i>Check Understanding</i> 505 Annotated Teacher's Edition: 5MW 52; CE 4-5, 509; ETL 51, 434; TT 456, 462
L3.2.2 Describe and explain round-off error, rounding, and truncating.	Student Edition: 4-5, 584 Annotated Teacher's Edition: AA 84; CE 4-5; ETL 51, 434; TT 456, 462
L3.2.3 Know the meaning of and interpret statistical significance, margin of error, and confidence level.	Student Edition: 26-27, 33 #2 Annotated Teacher's Edition: CE 27; ETL 51; QA 27

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STANDARD L4: MATHEMATICAL REASONING, LOGIC, AND PROOF	
<p>Students understand mathematical reasoning as being grounded in logic and proof and can distinguish mathematical arguments from other types of arguments. They can interpret arguments made about quantitative situations in the popular media. Students know the language and laws of logic and can apply them in both mathematical and everyday settings. They write proofs using direct and indirect methods and use counterexamples appropriately to show that statements are false.</p>	
L4.1 Mathematical Reasoning	
<p>L4.1.1 Distinguish between inductive and deductive reasoning, identifying and providing examples of each.</p>	<p>Student Edition: 538-541, 542-545, 546-547, 554, 555, 624-625 <i>MathWorks</i> 547</p> <p>Annotated Teacher's Edition: CE 539, 543; ITL 542; QA 540, 544; TT 538, 539, 542, 543</p>
<p>L4.1.2 Differentiate between statistical arguments (statements verified empirically using examples or data) and logical arguments based on the rules of logic.</p>	<p>Student Edition: 519, 532-535, 536-537, 538-541, 542-545, 546-547, 552-554, 555, 624-625 <i>Check Understanding</i> 539 <i>MathWorks</i> 547</p> <p>Annotated Teacher's Edition: CE 543, 546-547; QA 519, 540; TT 538, 539, 542, 543</p>
<p>L4.1.3 Define and explain the roles of axioms (postulates), definitions, theorems, counterexamples, and proofs in the logical structure of mathematics; identify and give examples of each.</p>	<p>Student Edition: 192-195, 196-199, 200-201, 203-205, 206-209, 210-211, 212-215</p> <p>Annotated Teacher's Edition: 5MW 192; AA 208; ETL 202, 209; QA 194; TT 200, 211, 213</p>
L4.2 Language and Laws of Logic	
<p>L4.2.1 Know and use the terms of basic logic (e.g., proposition, negation, truth and falsity, implication, if and only if, contrapositive, and converse).</p>	<p>Student Edition: 519, 524-527, 530-531, 532-535, 536-537, 538-541, 542-545, 546-547, 552-554, 555, 623-625</p> <p>Annotated Teacher's Edition: CE 531, 533, 536-537, 546-547; ITL 532; QA 531, 534, 540, 544; TT 539, 542, 543</p>

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<p>L4.2.2 Use the connectives “NOT,” “AND,” “OR,” and “IF..., THEN,” in mathematical and everyday settings. Know the truth table of each connective and how to logically negate statements involving these connectives.</p>	<p>Student Edition: 530-531, 532-535, 536-537, 538-541, 542-543, 546-547, 552-554, 555, 624-625</p> <p>Annotated Teacher’s Edition: CE 531, 533, 536-537, 539, 543, 547; ITL 532; QA 531, 534, 540; TT 539, 542, 543</p>
<p>L4.2.3 Use the quantifiers “THERE EXISTS” and “ALL” in mathematical and everyday settings and know how to logically negate statements involving them.</p>	<p>While these quantifiers are not specifically used in this text, they could be used with the following examples.</p> <p>Student Edition: 13 #19-#22, 530-531, 532-535, 538-541, 542-545</p>
<p>L4.2.4 Write the converse, inverse, and contrapositive of an “If..., then...” statement; use the fact, in mathematical and everyday settings, that the contrapositive is logically equivalent to the original while the inverse and converse are not.</p>	<p>Student Edition: 530-531, 532-535, 536-537, 542-545, 546-547, 552-554, 555, 624-625</p> <p>Annotated Teacher’s Edition: CE 531, 533, 536-537, 543, 547; ITL 532, 542; QA 531, 534, 544; TT 542, 543</p>
<p>L4.3 Proof</p>	
<p>L4.3.1 Know the basic structure for the proof of an “If..., then...” statement (assuming the hypothesis and ending with the conclusion) and know that proving the contrapositive is equivalent.</p>	<p>Student Edition: 530-531, 532-535, 536-537, 538-541, 542-545, 546-547, 552-554, 555, 624-625</p> <p>Annotated Teacher’s Edition: CE 531, 533, 536-537, 539, 543, 547; ITL 532, 542; QA 531, 534, 540, 544; TT 539, 542, 543</p>
<p>L4.3.2 Construct proofs by contradiction; use counterexamples, when appropriate, to disprove a statement.</p>	<p>Student Edition: 532-535, 536-537, 542-545, 546-547, 553-554, 624-625</p> <p><i>MathWorks</i> 547</p> <p>Annotated Teacher’s Edition: CE 533, 543; TT 542</p>
<p>L4.3.3 Explain the difference between a necessary and a sufficient condition within the statement of a theorem; determine the correct conclusions based on interpreting a theorem in which necessary or sufficient conditions in the theorem or hypothesis are satisfied.</p>	<p>Student Edition: 548-551, 554, 555, 625-626</p> <p>Annotated Teacher’s Edition: ETL 214; QA 550; TT 51, 200, 207, 211, 213, 217</p>

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STRAND 2: ALGEBRA AND FUNCTIONS

In the middle grades, students see the progressive generalization of arithmetic to algebra. They learn symbolic manipulation skills and use them to solve equations. They study simple forms of elementary polynomial functions such as linear, quadratic, and power functions as represented by tables, graphs, symbols, and verbal descriptions.

In high school, students continue to develop their “symbol sense” by examining expressions, equations, and functions, and applying algebraic properties to solve equations. They construct a conceptual framework for analyzing any function and, using this framework, they revisit the functions they have studied before in greater depth. By the end of high school, their catalog of functions will encompass linear, quadratic, polynomial, rational, power, exponential, logarithmic, and trigonometric functions. They will be able to reason about functions and their properties and solve multi-step problems that involve both functions and equation-solving. Students will use deductive reasoning to justify algebraic processes as they solve equations and inequalities, as well as when transforming expressions.

This rich learning experience in Algebra will provide opportunities for students to understand both its structure and its applicability to solving real-world problems. Students will view algebra as a tool for analyzing and describing mathematical relationships, and for modeling problems that come from the workplace, the sciences, technology, engineering, and mathematics.

STANDARD A1: EXPRESSIONS, EQUATIONS, AND INEQUALITIES

Students recognize, construct, interpret, and evaluate expressions. They fluently transform symbolic expressions into equivalent forms. They determine appropriate techniques for solving each type of equation, inequality, or system of equations, apply the techniques correctly to solve, justify the steps in the solutions, and draw conclusions from the solutions. They know and apply common formulas.

A1.1 Construction, Interpretation, and Manipulation of Expressions (linear, quadratic, polynomial, rational, power, exponential, logarithmic, and trigonometric)

<p>A1.1.1 Give a verbal description of an expression that is presented in symbolic form, write an algebraic expression from a verbal description, and evaluate expressions given values of the variables.</p>	<p>Student Edition: 56-59, 60, 62-65, 70-71, 77-79, 81, 82-85, 94-95, 97, 264-267 <i>Reading Math</i> 126 Annotated Teacher’s Edition: AA 264; CE 57, 63, 70, 83, 265; PE 62; QA 64; TT 63, 80, 81</p>
<p>A1.1.2 Know the definitions and properties of exponents and roots, transition fluently between them, and apply them in algebraic expressions.</p>	<p>Student Edition: 82-85, 86-89, 90-91, 94-96, 102-103, 380-383, 384-385, 386-389, 390-393, 394-395, 396-399, 588-592 <i>Check Understanding</i> 86 <i>Mental Math Tip</i> 87 Annotated Teacher’s Edition: ETL 382; ITL 386; PE 83; QA 382; TT 385, 387</p>

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<p>A1.1.3 Factor algebraic expressions using, for example, greatest common factor, grouping, and the special product identities (e.g., differences of squares and cubes).</p>	<p>Student Edition: 401, 402, 404-407, 408-411, 414, 415, 416 #12, 468 #9, 469 #22, 501, 615</p> <p>Annotated Teacher's Edition: 5MW 404; CE 405, 409; DI 408, 411; ETL 409; ITL 404, 408; QA 406, 410; TT 405, 415</p>
<p>A1.1.4 Add, subtract, multiply, and simplify polynomials and rational expressions (e.g., multiply $(x - 1)(1 - x^2 + 3)$; simplify $9x - x/3x + 3$)</p>	<p>Student Edition: 76-79, 80-81, 82-85, 86-89, 90-91, 94-96, 97, 135, 155, 376-379, 380-383, 384-385, 390-393, 394-395, 396-399, 402-403, 412-414, 415</p> <p><i>MathWorks</i> 385 <i>Problem Solving Tip</i> 378</p>
<p>A1.1.5 Divide a polynomial by a monomial.</p>	<p>Student Edition: 72-75, 80-81, 95, 97, 98, 135, 328 #2, 386-389, 394-395, 401, 403, 416 #11, 417 #26, 463, 590, 613</p> <p>Annotated Teacher's Edition: AA 389; CE 73, 387, 394; DI 386</p>
<p>A1.1.6 Transform exponential and logarithmic expressions into equivalent forms using the properties of exponents and logarithms including the inverse relationship between exponents and logarithms.</p>	<p>Student Edition: 82-85, 86-89, 90-91, 416 #2, 591-592</p> <p>Annotated Teacher's Edition: 5MW 380; AA 84; CE 83; ITL 82; QA 84; TT 86, 91</p>
<p>A1.2 Solutions of Equations and Inequalities (linear, quadratic, polynomial, rational, power, exponential, logarithmic, and trigonometric)</p>	
<p>A1.2.1 Write equations and inequalities with one or two variables to represent mathematical or applied situations, and solve.</p>	<p>Student Edition: 58-59, 104-107, 108-111, 113, 114-115, 116-119, 120-121, 126-129, 130-131, 132-135, 140-142, 143, 258-261, 334-337, 342-343</p> <p>Annotated Teacher's Edition: 5MW 154; CE 105, 109, 111, 127, 133, 272</p>
<p>A1.2.2 Associate a given equation with a function whose zeros are the solutions of the equation.</p>	<p>Student Edition: 268-271</p> <p>Annotated Teacher's Edition: ITL 264; QA 106</p>
<p>A1.2.3 Solve (and justify steps in the solutions) linear and quadratic equations and inequalities, including systems of up to three linear equations with three unknowns; apply the quadratic formula appropriately.</p>	<p>Student Edition: 108-111, 112-113, 114-115, 116-119, 120-121, 126-129, 132-135, 140-142, 143, 264-267, 268-271, 287, 289, 338-341, 342-343, 344-347, 348-351, 352-353, 354-357, 362-365</p> <p><i>MathWorks</i> 343</p>

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A1.2.4 Solve absolute value equations and inequalities, (e.g. solve $ x - 3 \leq 6$), and justify steps in the solution.	Annotated Teacher's Edition: ETL 106; QA 106
A1.2.5 Solve polynomial equations and equations involving rational expressions (e.g. solve $-2x(x^2 + 4x + 3) = 0$; solve $x - 1/x + 6 = 3$), and justify steps in the solution.	Student Edition: 108-111, 112-113, 122-125, 130-131, 141, 143, 161, 186 #7, 594 Annotated Teacher's Edition: 5MW 154; CE 109, 112, 123; TT 124
A1.2.6 Solve power equations (e.g., $(x + 1)^3 = 8$) and equations including radical expressions (e.g., $\sqrt{3x - 7} = 7$), justify steps in the solution, and explain how extraneous solutions may arise.	Student Edition: 136-139, 142, 143, 186 #8, 239 #16, 371 #13, 473, 593-594 Annotated Teacher's Edition: CE 137, 457, 472; DI 137; ETL 138; ITL 137; QA 138
A1.2.7 Solve exponential and logarithmic equations (e.g., $3(2^x) = 24$), $2 \ln(x + 1) = 4$), and justify steps in the solution.	Solving exponential and logarithmic equations could be introduced to the student when the following examples are covered. Student Edition: 82-85, 86-89 <i>Check Understanding</i> 86 <i>Mental Math Tip</i> 87 Annotated Teacher's Edition: 5MW 82, 86; CE 83, 87; TT 86
A1.2.8 Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable, and justify steps in the solution.	Student Edition: 108-111, 116-119, 254-257, 258-261, 262-263, 336-337, 342-343, 469 #13 Annotated Teacher's Edition: 5MW 254; CE 109, 117, 255, 259, 262; TT 342
A1.2.9 Know common formulas (e.g., slope, distance between two points, quadratic formula, compound interest, distance = velocity • time), and apply appropriately in contextual situations.	Student Edition: 74 #54, 75 #63, 105-107, 108-111, 112-113, 116-119, 131, 136-139, 140, 142, 222-225, 230, 244-247, 248-251, 252-253, 263, 286, 332, 603 <i>MathWorks</i> 113
A1.2.10 Use special values of the inverse trigonometric functions to solve trigonometric equations over specific intervals (e.g., $2\sin x - 1 = 0$ for $0 \leq x \leq 2\pi$).	This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 614-617, 618-621, 622 #14-#22, 633 #47, 637 #47, 639 #11

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STANDARD A2: FUNCTIONS	
Students understand functions, their representations, and their attributes. They perform transformations, combine and compose functions, and find inverses. Students classify functions and know the characteristics of each family. They work with functions with real coefficients fluently.	
A2.1 Definitions, Representations, and Attributes of Functions	
A2.1.1 Recognize whether a relationship (given in contextual, symbolic, tabular, or graphical form) is a function; and identify its domain and range.	Student Edition: 264-267, 268-271, 272-273, 274-275, 276-279, 280-281, 286-288, 289, 535, 604-605 Annotated Teacher's Edition: CE 269, 272, 275; ITL 264; QA 266; TT 265
A2.1.2 Read, interpret, and use function notation, and evaluate a function at a value in its domain.	Student Edition: 264-267, 272-273, 274-275, 287-288, 289, 604-605 Annotated Teacher's Edition: CE 265; ITL 264; QA 266; TT 265
A2.1.3 Represent functions in symbols, graphs, tables, diagrams, or words, and translate among representations.	Student Edition: 99 #18, 114-115, 120-121, 254-257, 262-263, 264-267, 268-271, 272-273, 274-275, 604-605 Annotated Teacher's Edition: CE 115, 120, 265, 269, 275; QA 275
A2.1.4 Recognize that functions may be defined by different expressions over different intervals of their domains; such functions are piecewise-defined (e.g., absolute value and greatest integer functions).	Student Edition: 264-267, 274-275 Annotated Teacher's Edition: CE 265; ITL 264
A2.1.5 Recognize that functions may be defined recursively, and compute values of and graph simple recursively defined functions (e.g., $f(0) = 5$, and $f(n) = f(n-1) + 2$).	Student Edition: 264-267, 274-275
A2.1.6 Identify the zeros of a function and the intervals where the values of a function are positive or negative, and describe the behavior of a function, as x approaches positive or negative infinity, given the symbolic and graphical representations.	Student Edition: 268-271, 272, 273 <i>MathWorks</i> 273 Annotated Teacher's Edition: CE 269; QA 270, 272

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<p>A2.1.7 Identify and interpret the key features of a function from its graph or its formula(e), (e.g. slope, intercept(s), asymptote(s), maximum and minimum value(s), symmetry, average rate of change over an interval, and periodicity).</p>	<p>Student Edition: 248-251, 252-253, 254-257, 262-263, 268-271, 272-273, 274-275, 276-279, 334-337, 603-605 <i>Check Understanding</i> 277 <i>MathWorks</i> 253, 273 <i>Problem Solving Tip</i> 255</p> <p>Annotated Teacher's Edition: ETL 255, 276; ITL 268, 276; TT 248, 254, 334</p>
<p>A2.2 Operations and Transformations</p>	
<p>A2.2.1 Combine functions by addition, subtraction, multiplication, and division.</p>	<p>A concept similar to combining functions is used in the following examples where polynomials are combined by using operations.</p> <p>Student Edition: 376-379, 380-383, 384-385, 386-389, 390-393, 394-395, 396-399,</p> <p>Annotated Teacher's Edition: CE 377, 381, 387, 391, 394, 397</p>
<p>A2.2.2 Apply given transformations (e.g., vertical or horizontal shifts, stretching or shrinking, or reflections about the x- and y-axes) to basic functions, and represent symbolically.</p>	<p>Student Edition: 268-271, 275, 334</p> <p>Annotated Teacher's Edition: CE 265; ETL 255, 297; ITL 254, 268; QA 270</p>
<p>A2.2.3 Recognize whether a function (given in tabular or graphical form) has an inverse and recognize simple inverse pairs (e.g., $f(x) = x^3$ and $g(x) = x^{1/3}$).</p>	<p>Annotated Teacher's Edition: CE 269; ITL 504</p>
<p>A2.3 Families of Functions (linear, quadratic, polynomial, rational, power, exponential, logarithmic, and trigonometric)</p>	
<p>A2.3.1 Identify a function as a member of a family of functions based on its symbolic, or graphical representation; recognize that different families of functions have different asymptotic behavior at infinity, and describe these behaviors.</p>	<p>Student Edition: 264-267</p> <p>Annotated Teacher's Edition: AA 264; CE 265</p>
<p>A2.3.2 Describe the tabular pattern associated with functions having constant rate of change (linear); or variable rates of change.</p>	<p>Student Edition: 99 #18-#19, 114-115, 120-121, 248-251, 264-267, 274-275, 276-279, 280-281, 288, 289</p> <p>Annotated Teacher's Edition: CE 115, 120, 265, 275, 280; QA 275</p>

STANDARDS	PAGE REFERENCES
<p>A2.3.3 Write the general symbolic forms that characterize each family of functions. (e.g., $f(x) = A_0a^x$; $f(x) = A\sin Bx$)</p>	<p>Student Edition: 254-257, 268-271, 287-288</p> <p>Annotated Teacher's Edition: CE 255</p>
<p>A2.4 Lines and Linear Functions</p>	
<p>A2.4.1 Write the symbolic forms of linear functions (standard [i.e., $Ax + By = C$, where $B \neq 0$], point-slope, and slope-intercept) given appropriate information, and convert between forms.</p>	<p>Student Edition: 114-115, 120-121, 254-257, 258-261, 262-263, 333, 334-337, 342-343</p> <p>Annotated Teacher's Edition: 5MW 254; CE 115, 121, 255, 259, 262; QA 256; TT 335</p>
<p>A2.4.2 Graph lines (including those of the form $x = h$ and $y = k$) given appropriate information.</p>	<p>Student Edition: 248-251, 252-253, 254-257, 258-261, 262-263, 264-267, 272, 333, 334-335, 338-341, 342-343, 603-605</p> <p><i>MathWorks</i> 343</p> <p><i>Technology Note</i> 335</p> <p>Annotated Teacher's Edition: CE 249, 252, 255, 259, 262, 265; ETL 255; ITL 255; TT 254</p>
<p>A2.4.3 Relate the coefficients in a linear function to the slope and x- and y-intercepts of its graph.</p>	<p>Student Edition: 254-257, 258-261, 262-263, 264-267, 273, 333, 334-337, 342-343, 603-605</p> <p>Annotated Teacher's Edition: CE 255, 259, 262, 342; ETL 336; QA 256, 340; TT 254</p>
<p>A2.4.4 Find an equation of the line parallel or perpendicular to given line, through a given point; understand and use the facts that non-vertical parallel lines have equal slopes, and that non-vertical perpendicular lines have slopes that multiply to give -1.</p>	<p>Student Edition: 334-337, 342-343, 399 #60, 468 #7, 609</p> <p>Annotated Teacher's Edition: CE 335; ETL 255, 336; ITL 254, 334; QA 336; TT 334, 335</p>
<p>A2.5 Exponential and Logarithmic Functions</p>	
<p>A2.5.1 Write the symbolic form and sketch the graph of an exponential function given appropriate information. (e.g., given an initial value of 4 and a rate of growth of 1.5, write $f(x) = 4(1.5)^x$).</p>	<p>This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages:</p> <p>Student Edition: 594-597, 598 #16-#28, 599 #57, 606 #37-#40, 607 #26</p>

STANDARDS	PAGE REFERENCES
<p>A2.5.2 Interpret the symbolic forms and recognize the graphs of exponential and logarithmic functions (e.g., $f(x) = 10^x$, $f(x) = \log x$, $f(x) = e^x$, $f(x) = \ln x$); recognize the logarithmic function as the inverse of the exponential function.</p>	<p>This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 600-603, 606 #41-#52, 607 #27-#28, 609 #22</p>
<p>A2.5.3 Apply properties of exponential and logarithmic functions (e.g., $a^{x+y} = a^x a^y$; $\log(ab) = \log a + \log b$).</p>	<p>Student Edition: 82-85, 86-89, 380-383, 386-389, 416 #2, 591-592 Annotated Teacher's Edition: 5MW 380; CE 83, 381; ETL 375; ITL 82; QA 84, 375, 382</p>
<p>A2.5.4 Understand and use the fact that the base of an exponential function determines whether the function increases or decreases and understand how the base affects the rate of growth or decay.</p>	<p>This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 594-597, 598 #16-#28, 599 #57, 606 #37-#40, 607 #26</p>
<p>A2.5.5 Relate exponential and logarithmic functions to real phenomena, including half-life and doubling time.</p>	<p>This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 594-597, 598 #16-#28, 599 #57, 606 #37-#40, 607 #26</p>
<p>A2.6 Quadratic Functions</p>	
<p>A2.6.1 Write the symbolic form and sketch the graph of a quadratic function given appropriate information (e.g., vertex, intercepts, etc.).</p>	<p>Student Edition: 268-271, 272-273, 287-288, 289, 347, 605 <i>MathWorks</i> 273 Annotated Teacher's Edition: CE 269, 272, 280; ITL 268; QA 270</p>
<p>A2.6.2 Identify the elements of a parabola (vertex, axis of symmetry, direction of opening) given its symbolic form or its graph, and relate these elements to the coefficient(s) of the symbolic form of the function.</p>	<p>Student Edition: 268-271, 272-273, 605 Annotated Teacher's Edition: CE 269; ITL 268; QA 270</p>
<p>A2.6.3 Convert quadratic functions from standard to vertex form by completing the square.</p>	<p>Completing the square can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 538 #17-#28, 539 #39-#47, 553 #20-#22</p>

STANDARDS	PAGE REFERENCES
A2.6.4 Relate the number of real solutions of a quadratic equation to the graph of the associated quadratic function.	Student Edition: 268-271
A2.6.5 Express quadratic functions in vertex form to identify their maxima or minima, and in factored form to identify their zeros.	This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 522 #10-#13, 523 #19-#20, 525 ex 1, 526 ex 3, 527 #15-#17, 528 #27-#29, 529 #36-#38, 539 #33-#38, 542 ex 3, 549 #37, 552 #14-#16
A2.7 Power Functions (including roots, cubics, quartics, etc.)	
A2.7.1 Write the symbolic form and sketch the graph of power functions.	This standard can be found in Glencoe's <i>Algebra 2</i> © 2008 on the following pages: Student Edition: 331-338, 339-345, 346-347
A2.7.2 Express direct and inverse relationships as functions (e.g., $y = kx^n$ and $y = kx^{-n}$, $n > 0$) and recognize their characteristics (e.g., in $y = x^3$, note that doubling x results in multiplying y by a factor of 8).	Student Edition: 276-279, 280, 282-285, 288, 289, 606 Annotated Teacher's Edition: AA 279; CE 277, 283; ETL 276, 277, 284, 285; QA 278, 284; TT 282
A2.7.3 Analyze the graphs of power functions, noting reflectional or rotational symmetry.	Student Edition: 264-267, 268-271, 272, 273, 287 #53 <i>MathWorks</i> 273 Annotated Teacher's Edition: CE 272; ETL 297
A2.8 Polynomial Functions	
A2.8.1 Write the symbolic form and sketch the graph of simple polynomial functions.	Student Edition: 254-257, 264-267, 268-271, 272, 333 Annotated Teacher's Edition: CE 255, 265, 269; ITL 264, 268; QA 256, 270; TT 254
A2.8.2 Understand the effects of degree, leading coefficient, and number of real zeros on the graphs of polynomial functions of degree greater than 2.	This standard can be found in Glencoe's <i>Algebra 2</i> © 2008 on the following pages: Student Edition: 356-361, 362-368, 369-373

STANDARDS	PAGE REFERENCES
<p>A2.8.3 Determine the maximum possible number of zeros of a polynomial function, and understand the relationship between the x-intercepts of the graph and the factored form of the function.</p>	<p>This standard can be found in Glencoe’s <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 520-523, 530-533, 538 #5-#10, 539 #7-#10, 553 #20-#22</p>
<p>A2.9 Rational Functions</p>	
<p>A2.9.1 Write the symbolic form and sketch the graph of simple rational functions.</p>	<p>Student Edition: 282-285</p>
<p>A2.9.2 Analyze graphs of simple rational functions (e.g., $f(x) = 2x + 1/x - 1$; $g(x) = x/x^2 - 4$) and understand the relationship between the zeros of the numerator and denominator and the function’s intercepts, asymptotes, and domain.</p>	<p>This standard can be found in Glencoe’s <i>Algebra 2</i> © 2008 on the following pages: Student Edition: 457-463, 464</p>
<p>A2.10 Trigonometric Functions</p>	
<p>A2.10.1 Use the unit circle to define sine and cosine; approximate values of sine and cosine (e.g., $\sin 3$, or $\cos 0.5$); use sine and cosine to define the remaining trigonometric functions; explain why the trigonometric functions are periodic.</p>	<p>Student Edition: 489-491, 492, 511, 621 Annotated Teacher’s Edition: ETL 488; PE 491</p>
<p>A2.10.2 Use the relationship between degree and radian measures to solve problems.</p>	<p>This standard can be found in Glencoe’s <i>Algebra 2</i> © 2008 on the following pages: Student Edition: 768-774</p>
<p>A2.10.3 Use the unit circle to determine the exact values of sine and cosine, for integer multiples of $\pi/6$ and $\pi/4$.</p>	<p>This standard can be found in Glencoe’s <i>Algebra 2</i> © 2008 on the following pages: Student Edition: 769, 799-805</p>
<p>A2.10.4 Graph the sine and cosine functions; analyze graphs by noting domain, range, period, amplitude, and location of maxima and minima.</p>	<p>This standard can be found in Glencoe’s <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 624-627, 628-631, 632 #22-#40, 638 #30-#33, 639 #18-#20</p>
<p>A2.10.5 Graph transformations of basic trigonometric functions (involving changes in period, amplitude, and midline) and understand the relationship between constants in the formula and the transformed graph.</p>	<p>This standard can be found in Glencoe’s <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 628-631, 632 #22-#40, 638 #30-#33, 639 #18-#20, 641 #23-#24</p>

STANDARDS	PAGE REFERENCES
STANDARD A3: MATHEMATICAL MODELING	
Students construct or select a function to model a real-world situation in order to solve applied problems. They draw on their knowledge of families of functions to do so.	
A3.1 Models of Real-world Situations Using Families of Functions.	
<i>Example: An initial population of 300 people grows at 2% per year. What will the population be in 10 years?</i>	
A3.1.1 Identify the family of function best suited for modeling a given real-world situation (e.g., quadratic functions for motion of an object under the force of gravity; exponential functions for compound interest; trigonometric functions for periodic phenomena. In the example above, recognize that the appropriate general function is exponential ($P = P_0a^t$)	Student Edition: 20-23, 114-115, 120-121, 131, 141, 143 <i>MathWorks</i> 131 Annotated Teacher's Edition: CE 21, 115, 120
A3.1.2 Adapt the general symbolic form of a function to one that fits the specifications of a given situation by using the information to replace arbitrary constants with numbers. <i>In the example above, substitute the given values $P_0 = 300$ and $a = 1.02$ to obtain $P = 300(1.02)^t$.</i>	Student Edition: 114-115, 120-121, 131, 141, 143 <i>MathWorks</i> 131 Annotated Teacher's Edition: CE 115, 120
A3.1.3 Using the adapted general symbolic form, draw reasonable conclusions about the situation being modeled. <i>In the example above, the exact solution is 365.698, but for this problem an appropriate approximation is 365.</i>	Student Edition: 114-115, 120-121, 131, 141, 143 <i>MathWorks</i> 131 Annotated Teacher's Edition: CE 115, 120
STRAND 3: GEOMETRY AND TRIGONOMETRY	
In Grades K–5, students study figures such as triangles, rectangles, circles, rectangular solids, cylinders, and spheres. They examine similarities and differences between geometric shapes. They learn to quantify geometric figures by measuring and calculating lengths, angles, areas and volumes. In Grades 6-8, students broaden their understanding of area and volume and develop the basic concepts of congruence, similarity, symmetry and the Pythagorean Theorem. They apply these ideas to solve geometric problems, including ones related to the real world.	

STANDARDS

PAGE REFERENCES

In Grades 9–12, students see geometry developed as a coherent, structured subject. They use the geometric skills and ideas introduced earlier, such as congruence and similarity, to solve a wide variety of problems. There is an emphasis on the importance of clear language (e.g. for postulates, definitions and theorems) and on learning to construct geometric proofs. In this process, students build geometric intuition and facility at deductive reasoning. They use elements of logic and reasoning as described in the Quantitative Literacy and Logic strand, including both direct and indirect proof presented in narrative form. They begin to use new techniques, including transformations and trigonometry. They apply these ideas to solve complex problems about two- and three-dimensional figures, again including ones related to the real world. Their spatial visualization skills will be developed through the study of the relationships between two- and three-dimensional shapes.

STANDARD G1: FIGURES AND THEIR PROPERTIES

Students represent basic geometric figures, polygons, and conic sections and apply their definitions and properties in solving problems and justifying arguments, including constructions and representations in the coordinate plane. Students represent three-dimensional figures, understand the concepts of volume and surface area, and use them to solve problems. They know and apply properties of common three-dimensional figures.

G1.1 Lines and Angles; Basic Euclidean and Coordinate Geometry

<p>G1.1.1 Solve multi-step problems and construct proofs involving vertical angles, linear pairs of angles supplementary angles, complementary angles, and right angles.</p>	<p>Student Edition: 196-199, 200-201, 231, 234-236, 237, 239, 257, 285, 303, 337, 599-600</p> <p>Annotated Teacher’s Edition: 5MW 196, 202; AA 197; CE 197, 200; QA 198, 204; TT 196, 201, 475</p>
<p>G1.1.2 Solve multi-step problems and construct proofs involving corresponding angles, alternate interior angles, alternate exterior angles, and same-side (consecutive) interior angles.</p>	<p>Student Edition: 202-205, 210-211, 231, 234-236, 237, 239, 351, 370 #5, 425, 514 #2, 599-600</p> <p>Annotated Teacher’s Edition: CE 203, 210; DI 203, 204; ETL 202; QA 204</p>
<p>G1.1.3 Perform and justify constructions, including midpoint of a line segment and bisector of an angle, using straightedge and compass.</p>	<p>Student Edition: 196-199, 202-205, 206-209, 212-215, 222-225</p> <p>Annotated Teacher’s Edition: ETL 219, 223; ITL 202, 206, 222</p>
<p>G1.1.4 Given a line and a point, construct a line through the point that is parallel to the original line using straightedge and compass; given a line and a point, construct a line through the point that is perpendicular to the original line; justify the steps of the constructions.</p>	<p>Student Edition: 202-205</p> <p>Annotated Teacher’s Edition: AA 509; ETL 202, 216; ITL 202</p>

STANDARDS	PAGE REFERENCES
<p>G1.1.5 Given a line segment in terms of its endpoints in the coordinate plane, determine its length and midpoint.</p>	<p>Student Edition: 244-247, 252-253, 263, 273, 281, 286, 289, 295, 309, 416 #6, 523, 603 <i>MathWorks</i> 253</p> <p>Annotated Teacher's Edition: AA 246; CE 245, 252, 294, 322; ETL 244, 245</p>
<p>G1.1.6 Recognize Euclidean Geometry as an axiom system; know the key axioms and understand the meaning of and distinguish between undefined terms (e.g., point, line, plane), axioms, definitions, and theorems.</p>	<p>Student Edition: 192-195, 200-201, 202-205, 206-209, 210-211, 212-215, 231, 234-236, 237, 599 <i>Check Understanding</i> 193</p> <p>Annotated Teacher's Edition: 5MW 192; CE 193, 200, 210, 213; DI 203, 204; ETL 202, 214; TT 200, 207, 211</p>
<p>G1.2 Triangles and Their Properties</p>	
<p>G1.2.1 Prove that the angle sum of a triangle is 180° and that an exterior angle of a triangle is the sum of the two remote interior angles.</p>	<p>Student Edition: 206-209, 210-211, 231, 234-236, 237</p> <p>Annotated Teacher's Edition: AA 208; CE 207, 210; ITL 206</p>
<p>G1.2.2 Construct and justify arguments and solve multi-step problems involving angle measure, side length, perimeter, and area of all types of triangles.</p>	<p>Student Edition: 191, 206-209, 210-211, 212-215, 231, 234-236, 237, 238-239, 378, 382-383, 385, 395, 420-421, 507, 599-601</p> <p>Annotated Teacher's Edition: AA 208; CE 148, 207, 210, 387; QA 208; TT 420</p>
<p>G1.2.3 Know a proof of the Pythagorean Theorem and use the Pythagorean Theorem and its converse to solve multi-step problems.</p>	<p>Student Edition: 455 #24, 484-487, 492-493, 511, 513, 621</p> <p>Annotated Teacher's Edition: AA 246; CE 485, 492; DI 484; ETL 485, 487; ITL 484; TT 453, 493</p>
<p>G1.2.4 Prove and use the relationships among the side lengths and the angles of 30°- 60°- 90° triangles and 45°- 45°- 90° triangles.</p>	<p>Student Edition: 504-507, 511-512, 513, 515 #20, 623 <i>Problem Solving Tip</i> 504</p> <p>Annotated Teacher's Edition: 5MW 508; CE 472, 505; DI 504, 505; ITL 504; QA 476, 506</p>

STANDARDS	PAGE REFERENCES
<p>G1.2.5 Solve multi-step problems and construct proofs about the properties of medians, altitudes, and perpendicular bisectors to the sides of a triangle, and the angle bisectors of a triangle; using a straightedge and compass, construct these lines.</p>	<p>This standard can be found in Glencoe’s <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 164-167, 168 #11-#19, 169 #8-#10, 177 #25, 193 #24-#26</p>
<p>G1.3 Triangles and Trigonometry</p>	
<p>G1.3.1 Define the sine, cosine, and tangent of acute angles in a right triangle as ratios of sides; solve problems about angles, side lengths, or areas using trigonometric ratios in right triangles.</p>	<p>Student Edition: 488-491, 492-493, 494-497, 498-501, 502-503, 511-512, 513, 545, 621-622 <i>MathWorks</i> 503 Annotated Teacher’s Edition: CE 489, 493, 495, 499, 502; QA 490, 496, 500; TT 489, 490, 494, 499, 502</p>
<p>G1.3.2 Know and use the Law of Sines and the Law of Cosines and use them to solve problems; find the area of a triangle with sides a and b and included angle θ using the formula $\text{Area} = (1/2) a b \sin \theta$.</p>	<p>This standard can be found in Glencoe’s <i>Algebra 2</i> © 2008 on the following pages: Student Edition: 785-792, 793-798</p>
<p>G1.3.3 Determine the exact values of sine, cosine, and tangent for 0°, 30°, 45°, 60°, and their integer multiples, and apply in various contexts.</p>	<p>Student Edition: 507 #27-#28, #29-#31 Annotated Teacher’s Edition: 5MW 508</p>
<p>G1.4 Quadrilaterals and Their Properties</p>	
<p>G1.4.1 Solve multi-step problems and construct proofs involving angle measure, side length, diagonal length, perimeter, and area of squares, rectangles, parallelograms, kites, and trapezoids.</p>	<p>Student Edition: 152-153, 156-157, 185 #6, 214 #19, 216-219, 220-221, 231, 234-236, 237, 239, 379 #47, 387-389, 393, 395, 398-399, 403, 407, 411, 413, 420-421 Annotated Teacher’s Edition: CE 405</p>
<p>G1.4.2 Solve multi-step problems and construct proofs involving quadrilaterals (e.g., prove that the diagonals of a rhombus are perpendicular) using Euclidean methods or coordinate geometry.</p>	<p>Student Edition: 216-219, 220-221, 231, 234-236, 237, 239, 271, 601, 631 #9 Annotated Teacher’s Edition: ETL 219; TT 217, 220, 221</p>

STANDARDS	PAGE REFERENCES
G1.4.3 Describe and justify hierarchical relationships among quadrilaterals, (e.g. every rectangle is a parallelogram).	Student Edition: 190-191, 216-219, 231, 234-236, 237 Annotated Teacher's Edition: CE 190, 217; DI 191; ITL 216; QA 191, 218; TT 217
G1.4.4 Prove theorems about the interior and exterior angle sums of a quadrilateral.	Student Edition: 216-219, 220-221 Annotated Teacher's Edition: CE 217, 220; TT 220
G1.5 Other Polygons and Their Properties	
G1.5.1 Know and use subdivision or circumscription methods to find areas of polygons (e.g., regular octagon, non-regular pentagon).	Student Edition: 152-153, 156-157, 167, 185 #6 Annotated Teacher's Edition: AA 153; CE 405
G1.5.2 Know, justify, and use formulas for the perimeter and area of a regular n -gon and formulas to find interior and exterior angles of a regular n -gon and their sums.	Student Edition: 135 #47, 222-225, 230, 231, 234-236, 237, 602 Annotated Teacher's Edition: CE 223; ETL 223; ITL 222; QA 224; TT 230
G1.6 Circles and Their Properties	
G1.6.1 Solve multi-step problems involving circumference and area of circles.	Student Edition: 152-153, 156-157, 167, 226, 232-233, 236, 237, 602 Annotated Teacher's Edition: CE 148, 151, 420; QA 228
G1.6.2 Solve problems and justify arguments about chords (e.g., if a line through the center of a circle is perpendicular to a chord, it bisects the chord) and lines tangent to circles (e.g., a line tangent to a circle is perpendicular to the radius drawn to the point of tangency).	Student Edition: 226-229, 230, 231, 236, 237, 239, 281, 602 Annotated Teacher's Edition: CE 227; ETL 228; QA 228
G1.6.3 Solve problems and justify arguments about central angles, inscribed angles and triangles in circles.	Student Edition: 226-229, 230, 231, 232-233, 236, 237, 239, 247 #41, 285, 371 #15, 417, 469 #16 Annotated Teacher's Edition: CE 227; QA 228

STANDARDS	PAGE REFERENCES
<p>G1.6.4 Know and use properties of arcs and sectors, and find lengths of arcs and areas of sectors.</p>	<p>Student Edition: 118 #11, 226-229, 230, 231, 232-233, 236, 237, 239, 285, 417, 459, 602</p> <p>Annotated Teacher's Edition: CE 227; ETL 226</p>
<p>G1.7 Conic Sections and Their Properties</p>	
<p>G1.7.1 Find an equation of a circle given its center and radius; given the equation of a circle, find its center and radius.</p>	<p>This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages:</p> <p>Student Edition: 562-565, 570 #1-#16, 579 #1-#4, 599 #29-#34, 604 #11-#16, 607 #1-#3</p>
<p>G1.7.2 Identify and distinguish among geometric representations of parabolas, circles, ellipses, and hyperbolas; describe their symmetries, and explain how they are related to cones.</p>	<p>This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages:</p> <p>Student Edition: 566-569, 570 #17-#37, 572-573, 574-577, 578 #1-#19, 579 #20, 599 #39-#44, 604 #17-#19, 605 #23-#24, 607 #10-#12</p>
<p>G1.7.3 Graph ellipses and hyperbolas with axes parallel to the x- and y-axes, given equations.</p>	<p>This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages:</p> <p>Student Edition: 572-573, 574-577, 578 #1-#19, 579 #11-#14, 599 #39-#44, 605 #25-#26, 607 #13-#14</p>
<p>G1.8 Three- Dimensional Figures</p>	
<p>G1.8.1 Solve multi-step problems involving surface area and volume of pyramids, prisms, cones, cylinders, hemispheres, and spheres.</p>	<p>Student Edition: 404, 406 #38, 420-421, 426-429, 430-431, 432-435, 443-445, 446, 449, 451, 452-455, 456-459, 460-461, 462-463, 464-466, 467, 501, 507, 617, 619</p> <p>Annotated Teacher's Edition: FG 435</p>
<p>G1.8.2 Identify symmetries of pyramids, prisms, cones, cylinders, hemispheres, and spheres.</p>	<p>Student Edition: 422-425, 452-455, 456-459</p> <p>Annotated Teacher's Edition: ITL 422; TT 422</p>

STANDARDS		PAGE REFERENCES
STANDARD G2: RELATIONSHIPS BETWEEN FIGURES		
Students use and justify relationships between lines, angles, area and volume formulas, and 2- and 3-dimensional representations. They solve problems and provide proofs about congruence and similarity.		
G2.1 Relationships Between Area and Volume Formulas		
G2.1.1	Know and demonstrate the relationships between the area formula of a triangle, the area formula of a parallelogram, and the area formula of a trapezoid.	Student Edition: 99 #14 Annotated Teacher's Edition: CE 405
G2.1.2	Know and demonstrate the relationships between the area formulas of various quadrilaterals (e.g., explain how to find the area of a trapezoid based on the areas of parallelograms and triangles).	Student Edition: 152-153, 156-157, 167, 185 #6 Annotated Teacher's Edition: CE 405
G2.1.3	Know and use the relationship between the volumes of pyramids and prisms (of equal base and height) and cones and cylinders (of equal base and height).	Student Edition: 140 #15-#16, 452-455, 456-459 Annotated Teacher's Edition: TT 422
G2.2 Relationships Between Two-dimensional and Three-dimensional Representations		
G2.2.1	Identify or sketch a possible 3-dimensional figure, given 2-dimensional views (e.g., nets, multiple views); create a 2-dimensional representation of a 3-dimensional figure.	Student Edition: 422-425, 426-429, 430-431, 432-435, 436-439, 440-441, 442-445, 446-449, 450-451 <i>MathWorks</i> 431, 451 <i>Problem Solving Tip</i> 427 Annotated Teacher's Edition: AA 426; CE 423, 427, 437, 440-441, 443, 450, 453; DI 432; QA 424, 428
G2.2.2	Identify or sketch cross-sections of 3-dimensional figures; identify or sketch solids formed by revolving 2-dimensional figures around lines.	Student Edition: 422-425, 426-429, 430-431, 432-435, 436-439, 440-441, 442-445, 446-449, 450-451 <i>MathWorks</i> 431, 451 <i>Problem Solving Tip</i> 427 Annotated Teacher's Edition: AA 426; CE 423, 427, 428, 437, 440-441, 443, 450; DI 432; ETL 443

STANDARDS	PAGE REFERENCES
G2.3 Congruence and Similarity	
G2.3.1 Prove that triangles are congruent using the SSS, SAS, ASA, and AAS criteria, and for right triangles, the hypotenuse-leg criterion.	Student Edition: 212-215, 220-221, 231, 234-236, 237, 238 #10, 239 #20, 309, 477, 535, 601 Annotated Teacher's Edition: CE 213, 220; DI 212; ETL 214; ITL 212; QA 214; TT 213, 235
G2.3.2 Use theorems about congruent triangles to prove additional theorems and solve problems, with and without use of coordinates.	Student Edition: 212-215, 216-219, 220-221 Annotated Teacher's Edition: TT 220, 221
G2.3.3 Prove that triangles are similar by using SSS, SAS, and AA conditions for similarity.	Annotated Teacher's Edition: AA 474; QA 476; TT 475, 483, 492
G2.3.4 Use theorems about similar triangles to solve problems with and without use of coordinates.	Student Edition: 474-477, 478-481, 482-483, 488, 493, 503, 510, 513, 620, 631 #11 <i>Check Understanding</i> 475 <i>MathWorks</i> 483 Annotated Teacher's Edition: CE 475, 479, 482; TT 475, 478, 482, 483, 492, 511
G2.3.5 Know and apply the theorem stating that the effect of a scale factor of k relating one two dimensional figure to another or one three dimensional figure to another, on the length, area, and volume of the figures is to multiply each by k , k^2 , and k^3 , respectively.	Student Edition: 644 #6 Annotated Teacher's Edition: TT 452

STANDARDS	PAGE REFERENCES
STANDARD G3: TRANSFORMATIONS OF FIGURES IN THE PLANE	
Students will solve problems about distance-preserving transformations and shape-preserving transformations. The transformations will be described synthetically and, in simple cases, by analytic expressions in coordinates.	
G3.1 Distance-preserving Transformations: Isometries	
G3.1.1 Define reflection, rotation, translation, and glide reflection and find the image of a figure under a given isometry.	Student Edition: 296-299, 300-303, 304-305, 306-309, 310-313, 314-315, 320-321, 322-323, 324-326, 327, 357, 359, 607-608 <i>MathWorks</i> 305, 323 <i>Reading Math</i> 297 Annotated Teacher's Edition: CE 297, 301; QA 298, 302, 308, 312
G3.1.2 Given two figures that are images of each other under an isometry, find the isometry and describe it completely.	Student Edition: 296-299, 300-303, 304-305, 306-309, 310-313, 314-315, 322-323, 324-326, 327, 416 #7, 607-608 <i>Check Understanding</i> 300, 301 <i>MathWorks</i> 305 Annotated Teacher's Edition: CE 297, 301, 304, 307, 311; ETL 297, 307, 312
G3.1.3 Find the image of a figure under the composition of two or more isometries, and determine whether the resulting figure is a reflection, rotation, translation, or glide reflection image of the original figure.	Student Edition: 299 #24, 323 <i>MathWorks</i> 323 Annotated Teacher's Edition: ETL 301, 307
G3.2 Shape-preserving Transformations: Dilations and Isometries	
G3.2.1 Know the definition of dilation, and find the image of a figure under a given dilation.	Student Edition: 316-319, 326, 327, 609 Annotated Teacher's Edition: CE 317; DI 316; ITL 316; QA 318
G3.2.2 Given two figures that are images of each other under some dilation, identify the center and magnitude of the dilation.	Student Edition: 316-319, 326, 327, 371 #18, 609 Annotated Teacher's Edition: CE 317

STRAND 4: STATISTICS AND PROBABILITY

In Kindergarten through Grade 8, students develop the ability to read, analyze, and construct a repertoire of statistical graphs. Students also examine the fundamentals of experimental and theoretical probability in informal ways. The Basic Counting Principle and tree diagrams serve as tools to solve simple counting problems in these grades.

During high school, students build on that foundation. They develop the data interpretation and decision-making skills that will serve them in their further study of mathematics as well as in their coursework in the physical, biological, and social sciences. Students learn important skills related to the collection, display, and interpretation of both univariate and bivariate data. They understand basic sampling methods and apply principles of effective data analysis and data presentation. These skills are also highly valuable outside of school, both in the workplace and in day-to-day life.

In probability, students utilize probability models to calculate probabilities and make decisions. The normal distribution and its properties are studied. Students then use their understanding of probability to make decisions, solve problems, and determine whether or not statements about probabilities of events are reasonable. Students use technology when appropriate, including spreadsheets. This strong background in statistics and probability will enable students to be savvy decision-makers and smart information-consumers and producers who have a full range of tools in order to make wise choices.

STANDARD S1: UNIVARIATE DATA – EXAMINING DISTRIBUTIONS

Students plot and analyze univariate data by considering the shape of distributions and analyzing outliers; they find and interpret commonly-used measures of center and variation; and they explain and use properties of the normal distribution.

S1.1 Producing and Interpreting Plots

<p>S1.1.1 Construct and interpret dot plots, histograms, relative frequency histograms, bar graphs, basic control charts, and box plots with appropriate labels and scales; determine which kinds of plots are appropriate for different types of data; compare data sets and interpret differences based on graphs and summary statistics.</p>	<p>Student Edition: 3, 4-5, 16-19, 20-23, 24-25, 26-27, 28-31, 41 #27-#28, 42-44, 45, 46-47, 65, 585-588 <i>MathWorks</i> 33 <i>Technology Note</i> 29 Annotated Teacher's Edition: CE 5, 17, 24, 29; QA 5, 18</p>
<p>S1.1.2 Given a distribution of a variable in a data set, describe its shape, including symmetry or skewness, and state how the shape is related to measures of center (mean and median) and measures of variation (range and standard deviation) with particular attention to the effects of outliers on these measures.</p>	<p>Student Edition: 16-19, 20-23, 24-25, 28-31, 42-44, 45, 46-47, 65, 119, 132, 585-588 Annotated Teacher's Edition: CE 17, 21, 29; ETL 132; ITL 28, 132; QA 18, 36</p>

STANDARDS	PAGE REFERENCES
S1.2 Measures of Center and Variation	
<p>S1.2.1 Calculate and interpret measures of center including: mean, median, and mode; explain uses, advantages and disadvantages of each measure given a particular set of data and its context.</p>	<p>Student Edition: 10-13, 14-15, 16-19, 20-23, 28-31, 42-44, 45, 46-47, 585-588 <i>Check Understanding</i> 11 <i>MathWorks</i> 15</p> <p>Annotated Teacher's Edition: 5MW 34; AA 10; CE 11, 15, 20; ETL 11, 29; ITL 10, 20, 28; QA 12</p>
<p>S1.2.2 Estimate the position of the mean, median, and mode in both symmetrical and skewed distributions, and from a frequency distribution or histogram.</p>	<p>Student Edition: 16-19, 19 #28, 20-23, 28-31, 32-33, 41 #28, 42-44, 45, 46-47, 65, 585-588 <i>Check Understanding</i> 29</p> <p>Annotated Teacher's Edition: CE 20; ITL 10, 28</p>
<p>S1.2.3 Compute and interpret measures of variation, including percentiles, quartiles, interquartile range, variance, and standard deviation.</p>	<p>Student Edition: 11-13, 14-15, 16-19, 20-23, 28-31, 32-33, 42-44, 45, 46-47, 65, 587 <i>Check Understanding</i> 29 <i>Reading Math</i> 28</p> <p>Annotated Teacher's Edition: CE 17, 20, 24, 29, 32; DI 32; ETL 29; QA 30; TT 42</p>
S1.3 The Normal Distribution	
<p>S1.3.1 Explain the concept of distribution and the relationship between summary statistics for a data set and parameters of a distribution.</p>	<p>This standard can be found in Glencoe's <i>Algebra 2</i> © 2008 on the following pages: Student Edition: 724-728, 729-733</p>
<p>S1.3.2 Describe characteristics of the normal distribution, including its shape and the relationships among its mean, median, and mode.</p>	<p>This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 412-415, 418 #37-#40, 419 #11-#12</p>
<p>S1.3.3 Know and use the fact that about 68%, 95%, and 99.7% of the data lie within one, two, and three standard deviations of the mean, respectively in a normal distribution.</p>	<p>This standard can be found in Glencoe's <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 412-415, 418 #37-#40, 419 #11-#12</p>

STANDARDS	PAGE REFERENCES
<p>S1.3.4 Calculate z-scores, use z-scores to recognize outliers, and use z-scores to make informed decisions.</p>	<p>This standard can be found in Glencoe’s <i>MathMatters 3: An Integrated Program</i> © 2009 on the following pages: Student Edition: 413 ex 3</p>
<p>STANDARD S2: BIVARIATE DATA – EXAMINING RELATIONSHIPS</p>	
<p>Students plot and interpret bivariate data by constructing scatterplots, recognizing linear and nonlinear patterns, and interpreting correlation coefficients; they fit and interpret regression models, using technology as appropriate.</p>	
<p>S2.1 Scatterplots and Correlation</p>	
<p>S2.1.1 Construct a scatterplot for a bivariate data set with appropriate labels and scales.</p>	<p>Student Edition: 20-23, 24-25, 34-37, 42-44, 45, 47, 644 <i>MathWorks</i> 33 Annotated Teacher’s Edition: QA 36</p>
<p>S2.1.2 Given a scatterplot, identify patterns, clusters, and outliers; recognize no correlation, weak correlation, and strong correlation.</p>	<p>Student Edition: 20-23, 24-25, 26-27, 32-33, 42-44, 45, 46-47, 61 #3, 79, 98 #2, 145, 186, 586, 643 Annotated Teacher’s Edition: CE 21, 24, 27, 32; ETL 21, 27; QA 22</p>
<p>S2.1.3 Estimate and interpret Pearson’s correlation coefficient for a scatterplot of a bivariate data set; recognize that correlation measures the strength of linear association.</p>	<p>Student Edition: 26-27, 33, 43-44, 45, 46-47 Annotated Teacher’s Edition: CE 27, 32; ETL 27; QA 27; TT 26</p>
<p>S2.1.4 Differentiate between correlation and causation; know that a strong correlation does not imply a cause-and-effect relationship; recognize the role of lurking variables in correlation.</p>	<p>Student Edition: 20-23, 24-25, 26-27, 42-44, 45, 61 <i>MathWorks</i> 61 Annotated Teacher’s Edition: CE 21, 24, 27; ETL 21, 27; QA 22, 27</p>
<p>S2.2 Linear Regression</p>	
<p>S2.2.1 For bivariate data which appear to form a linear pattern, find the least squares regression line by estimating visually and by calculating the equation of the regression line; interpret the slope of the equation for a regression line.</p>	<p>Student Edition: 20-23, 24-25, 26-27, 43-44, 45, 46-47 Annotated Teacher’s Edition: CE 21, 24, 27; DI 20; QA 22, 27</p>

STANDARDS	PAGE REFERENCES
S2.2.2 Use the equation of the least squares regression line to make appropriate predictions.	Student Edition: 20-23, 24-25, 26-27, 43-44, 45, 46-47, 586 Annotated Teacher's Edition: CE 21, 24, 27; ETL 21; QA 22, 27
STANDARD S3: SAMPLES, SURVEYS, AND EXPERIMENTS	
Students understand and apply sampling and various sampling methods, examine surveys and experiments, identify bias in methods of conducting surveys, and learn strategies to minimize bias. They understand basic principles of good experimental design.	
S3.1 Data Collection and Analysis	
S3.1.1 Know the meanings of a sample from a population and a census of a population, and distinguish between sample statistics and population parameters.	Student Edition: 2-3, 6-9, 14-15, 42, 45, 46-47, 55, 585-588 Annotated Teacher's Edition: 5MW 6; CE 7, 14; ETL 7; QA 8; TT 6
S3.1.2 Identify possible sources of bias in data collection and sampling methods and simple experiments; describe how such bias can be reduced and controlled by random sampling; explain the impact of such bias on conclusions made from analysis of the data; and know the effect of replication on the precision of estimates.	Student Edition: 6-9, 14-15, 34-37, 42, 44, 45, 46-47, 55, 153 #24, 585-588 Annotated Teacher's Edition: AA 34, 45; CE 7, 14, 35; ETL 35; ITL 34; QA 8, 36
S3.1.3 Distinguish between an observational study and an experimental study, and identify, in context, the conclusions that can be drawn from each.	Student Edition: 6-9, 42, 44, 45, 47, 585-588 Annotated Teacher's Edition: AA 45; ETL 7; TT 6
STANDARD S4: PROBABILITY MODELS AND PROBABILITY CALCULATION	
Students understand probability and find probabilities in various situations, including those involving compound events, using diagrams, tables, geometric models and counting strategies; they apply the concepts of probability to make decisions.	
S4.1 Probability	
S4.1.1 Understand and construct sample spaces in simple situations (e.g., tossing two coins, rolling two number cubes and summing the results).	Student Edition: 150-153, 154-155, 156-157, 158-161, 162-165, 166-167, 168-171, 176-177, 182-184, 185, 635 #25, 639, 644 <i>Check Understanding</i> 159, 169 Annotated Teacher's Edition: CE 151, 155, 159, 163, 169; QA 160, 164

STANDARDS	PAGE REFERENCES
<p>S4.1.2 Define mutually exclusive events, independent events, dependent events, compound events, complementary events and conditional probabilities; and use the definitions to compute probabilities.</p>	<p>Student Edition: 158-161, 162-165, 166-167, 168-171, 176-177, 182-184, 185, 635, 639, 644 <i>Check Understanding</i> 159, 169 Annotated Teacher's Edition: CE 163, 166, 169; ETL 163, 169; ITL 168; QA 164, 169; TT 170, 176</p>
<p>S4.2 Application and Representation</p>	
<p>S4.2.1 Compute probabilities of events using tree diagrams, formulas for combinations and permutations, Venn diagrams, or other counting techniques.</p>	<p>Student Edition: 149, 150-153, 154-155, 156-157, 158-161, 162-165, 166-167, 168-171, 172-175, 176-177, 182-184, 185, 518, 635, 639, 644 <i>MathWorks</i> 157 Annotated Teacher's Edition: CE 151, 155, 159, 163, 166</p>
<p>S4.2.2 Apply probability concepts to practical situations, in such settings as finance, health, ecology, or epidemiology, to make informed decisions.</p>	<p>Student Edition: 150-153, 154-155, 156-157, 158-161, 162-165, 170-171, 176-177, 180-181, 598, 639, 644 Annotated Teacher's Edition: CE 151, 156, 166</p>