

# **Curriculum Guide**

**Mathematics  
Grades K-12**

**Office of Education  
North American Division  
of Seventh-day Adventists**

**2003**

# The North American Division

The North American Division includes the United States and Canada, as well as the Islands of Bermuda, St. Pierre, and Miquelon. With such a diversity of cultures, this curriculum guide is designed to ensure that uniform standards are maintained. In those places, within the Division where governmental academic requirements differ from those of this guide, appropriate adjustments may be made as long as the Seventh-day Adventist philosophy is maintained.

## Acknowledgments

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# Introduction

Mathematics education should equip students with the essential skills for career preparation, character development, and appreciation of the created world around them. The study of mathematics must foster critical and analytic thinking skills leading students to develop basic mathematical skills, use their developing skills in problem-solving applications, and assist students to transfer their concrete learning experiences to abstract reasoning. Societal trends necessitate that students become mathematically literate, have equal opportunity to learn, and become informed citizens capable of coping successfully in a technological society.

This curriculum guide is developed by the North American Division Office of Education (NADOE) Mathematics K-12 Curriculum Subcommittee and is consistent with the Seventh-day Adventist *Journey to Excellence* curriculum publication (see Appendix). In addition, the National Council of Teachers of Mathematics (NCTM) principles and standards have been integrated into the NADOE *Mathematics K-12 Curriculum Guide*. The following six NCTM principles are the driving force for high-quality mathematics education:

- Equity:** Excellence in mathematics education requires high expectations and strong support for all students.
- Curriculum:** The curriculum is focused on the important aspects of mathematical learning and is emphasized throughout the various grade levels.
- Teaching:** Effective teaching requires an understanding of what students need to learn, then challenges their knowledge and supports them in their success.
- Learning:** Students must learn mathematics with understanding, which means building upon experience and previous knowledge.
- Assessment:** Assessment must provide the teacher and student with useful information to support their teaching and learning experiences.
- Technology:** The use of technology is an essential skill with increasing emphasis K-12, and must enhance all students' learning experiences.

In addition, this curriculum guide will provide the mathematics educator with a:

- framework for mathematics education from K-12;
- resource for establishing goals and uniform expectations for Seventh-day Adventist schools;
- support for lesson development and assessment.

The standards and essential learnings contained in this document provide the components for a comprehensive mathematics program as outlined in the two main sections of this document—the elementary and secondary essential learnings. It is the intent of the NADOE Mathematics K-12 Curriculum Subcommittee that teachers will find this guide to be a valuable resource in developing positive mathematics programs within their individual schools.

# Philosophy

The Seventh-day Adventist Church recognizes God as the ultimate source of existence and truth. In the beginning God created in His image, a perfect humanity, a perfection later marred by sin. Through the guidance of the Holy Spirit, God's character and purposes can be understood as revealed in nature, the Bible, and Jesus Christ. The distinctive characteristics of Adventist education, derived from the Bible and the inspired writings of Ellen G. White, point to the redemptive aim of true education: *to restore human beings into the image of their Maker.*

While God presents His infinitely loving and wise character as the ultimate norm for human conduct, human motives, thinking, and behavior have fallen short of God's ideal. Education in its broadest sense is a means of returning human beings to their original relationship with God. Its time dimensions span eternity.

Adventist education seeks to develop a life of faith in God and respect for the dignity of all human beings; to build character akin to that of the Creator; to nurture thinkers rather than mere reflectors of others' thoughts; to promote loving service rather than selfish ambition; to ensure maximum development of each individual's potential; and to embrace all that is true, good, and beautiful.

An education of this kind imparts far more than academic knowledge. It fosters a balanced development of the whole person — physically, intellectually, socially, and spiritually. Working together, homes, schools, and churches cooperate together with divine agencies in preparing learners for responsible citizenship in this world and in the world to come.

# General Goals

The general goals of this document, developed by the NADOE Mathematics K-12 Curriculum Subcommittee, are to provide for the following:

- A growing relationship with God, the Creator, who is orderly, precise, and infinite.
  
- A coherent, well-articulated curriculum across all grades in order to develop analytic and critical thinking along with problem-solving skills.
  
- The development of spiritual values by emphasizing Christian principles in mathematical applications, such as stewardship, responsible citizenship, and balanced lifestyle.
  
- The development of high expectations and strong support for all students as they become skillful and confident in their ability to perform, communicate, and connect mathematics from experience and prior knowledge.
  
- The development of a Christian work ethic with an appreciation for the dignity of service.
  
- The opportunity to select and use technology appropriately to enhance learning.

# Elementary Essential Learnings

Seventh-day Adventist education embodies not only the highest academic models, but also the church's legacy of beliefs, values, and spiritual convictions. These elementary essential learning elements are outlined thematically, by grade, using the standards identified by the National Council of Teachers of Mathematics. The skills and concepts listed specify those essential learnings to be incorporated in each grade level. The essential learnings progress and develop along a continuum. Each standard ends with a correlation to the goals and essential core elements of the *Journey to Excellence*. The resources used in the development of the elementary essential learnings are as follows:

- Journey to Excellence*, FACT21 from the North American Division Office of Education
- Principles and Standards for School Mathematics* from the National Council of Teachers of Mathematics, 2000
- Ten Sigma's Math Curriculum at Four Levels, Grades K-6
- Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education*, 3<sup>rd</sup> edition by McRel, Mid-continent Research for Education and Learning. 2000
- Integrated Resource Package 1995, Mathematics K-7 and Mathematics 8 and 9* from the British Columbia Ministry of Education, Skills, and Training
- The Ontario Curriculum Grades 1-8: Mathematics* from the Ontario Ministry of Education and Training, 1997
- Academic Content Standard K-12 Mathematics* from the Center for Curriculum and Assessment, Office of Curriculum and Instruction, Ohio Department of Education,
- Minimum Math Standards for Students, Grades K-8* from the Michigan Conference of Seventh-day Adventists
- Suggested Essential Topics in Math, Grades 1-8* from the Southern New England Conference of Seventh-day Adventists

**Use of Technology:** Although technology has become integral to education in the early twenty-first century, calculators and computers should enhance the learning experience rather than create a dependency. There must be a proper balance between using technology as a tool and acquiring understanding of conceptual ideas and manipulative processes. The elementary section of this guide does not stipulate how technology should be used, but encourages discretion.



# Content Standards

**Number and Operations Standard.** Instructional programs from prekindergarten through grade 12 should enable all students to:

- understand numbers, ways of representing numbers, relationships among numbers, and number systems;
- understand meanings of operations and how they relate to one another;
- compute fluently and make reasonable estimates.

**Algebra Standard.** Instructional programs from prekindergarten through grade 12 should enable all students to:

- understand patterns, relations, and functions;
- represent and analyze mathematical situations and structures using algebraic symbols;
- use mathematical models to represent and understand quantitative relationships;
- analyze change in various contexts.

**Geometry Standard.** Instructional programs from prekindergarten through grade 12 should enable all students to:

- analyze characteristics and properties of two- and three- dimensional geometric shapes and develop mathematical arguments about geometric relationships;
- specify locations and describe spatial relationship using coordinate geometry and other representational systems;
- apply transformations and use symmetry to analyze mathematical situations;
- use visualization, spatial reasoning, and geometric modeling to solve problems.

**Measurement Standard.** Instructional programs from prekindergarten through grade 12 should enable all students to:

- understand measurable attributes of objects and the units, systems, and processes of measurement;
- apply appropriate techniques, tools, and formulas to determine measurements.

**Data Analysis and Probability Standard.** Instructional programs from prekindergarten through grade 12 should enable all students to:

- formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them;
- select and use appropriate statistical methods to analyze data;
- develop and evaluate inferences and predictions that are based on data;
- understand and apply basic concepts of probability.

*Principles and Standards for School Mathematics,*  
National Council of Teachers of Mathematics, 2000



# Number and Operations Standard

“Instructional programs from prekindergarten through grade 12 should enable all students to:

- understand numbers, ways of representing numbers, relationships among numbers, and number systems;
- understand meanings of operations and how they relate to one another;
- compute fluently and make reasonable estimates.”

*(Principles and Standards for School Mathematics, NCTM, 2000, p. 32)*

Kindergarten	Grade 1	Grade 2
<ul style="list-style-type: none"> <li>• Count and understand numbers to 20</li> <li>• Write numbers 0 to 10</li> <li>• Use one-to-one correspondence with numbers and objects</li> <li>• Understand and represent adding two numbers with sums to ten</li> <li>• Add and subtract two numbers using objects to ten</li> </ul>	<ul style="list-style-type: none"> <li>• Count, write, and understand numbers 0 to 100</li> <li>• Count by twos, fives, tens, and twenty-fives to 100</li> <li>• Skip count by tens, e.g. 17, 27, 37 ...</li> <li>• Connect numbers to the quantities they represent using various models and representations</li> <li>• Understand place value of tens and ones</li> <li>• Explore the concept of zero</li> <li>• Compare numbers using symbols <math>&gt;</math>, <math>&lt;</math>, and <math>=</math></li> <li>• Understand the meaning of addition and subtraction and relate to appropriate symbols</li> <li>• Understand basic addition and subtraction fact families</li> <li>• Develop a counting strategy for addition and subtraction facts to 20</li> <li>• Memorize addition with sums to 12 and related subtraction facts</li> <li>• Add and subtract 1- and 2-digit numbers, with no renaming</li> <li>• Understand basic fractions, i.e. halves, thirds, and fourths</li> <li>• Read number words to ten</li> <li>• Understand and use a number line</li> </ul>	<ul style="list-style-type: none"> <li>• Count and understand numbers with 3-digits</li> <li>• Skip count by two, e.g. 23, 25, 27 ...</li> <li>• Understand and use ordinals 1-20</li> <li>• Understand even and odd numbers</li> <li>• Understand the place value of hundreds, tens, ones</li> <li>• Given a math fact, construct the other three in the fact family</li> <li>• Know addition and subtraction facts through 20 by recall</li> <li>• Add and subtract 2-digit numbers with renaming</li> <li>• Add and subtract 3-digit numbers with no renaming</li> <li>• Add a series of three numbers</li> <li>• Using a number line, explain rounding to the nearest ten</li> <li>• Write, add, and subtract money using appropriate symbols</li> <li>• Understand situations that entail multiplication and division, i.e. equal groupings of objects and sharing equally</li> </ul>

*Number and Operations Standard*

Grade 3	Grade 4	Grade 5
<ul style="list-style-type: none"> <li>• Understand and describe place value to the ten-thousands place</li> <li>• Design and label number lines appropriate to the situation</li> <li>• Compare and order numbers through 10,000</li> <li>• Skip count by threes, e.g. 15, 18, 21, 24 ...</li> <li>• Understand the commutative property of addition and multiplication</li> <li>• Understand the zero property of multiplication</li> <li>• Understand the meaning of the decimal point</li> <li>• Understand the concept of tenths written as a decimal</li> <li>• Understand the meaning of multiplication and division</li> <li>• Know the multiplication and division fact families</li> <li>• Know multiplication and corresponding division facts</li> <li>• Add and subtract numbers up to four digits with and without renaming</li> <li>• Multiply mentally by 10 and 100</li> <li>• Multiply a 2-digit number by a 1-digit number</li> <li>• Divide a 2-digit number by a 1-digit number with remainder</li> <li>• Understand the meaning and structure of fractions between zero and one</li> <li>• Understand and write simple mixed numbers</li> <li>• Compare fractions with like denominators</li> <li>• Add and subtract fractions with like denominators</li> <li>• Add and subtract money</li> <li>• Use strategies to estimate the results of whole number computations</li> </ul>	<ul style="list-style-type: none"> <li>• Understand place value through millions</li> <li>• Understand the concept and representation of numbers between zero and one, i.e. fractions and decimals</li> <li>• Recognize representations for equivalent numbers</li> <li>• Read, write, and compare decimals to the hundredths</li> <li>• Know equivalents in counting money, e.g. 5 nickels equal 1 quarter</li> <li>• Know how to count up to make change</li> <li>• Understand how multiplication and division relate to each other to solve problems</li> <li>• Interpret the meaning of a remainder in a division problem</li> <li>• Memorize multiplication and division facts through 12</li> <li>• Multiply a 3- and 4-digit number by a 1-digit number</li> <li>• Divide using 1-digit divisor and 1- 2- or 3-digit dividend</li> <li>• Multiply two 2-digit numbers</li> <li>• Understand simple equivalent fractions</li> <li>• Convert improper fractions to mixed numbers and vice versa</li> <li>• Add and subtract fractions and mixed numbers with common denominators</li> <li>• Estimate solutions involving whole number, fraction, and decimal computations</li> <li>• Understand the basic concepts of least common multiple (LCM) and greatest common factor (GCF)</li> <li>• Reduce simple fractions to lowest terms</li> <li>• Explore numbers less than zero by extending the number line and through familiar applications</li> </ul>	<ul style="list-style-type: none"> <li>• Understand place value through billions</li> <li>• Be proficient in counting money and making change</li> <li>• Develop and use number sense for whole numbers, fractions, and decimals</li> <li>• Develop and apply number theory concepts, e.g. multiples, primes, and factors in real world and mathematical situations</li> <li>• Determine pairs of numbers given a relation or rule, and determine the relation or rule of given pairs of numbers</li> <li>• Understand how basic mathematical operations are related</li> <li>• Develop, analyze, and explain procedures for computation and techniques for estimation</li> <li>• Select appropriate methods and tools for computing with whole numbers, fractions, and decimals from among mental computation, estimation, calculator, and paper/pencil</li> <li>• Round whole numbers to the designated place value</li> <li>• Identify and generate equivalent forms of fractions, decimals, and percents</li> <li>• Recognize, model, and describe multiples, factors, composites, and primes</li> <li>• Determine the greatest common factor (GCF) and least common multiple (LCM) of two numbers</li> <li>• Convert fractions to the least common denominator (LCD)</li> <li>• Reduce fractions to simplest form (lowest terms)</li> <li>• Add and subtract time using renaming</li> </ul>

*Number and Operations Standard*

Grade 6	Grade 7	Grade 8
<ul style="list-style-type: none"> <li>• Understand the meaning and use of exponents</li> <li>• Understand the associative property of addition and multiplication</li> <li>• Extend understanding of whole number operations to fractions, decimals, percents, and mixed numbers</li> <li>• Understand and apply divisibility rules</li> <li>• Round decimals to the nearest thousandths</li> <li>• Understand the concepts of ratio, percent, and percentage</li> <li>• Compare and order improper fractions, mixed numbers, and decimal fractions to thousandths</li> <li>• Develop meaning for integers and use integers to represent and compare quantities</li> <li>• Add, subtract, multiply, and divide integers</li> <li>• Give the prime factorization of a number</li> <li>• Use factor trees to give the prime factorization of a number</li> <li>• Convert fractions to decimals to percents and vice versa</li> <li>• Convert fractions to terminating, repeating, or rounded decimals</li> <li>• Solve proportions with an unknown</li> <li>• Understand and use mathematical vocabulary appropriately</li> <li>• Write a remainder as a fraction or decimal</li> <li>• Find the percent of a number</li> <li>• Find the percent one number is of another and find the original number when the percent is given</li> <li>• Use percents to determine sales tax, commission, discount, and simple interest</li> </ul>	<ul style="list-style-type: none"> <li>• Understand and use scientific notation</li> <li>• Evaluate powers that have negative and zero exponents</li> <li>• Use integers to express quantities that occur naturally in problem situations, e.g. representing direction, loss, gain, etc.</li> <li>• Develop and use number sense for integers, rational, and irrational numbers</li> <li>• Understand and use the additive inverse property</li> <li>• Understand the principles of the distributive property</li> <li>• Apply properties of operations with whole numbers, fractions, and decimals</li> <li>• Use proportions to solve problems</li> <li>• Compute with rational numbers using a calculator to perform difficult computations</li> <li>• Understand squares and square roots</li> <li>• Estimate the square root of a number less than 100</li> <li>• Find the percent of increase and/or decrease</li> </ul>	<ul style="list-style-type: none"> <li>• Use appropriate significant digits in calculations</li> <li>• Extend understanding of number operations to irrational numbers</li> <li>• Know the definition of real numbers, set notation, and set operations</li> </ul>

*Number and Operations Standard*

<b>Journey to Excellence (FACT21) Connection</b>	
<p>The following <b>GOALS</b> have been established to support the unique philosophy of Adventist education. Each student will:</p>	<p><b>ESSENTIAL CORE ELEMENTS</b> clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:</p>
<p>I. Surrender one’s whole life to God; develop a relationship with Jesus Christ; and allow the Holy Spirit to work in one’s life.</p> <p>II. Desire to know, live, and share the message and mission of the Seventh-day Adventist Church</p> <p>V. Accept personal responsibility for achieving and maintaining optimum physical, mental, and spiritual health.</p> <p>VIII. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.</p> <p>X. Develop a Christian work ethic with an appreciation for the dignity of service.</p>	<p>E. Value God’s revelation of Himself through inspired writings and creation.</p> <p>D. Accept the fundamental beliefs of the Seventh-day Adventist church.</p> <p>E. Appreciate the heritage of the Seventh-day Adventist church.</p> <p>B. Incorporate into one’s lifestyle the principles that promote health: nutrition, exercise, water, sunlight, temperance, air, rest, trust in God.</p> <p>B. Appropriately manage one’s personal finances.</p> <p>C. Acquire skill in the use of technologies.</p> <p>E. Value cooperation and teamwork when interacting in groups.</p> <p>G. Manage time effectively.</p> <p>C. Develop skills that will enhance employability.</p>

# Algebra Standard

“Instructional programs from prekindergarten through grade 12 should enable all students to:

- understand patterns, relations, and functions;
- represent and analyze mathematical situations and structures using algebraic symbols;
- use mathematical models to represent and understand quantitative relationships;
- analyze change in various contexts.”

*(Principles and Standards for School Mathematics, NCTM, 2000, p. 37)*

<b>Kindergarten</b>	<b>Grade 1</b>	<b>Grade 2</b>
<ul style="list-style-type: none"> <li>• Recognize and explain how objects can be classified</li> <li>• Sort, classify, and order objects by size, number, and other properties</li> <li>• Compare and contrast objects</li> <li>• Order objects according to time, size, or position</li> <li>• Identify, create, copy, describe, and extend sequences, e.g. sounds, shapes, motions, and numbers</li> <li>• Model a mathematical problem situation using manipulatives</li> </ul>	<ul style="list-style-type: none"> <li>• Recognize and express expanding and repeating mathematical patterns both orally and with manipulatives</li> <li>• Identify properties of patterns; create and describe using letters and symbols</li> <li>• Use variables and open sentences to express relationships, e.g. missing numbers in number sentences using symbols to represent missing numbers</li> <li>• Use the commutative property and solve number sentences with numbers and symbols, e.g. <math>4 + 5 = 5 + 4</math> or show red balls plus blue balls by <math>R + B = B + R</math></li> </ul>	<ul style="list-style-type: none"> <li>• Use patterns to make generalizations and predictions</li> <li>• Analyze patterns in tables and graphs</li> <li>• Describe qualitative and quantitative changes involving addition and subtraction</li> <li>• Understand equivalence concepts using symbols, such as <math>5 + 3 = 8</math> and <math>8 = 5 + 3</math> or <math>\blacktriangle + \blacksquare = 8</math> or <math>\bullet - 3 = 5</math></li> </ul>

*Algebra Standard*

<b>Grade 3</b>	<b>Grade 4</b>	<b>Grade 5</b>
<ul style="list-style-type: none"><li>• Analyze mathematical sequences with and without a calculator</li><li>• Use patterns to make predictions, solve problems, and identify relationships</li><li>• Understand and explain mathematical relationships in equations and inequalities</li><li>• Solve equations and inequalities</li><li>• Identify such properties as commutative, and associative and use to compute with whole numbers</li><li>• Understand and use grouping symbols e.g. <math>8 + 6 = 8 + (2 + 4)</math> and <math>(8 + 2) + 4 = 8 + (2 + 4) = 14</math></li></ul>	<ul style="list-style-type: none"><li>• Construct a table of values to solve problems in a mathematical relationship</li><li>• Understand how a change in one variable affects the value of another variable</li><li>• Use distributive properties to simplify and perform computations</li><li>• Make and justify predictions using numerical and non-numerical patterns</li></ul>	<ul style="list-style-type: none"><li>• Graph linear equations with one variable</li><li>• Use calculators, computers, tables, and graphs to develop and interpret patterns</li><li>• Understand and use formulas</li><li>• Develop skill in solving and writing linear equations using informal and formal methods</li><li>• Investigate inequalities and nonlinear equations</li><li>• Apply order of operation rules</li></ul>

Grade 6	Grade 7	Grade 8
<ul style="list-style-type: none"> <li>• Write, solve, and graph linear equations</li> <li>• Use two-step operations to solve linear equations</li> <li>• Write and solve inequalities</li> <li>• Infer and use a rule to determine a missing number</li> <li>• Use appropriate mathematical vocabulary and properties</li> <li>• Compare integers on a number line</li> </ul>	<ul style="list-style-type: none"> <li>• Use and apply ratios, proportions, averages and percentage</li> <li>• Graph inequalities</li> <li>• Choose a formula to use in problem-solving</li> <li>• Demonstrate proficiency in using the laws of exponents</li> <li>• Use the Pythagorean Theorem</li> <li>• Manipulate simple polynomials</li> </ul>	<ul style="list-style-type: none"> <li>• Add and subtract matrices</li> <li>• Recognize slope and intercept relationships</li> <li>• Use information to determine whether situations are functions</li> <li>• Recognize minimum and maximum values</li> <li>• Understand the properties of arithmetic and geometric sequences</li> <li>• Develop an initial conceptual understanding of different uses of variables</li> <li>• Identify functions as linear or nonlinear and contrast their properties from tables, graphs, or equations</li> </ul>

*Algebra Standard*

<b>Journey to Excellence (FACT21) Connection</b>	
The following <b>GOALS</b> have been established to support the unique philosophy of Adventist education. Each student will:	<b>ESSENTIAL CORE ELEMENTS</b> clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:
VIII. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.	C. Acquire skill in the use of technologies. E. Value cooperation and teamwork when interacting in groups.
X. Develop a Christian work ethic with an appreciation for the dignity of service.	C. Develop skills that will enhance employability.

# Geometry Standard

“Instructional programs from prekindergarten through grade 12 should enable all students to:

- analyze characteristics and properties of two- and three- dimensional geometric shapes and develop mathematical arguments about geometric relationships;
- specify locations and describe spatial relationship using coordinate geometry and other representational systems;
- apply transformations and use symmetry to analyze mathematical situations;
- use visualization, spatial reasoning, and geometric modeling to solve problems.”

*(Principles and Standards for School Mathematics, NCTM, 2000, p. 41)*

Kindergarten	Grade 1	Grade 2
<ul style="list-style-type: none"> <li>• Compare, sort, and arrange similar and different objects by size, color, and shape</li> <li>• Visually identify triangles, squares, and circles</li> <li>• Describe relative position of objects in space</li> <li>• Identify and fit pieces of puzzles or shapes that go together</li> <li>• Construct 3-dimensional objects</li> </ul>	<ul style="list-style-type: none"> <li>• Describe attributes and parts of 2- and 3-dimensional objects</li> <li>• Describe shapes from different perspectives, e.g. front, back, top, bottom, and side</li> <li>• Apply ideas about direction and space</li> <li>• Recognize and apply slides, flips, and turns</li> <li>• Recognize rectangles and spheres</li> <li>• Recognize sides and corners of shapes</li> <li>• Recognize geometric shapes and structures in the environment</li> <li>• Recognize and draw a line of symmetry in objects</li> <li>• Copy figures and draw simple 2-dimensional shapes from memory</li> </ul>	<ul style="list-style-type: none"> <li>• Investigate and predict the results of assembling and disassembling 2- and 3-dimensional shapes</li> <li>• Find locations using simple coordinates</li> <li>• Recognize prisms, pyramids, cylinders and cones</li> <li>• Relate ideas in geometry to number and measurement</li> </ul>

**Geometry Standard**

<b>Grade 3</b>	<b>Grade 4</b>	<b>Grade 5</b>
<ul style="list-style-type: none"><li>• Explore congruence and similarity</li><li>• Add to find perimeter</li><li>• Count squares to find area</li><li>• Count cubes to determine volume</li><li>• Create models of 2-dimensional objects</li><li>• Investigate simple nets</li><li>• Analyze and describe 2- and 3-dimensional objects using terms such as vertex, edge, angle, side, and face</li><li>• Find and name locations on a labeled grid or coordinate system</li><li>• Identify shapes that can be put together to make a given shape, e.g. tangrams</li></ul>	<ul style="list-style-type: none"><li>• Describe points, lines, and planes</li><li>• Use columns and rows to determine position on a grid</li><li>• Use coordinate systems to specify locations</li><li>• Identify line symmetry in 3-dimensional shapes</li><li>• Create models of 3-dimensional objects</li><li>• Multiply to find area of rectangles</li><li>• Make and test conjectures about geometric properties and relationships, then develop logical arguments to justify conclusions</li><li>• Compare similarities and differences of quadrilaterals</li></ul>	<ul style="list-style-type: none"><li>• Learn the relationship between radius and diameter</li><li>• Classify angles according to the measure</li><li>• Identify and select appropriate units to measure angles (degrees)</li><li>• Understand and use linear, square, and cubic units</li><li>• Count faces, vertices, and edges</li><li>• Create perspective drawings</li><li>• Describe ray, segment, interior, and exterior of an angle</li><li>• Recognize and create patterns with tessellations</li></ul>

Grade 6	Grade 7	Grade 8
<ul style="list-style-type: none"> <li>• Define and use appropriate geometrical vocabulary</li> <li>• Use strategies to develop formulas for determining perimeter and area of triangles, rectangles and parallelograms, and volume of rectangular prisms</li> <li>• Find the area of parallelograms and triangles</li> <li>• Find the circumference and area of circles</li> <li>• Find the volume and surface area of prisms</li> <li>• Classify triangles according to the angles and sides</li> <li>• Understand parallel, intersecting, and perpendicular lines</li> <li>• Measure an angle using a protractor</li> <li>• Draw similar figures that model proportional relations</li> <li>• Explore fractal patterns</li> <li>• Do geometric constructions, e.g. bisect a segment</li> </ul>	<ul style="list-style-type: none"> <li>• Find the area of a trapezoid</li> <li>• Find the surface area of a cylinder</li> <li>• Find the volume of various geometric solids, e.g. pyramids and cones</li> <li>• Use transformations to explore congruence and create designs</li> <li>• Explore the angle measures in a triangle</li> <li>• Understand complementary, supplementary, and vertical angles</li> <li>• Draw and interpret scale diagrams</li> </ul>	<ul style="list-style-type: none"> <li>• Find the surface area of various geometric shapes, e.g. pyramids and cones</li> <li>• Find the volume of spheres using formula</li> <li>• Define objects by geometric properties</li> <li>• Recognize sine, cosine, and tangent relationships with respect to the right triangle</li> </ul>

*Geometry Standard*

<b>Journey to Excellence (FACT21) Connection</b>	
<p>The following <b>GOALS</b> have been established to support the unique philosophy of Adventist education. Each student will:</p>	<p><b>ESSENTIAL CORE ELEMENTS</b> clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:</p>
<p>VIII. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.</p> <p>IX. Develop an appreciation of the beautiful, both in God’s creation and in human expression, while nurturing individual ability in the fine arts.</p> <p>X. Develop a Christian work ethic with an appreciation for the dignity of service.</p>	<p>C. Acquire skill in the use of technologies.            D. Develop basic home-management skills.            E. Value cooperation and teamwork when interacting in groups.</p> <p>I. View God as the Author of beauty both in His creation and in human expression.            D. Use aesthetic expression as a means of communication and service.</p> <p>C. Develop skills that will enhance employability.</p>

# Measurement Standard

“Instructional programs from prekindergarten through grade 12 should enable all students to:

- understand measurable attributes of objects and the units, systems, and processes of measurement;
- apply appropriate techniques, tools, and formulas to determine measurements.”

*(Principles and Standards for School Mathematics, NCTM, 2000, p. 44)*

Kindergarten	Grade 1	Grade 2
<ul style="list-style-type: none"> <li>• Compare the weight of two objects and the capacity of two containers</li> <li>• Compare and describe length and size, e.g. long, longer, longest, same length</li> <li>• Measure length by counting non-standard units</li> <li>• Compare and describe distance, e.g. nearer, farther, close to</li> <li>• Compare and describe temperature, e.g. hotter, colder</li> <li>• Recognize how a thermometer denotes hot, cold, and medium temperatures</li> <li>• Measure area using concrete objects</li> <li>• Order events by time, e.g. before, after</li> <li>• Identify that clocks, watches, and calendars are used to measure time</li> <li>• Tell time to the hour</li> <li>• Know and name the seven days of the week (relate to Sabbath)</li> </ul>	<ul style="list-style-type: none"> <li>• Identify and recognize various measurable attributes of an object</li> <li>• Estimate and measure length, weight, volume and mass using nonstandard and standard units</li> <li>• Compare objects in terms of length, area, capacity, and weight</li> <li>• Recognize and explain the need for measuring tools and fixed units</li> <li>• Order a sequence of events with respect to time, e.g. seasons; morning, afternoon and night; o'clock</li> <li>• Know the number of minutes in an hour</li> <li>• Tell time to the hour and half hour using both digital and analog clocks</li> <li>• Identify pennies, nickels, dimes, quarters, half-dollars, and dollars</li> <li>• Determine the value of a set of coins to \$1.00</li> <li>• Determine the equivalent value of coins to \$1.00, e.g. 10 dimes, 4 quarters, etc.</li> <li>• Know and name the twelve months of the year</li> </ul>	<ul style="list-style-type: none"> <li>• Select and use appropriate measuring tools</li> <li>• Select and use appropriate units of measurement</li> <li>• Use different units to measure the same thing</li> <li>• Use nonstandard units to compare weight of real objects and capacity of real containers</li> <li>• Estimate the weight of an object</li> <li>• Apply and use measurements in problems and “real life” situations, e.g. gathering data for mi/km – odometer and map reading</li> <li>• Tell time to the nearest minute (digital), and the nearest 5 minutes (analog)</li> <li>• Use and compare A.M. and P.M. time designations</li> <li>• Count coins and dollars to \$5.00</li> <li>• Determine correct change to \$1.00 by counting</li> <li>• Estimate to the nearest dollar</li> <li>• Demonstrate the “real world” practice of spending money to the penny</li> <li>• Use correct symbols in writing money amounts</li> <li>• Understand one hour of elapsed time</li> <li>• Identify days and dates on a calendar</li> <li>• Understand one week before and after a certain date on a calendar</li> </ul>

**Measurement Standard**

Grade 3	Grade 4	Grade 5
<ul style="list-style-type: none"> <li>• Use correct measurement vocabulary</li> <li>• Explain and measure temperature using Celsius and Fahrenheit scales</li> <li>• Read and understand a simple time line</li> <li>• Measure length, weight and volume using metric and U.S. customary units to the nearest ½ unit as appropriate</li> <li>• Using appropriate tools, draw a line or shape with specified measurements</li> <li>• Count money up to \$10.00</li> <li>• Understand attributes of second, minute, hour</li> <li>• Tell time to the minute, before or after the hour, using analog and digital clocks</li> <li>• Measure elapsed time using a calendar or clock</li> <li>• Read and understand a calendar using day, week, month, and year</li> <li>• Count weeks before and after certain dates on the calendar</li> </ul>	<ul style="list-style-type: none"> <li>• Measure length to the nearest ¼ inch</li> <li>• Use measures less than one unit</li> <li>• Solve multi-step problems involving measurement</li> <li>• Estimate and measure the perimeter of irregular shapes</li> <li>• Compare the number of units to the size of units, e.g. number of feet compared to number of yards in a given length, estimating/determining cups in a 2-liter container</li> <li>• Draw a simple time line</li> <li>• Determine elapsed time by the hour and half-hour</li> <li>• Understand time zones and read timetables</li> <li>• Read a Celsius thermometer knowing the significance of 0 and 100 degrees; and read a Fahrenheit thermometer knowing the significance of 32 and 212 degrees</li> <li>• Know equivalent measures for simple metric and customary units of length, capacity, weight/mass, and time, e.g. inches to feet, feet to yards, feet to mile, pounds to tons, meters to kilometers, kilograms to metric tonnes</li> <li>• Convert simple metric and customary units of length, capacity, weight/mass, and time, e.g. inches to feet, kilograms to grams, quarts to gallons</li> </ul>	<ul style="list-style-type: none"> <li>• Identify the paths between points on a grid or coordinate plane and compare the lengths of the paths, e.g. shortest path, paths of equal lengths</li> <li>• Demonstrate and describe the difference between covering the faces (surface area), and filling the interior (volume), of 3-dimensional objects</li> <li>• Use standard angles (45°, 90°, 120°) to estimate the measure of angles and use a protractor to measure and draw angles</li> <li>• Convert one metric unit to one customary unit and one customary unit to one metric unit</li> <li>• Understand that measurement is not exact, e.g. when measured multiple times, measurements may give slightly different numbers</li> <li>• Understand and explain how differences in units affect precision</li> <li>• Measure length to the nearest cm and ⅛ of an in</li> </ul>

Grade 6	Grade 7	Grade 8
<ul style="list-style-type: none"> <li>• Describe how perimeter, area, and volume are affected when the dimensions of a figure are changed</li> <li>• Use strategies to develop formulas for finding circumference and area of circles, and area of sectors (<math>\frac{1}{2}</math> circle, <math>\frac{2}{3}</math> circle, <math>\frac{1}{3}</math> circle, <math>\frac{1}{4}</math> circle)</li> <li>• Express solutions to the nearest unit</li> <li>• Estimate length, area, volume, perimeter, circumference, area of a circle, various shapes and surfaces using everyday objects, e.g. string, arms, etc.</li> <li>• Make conversions within the same measurement system while performing computations</li> <li>• Use indirect measurement such as similar triangles to solve problems</li> </ul>	<ul style="list-style-type: none"> <li>• Use graphs, charts, and formulas to convert between a variety of standard/metric measures</li> <li>• Apply ratios to solve measurement problems</li> <li>• Use scale models to represent measures of real-life objects, e.g. sanctuary model, Noah’s ark, etc.</li> <li>• Relate ancient monetary values to current values, e.g. shekel, denari, mite</li> <li>• Develop a proportionately correct time line using complex concepts, e.g. the 2300-day prophecy</li> <li>• Use strategies to develop formulas for finding volume and surface areas of solids</li> <li>• Explain how time zones are determined</li> </ul>	<ul style="list-style-type: none"> <li>• Draw pictures to assist in solving measurement problems</li> <li>• Find the size of interior and exterior angles of convex polygons using formula and protractor</li> <li>• Use appropriate significant digits in calculations</li> <li>• Convert temperature between Fahrenheit and Celsius</li> </ul>

*Measurement Standard*

<b>Journey to Excellence (FACT21) Connection</b>	
<p>The following <b>GOALS</b> have been established to support the unique philosophy of Adventist education. Each student will:</p>	<p><b>ESSENTIAL CORE ELEMENTS</b> clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:</p>
<p>II. Desire to know, live, and share the message and mission of the Seventh-day Adventist Church.</p> <p>D. Develop an understanding of cultural and historical heritages, affirm a belief in the dignity and worth of others, and accept responsibility for one’s local, national, and global environments.</p> <p>E. Accept personal responsibility for achieving and maintaining optimum physical, mental, and spiritual health.</p> <p>H. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.</p> <p>X. Develop a Christian work ethic with an appreciation for the dignity of service.</p>	<p>E. Appreciate the heritage of the Seventh-day Adventist church.</p> <p>IV. Use a biblical perspective to analyze history and current events.</p> <p>V. Assume an active role in nurturing and preserving God’s creation.</p> <p>B. Incorporate into one’s lifestyle the principles that promote health: nutrition, exercise, water, sunlight, temperance, air, rest, trust in God.</p> <p>B. Appropriately manage one’s personal finances.</p> <p>C. Acquire skill in the use of technologies.</p> <p>D. Develop basic home-management skills.</p> <p>E. Value cooperation and teamwork when interacting in groups.</p> <p>G. Manage time effectively.</p> <p>C. Develop skills that will enhance employability.</p>

# Data Analysis and Probability Standard

“Instructional programs from prekindergarten through grade 12 should enable all students to:

- formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them;
- select and use appropriate statistical methods to analyze data;
- develop and evaluate inferences and predictions that are based on data;
- understand and apply basic concepts of probability.”

*(Principles and Standards for School Mathematics, NCTM, 2000, p. 48)*

Kindergarten	Grade 1	Grade 2
<ul style="list-style-type: none"> <li>• Discuss events as likely or unlikely</li> <li>• Pose questions and gather data about themselves and their surroundings</li> </ul>	<ul style="list-style-type: none"> <li>• Use whole number units to construct graphic representations</li> <li>• Understand information represented in simple bar graphs, line graphs and pictographs</li> <li>• Collect first-hand information by conducting surveys, measuring, and performing simple experiments</li> <li>• Collect and organize data into charts using tally marks</li> </ul>	<ul style="list-style-type: none"> <li>• Construct and interpret data using a simple bar graph</li> <li>• Interpret data as represented in a simple table or chart</li> <li>• Make predictions and test validity</li> <li>• Do a probability study with a 50/50 chance</li> </ul>

*Data Analysis and Probability Standard*

Grade 3	Grade 4	Grade 5
<ul style="list-style-type: none"> <li>• Organize and interpret data using line graphs</li> <li>• Construct graphs using data from a table</li> <li>• Discover patterns in tables and graphs by creating, organizing, recording and analyzing data</li> <li>• Formulate questions and categories for data collection and actively collect first-hand information</li> <li>• Describe the shape and important features of a set of data and compare related data sets, with an emphasis on how the data are distributed</li> </ul>	<ul style="list-style-type: none"> <li>• Collect and organize data into tables and graphs using different scales</li> <li>• Read and interpret data presented in circle graphs</li> <li>• Conduct simple probability experiments</li> <li>• Interpret and construct Venn diagrams</li> <li>• Evaluate the process of data collection</li> </ul>	<ul style="list-style-type: none"> <li>• Collect and organize data, then determine appropriate method and scale to display data</li> <li>• Find the mean, median, mode, and range of a given set of data and use these measures to describe the set of data</li> <li>• Use calculators to simplify computations and use computers to assist in generating and analyzing information</li> <li>• Sample and analyze data, making predictions and conjectures based on samples</li> <li>• Distinguish between a population and a sample</li> <li>• Discuss the reasonableness of the data and the results</li> <li>• List all possible outcomes of an event</li> <li>• Read, construct, and interpret frequency tables</li> <li>• Make predictions based on experimental and theoretical probabilities</li> </ul>

<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>
<ul style="list-style-type: none"><li>• Calculate the probability of independent and dependent events</li><li>• Construct a multiple line graph</li><li>• Make logical inferences from statistical data</li><li>• Calculate the odds</li><li>• Design an experiment to test a theoretical probability and explain how the results may vary</li><li>• Construct a scatter plot</li><li>• Make organized lists and tree diagrams</li></ul>	<ul style="list-style-type: none"><li>• Understand the number of possible permutations</li><li>• Predict the number of times an event will occur</li><li>• Construct a multiple bar graph</li><li>• Construct a circle graph</li><li>• Make a histogram</li><li>• Make a stem and leaf plot</li></ul>	<ul style="list-style-type: none"><li>• Determine the number of combinations from a given set</li><li>• Make a box and whisker plot</li></ul>

*Data Analysis and Probability Standard*

<b>Journey to Excellence (FACT21) Connection</b>	
<p>The following <b>GOALS</b> have been established to support the unique philosophy of Adventist education. Each student will:</p>	<p><b>ESSENTIAL CORE ELEMENTS</b> clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:</p>
<p>D. Develop an understanding of cultural and historical heritages, affirm a belief in the dignity and worth of others, and accept responsibility for one’s local, national, and global environments.</p> <p>VIII. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.</p> <p>X. Develop a Christian work ethic with an appreciation for the dignity of service.</p>	<p>E. Assume an active role in nurturing and preserving God’s creation.</p> <p>C. Acquire skill in the use of technologies.</p> <p>E. Value cooperation and teamwork when interacting in groups.</p> <p>A. Develop an awareness of career options and opportunities in a changing world, as well as in the church.</p> <p>C. Develop skills that will enhance employability.</p>

# Process Standards

**Problem Solving Standard.** Instructional programs from prekindergarten through grade 12 should enable all students to:

- build new mathematical knowledge through problem solving;
- solve problems that arise in mathematics and in other contexts;
- apply and adapt a variety of appropriate strategies to solve problems;
- monitor and reflect on the process of mathematical problem solving.

**Reasoning and Proof Standard.** Instructional programs from prekindergarten through grade 12 should enable all students to:

- recognize reasoning and proof as fundamental aspects of mathematics;
- make and investigate mathematical conjectures;
- develop and evaluate mathematical arguments and proofs;
- select and use various types of reasoning and methods of proof.

**Communication Standard.** Instructional programs from prekindergarten through grade 12 should enable all students to:

- organize and consolidate their mathematical thinking through communication;
- communicate their mathematical thinking coherently and clearly to peers, teachers, and others;
- analyze and evaluate the mathematical thinking and strategies of others;
- use the language of mathematics to express mathematical ideas precisely.

**Connections Standard.** Instructional programs from prekindergarten through grade 12 should enable all students to:

- recognize and use connections among mathematical ideas;
- understand how mathematical ideas interconnect and build on one another to produce a coherent whole;
- recognize and apply mathematics in contexts outside of mathematics.

**Representation Standard.** Instructional programs from prekindergarten through grade 12 should enable all students to:

- create and use representations to organize, record, and communicate mathematical ideas;
- select, apply, and translate among mathematical representations to solve problems;
- use representations to model and interpret physical, social, and mathematical phenomena.

*Principles and Standards for School Mathematics,*  
National Council of Teachers of Mathematics, 2000



# Problem Solving Standard

“Instructional programs from prekindergarten through grade 12 should enable all students to:

- build new mathematical knowledge through problem solving;
- solve problems that arise in mathematics and in other contexts;
- apply and adapt a variety of appropriate strategies to solve problems;
- monitor and reflect on the process of mathematical problem solving.”

*(Principles and Standards for School Mathematics, NCTM, 2000, p. 52)*

<b>Journey to Excellence (FACT21) Connection</b>	
<p>The following <b>GOALS</b> have been established to support the unique philosophy of Adventist education. Each student will:</p>	<p><b>ESSENTIAL CORE ELEMENTS</b> clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:</p>
<p>VI. Adopt a systematic, logical, and biblically-based approach to decision-making and problem solving when applied to a developing body of knowledge.</p>	<p>A. Broaden intellectual abilities through the study of God’s Word.            B. Use critical and creative thinking skills in “real world” experiences.            C. Develop one’s intellectual potential in natural sciences and mathematics; arts and humanities; social sciences and applied arts.            D. Utilize effective study techniques to locate, organize, and learn information.            E. Apply the principles of life-long learning.            F. Approach all intellectual pursuits from a biblical perspective.</p>
<p>VIII. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.</p>	<p>A. Develop responsible decision-making skills.            B. Appropriately manage one’s personal finances.            C. Acquire skill in the use of technologies.            D. Develop basic home-management skills.            E. Value cooperation and teamwork when interacting in groups.            G. Manage time effectively.</p>
<p>X. Develop a Christian work ethic with an appreciation for the dignity of service.</p>	<p>A. Develop an awareness of career options and opportunities in a changing world, as well as in the church.            C. Develop skills that will enhance employability.</p>

# Reasoning and Proof Standard

“Instructional programs from prekindergarten through grade 12 should enable all students to:

- recognize reasoning and proof as fundamental aspects of mathematics;
- make and investigate mathematical conjectures;
- develop and evaluate mathematical arguments and proofs;
- select and use various types of reasoning and methods of proof.

*(Principles and Standards for School Mathematics, NCTM, 2000, p. 56)*

<b>Journey to Excellence (FACT21) Connection</b>	
<p>The following <b>GOALS</b> have been established to support the unique philosophy of Adventist education. Each student will:</p>	<p><b>ESSENTIAL CORE ELEMENTS</b> clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:</p>
<p>I. Surrender one’s whole life to God; develop a relationship with Jesus Christ; and allow the Holy Spirit to work in one’s life.</p> <p>VI. Adopt a systematic, logical, and biblically-based approach to decision-making and problem solving when applied to a developing body of knowledge.</p> <p>VIII. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.</p> <p>X. Develop a Christian work ethic with an appreciation for the dignity of service.</p>	<p>E. Value God’s revelation of Himself through inspired writings and creation.</p> <p>C. Develop one’s intellectual potential in natural sciences and mathematics; arts and humanities; social sciences and applied arts.</p> <p>A. Develop responsible decision-making skills.            C. Acquire skill in the use of technologies.            E. Value cooperation and teamwork when interacting in groups.</p> <p>C. Develop skills that will enhance employability.</p>

# Communication Standard

Instructional programs from prekindergarten through grade 12 should enable all students to:

- organize and consolidate their mathematical thinking through communication;
- communicate their mathematical thinking coherently and clearly to peers, teachers, and others;
- analyze and evaluate the mathematical thinking and strategies of others;
- use the language of mathematics to express mathematical ideas precisely.”

*(Principles and Standards for School Mathematics, NCTM, 2000, p. 60)*

<b>Journey to Excellence (FACT21) Connection</b>	
<p>The following <b>GOALS</b> have been established to support the unique philosophy of Adventist education. Each student will:</p>	<p><b>ESSENTIAL CORE ELEMENTS</b> clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:</p>
<p>III. Develop a sense of self-worth, skills in interpersonal relationships, an understanding of the responsibilities of family membership, and the ability to respond with sensitivity to the needs of others.</p>	<p>B. Develop an appreciation for the diversity of individuals.</p>
<p>VI. Adopt a systematic, logical, and biblically-based approach to decision-making and problem solving when applied to a developing body of knowledge.</p>	<p>D. Utilize effective study techniques to locate, organize, and learn information.</p>
<p>VII. Recognize the importance of effective communication and develop the requisite skills.</p>	<p>A. Communicate effectively through the avenues of reading, writing, listening, speaking, and non-verbal language.            B. Apply a Christ-centered perspective to all forms of personal expression and media.            D. Recognize how media and information technology impacts communication.            E. Utilize communication skills to enhance one’s Christian witness.</p>
<p>VIII. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.</p>	<p>C. Acquire skill in the use of technologies.            E. Value cooperation and teamwork when interacting in groups.            F. Develop conflict resolution skills.</p>
<p>IX. Develop an appreciation of the beautiful, both in God’s creation and in human expression, while nurturing individual ability in the fine arts.</p>	<p>A. View God as the Author of beauty both in His creation and in human expression.</p>
<p>X. Develop a Christian work ethic with an appreciation for the dignity of service.</p>	<p>C. Develop skills that will enhance employability.</p>

# Connections Standard

Instructional programs from prekindergarten through grade 12 should enable all students to:

- recognize and use connections among mathematical ideas;
- understand how mathematical ideas interconnect and build on one another to produce a coherent whole;
- recognize and apply mathematics in contexts outside of mathematics.”

*(Principles and Standards for School Mathematics, NCTM, 2000, p. 64)*

<b>Journey to Excellence (FACT21) Connection</b>	
<p>The following <b>GOALS</b> have been established to support the unique philosophy of Adventist education. Each student will:</p>	<p><b>ESSENTIAL CORE ELEMENTS</b> clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:</p>
<p>I. Surrender one’s whole life to God; develop a relationship with Jesus Christ; and allow the Holy Spirit to work in one’s life.</p> <p>II. Desire to know, live, and share the message and mission of the Seventh-day Adventist Church.</p> <p>III. Develop a sense of self-worth, skills in interpersonal relationships, an understanding of the responsibilities of family membership, and the ability to respond with sensitivity to the needs of others.</p> <p>VI. Adopt a systematic, logical, and biblically-based approach to decision-making and problem solving when applied to a developing body of knowledge.</p> <p>VIII. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.</p> <p>IX. Develop an appreciation of the beautiful, both in God’s creation and in human expression, while nurturing individual ability in the fine arts.</p> <p>X. Develop a Christian work ethic with an appreciation for the dignity of service.</p>	<p>E. Value God’s revelation of Himself through inspired writings and creation.</p> <p>D. Accept the fundamental beliefs of the Seventh-day Adventist church.</p> <p>E. Appreciate the heritage of the Seventh-day Adventist church.</p> <p>B. Develop an appreciation for the diversity of individuals.</p> <p>D. Utilize effective study techniques to locate, organize, and learn information.</p> <p>F. Approach all intellectual pursuits from a biblical perspective.</p> <p>A. Develop responsible decision-making skills.</p> <p>C. Acquire skill in the use of technologies.</p> <p>E. Value cooperation and teamwork when interacting in groups.</p> <p>A. View God as the Author of beauty both in His creation and in human expression.</p> <p>A. Develop an awareness of career options and opportunities in a changing world, as well as in the church.</p> <p>C. Develop skills that will enhance employability.</p>

# Representation Standard

“Instructional programs from prekindergarten through grade 12 should enable all students to:

- create and use representations to organize, record, and communicate mathematical ideas;
- select, apply, and translate among mathematical representations to solve problems;
- use representations to model and interpret physical, social, and mathematical phenomena.”

*(Principles and Standards for School Mathematics, NCTM, 2000, p. 67)*

<b>Journey to Excellence (FACT21) Connection</b>	
<p>The following <b>GOALS</b> have been established to support the unique philosophy of Adventist education. Each student will:</p>	<p><b>ESSENTIAL CORE ELEMENTS</b> clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:</p>
<p>I. Surrender one’s whole life to God; develop a relationship with Jesus Christ; and allow the Holy Spirit to work in one’s life.</p> <p>VIII. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.</p> <p>IX. Develop an appreciation of the beautiful, both in God’s creation and in human expression, while nurturing individual ability in the fine arts.</p> <p>X. Develop a Christian work ethic with an appreciation for the dignity of service.</p>	<p>E. Value God’s revelation of Himself through inspired writings and creation.</p> <p>C. Acquire skill in the use of technologies.</p> <p>E. Value cooperation and teamwork when interacting in groups.</p> <p>A. View God as the Author of beauty both in His creation and in human expression.</p> <p>B. Employ biblical principles as the basis for appreciation and expression of creative and performing arts.</p> <p>C. Develop skills that will enhance employability.</p>



## Secondary Essential Learnings

The goal of Seventh-day Adventist education is to restore the image of the Creator in each individual. The restoration process is accomplished by developing a personal relationship with Jesus, prayer, reading of scripture, commitment, modeling and instruction that integrate faith and learning. As a result the NCTM standards and Ten Sigma, as well as the perspectives of a variety of textbook series and authors have been integrated with the far-reaching goals of *Journey to Excellence* (See Appendix), which impact one's life presently as well as one's future destiny.

This section identifies those Essential Core Elements within the stated goals of *Journey to Excellence*. The Roman numerals correspond to the specific goal listed in the document, *Journey to Excellence*, with the related Essential Core Elements identified. The mathematical concept or principle that can easily be used to integrate faith and learning is given under each Essential Core Element. This is not an exhaustive list, but one that can serve as a springboard to generate other mathematical connections between faith and learning.



# Spiritual Concepts Integrated in Mathematics

## *Journey to Excellence Through Secondary Mathematics Instruction*

In mathematical instruction every effort will be made to guide students to:

- I-E Value God’s revelation of Himself through inspired writings and creation**
  - Demonstrate the harmony of mathematical principles evident in an orderly universe
  - Illustrate the relation of shape and space in nature to Euclidian geometry
  
- II-F Relate to lifestyle choices and cultural issues based on Biblical principles**
  - Teach that integrity in accomplishing one’s work is most important
  
- III-B Develop an appreciation for the diversity of individuals**
  - Develop sensitivity to the diversity of culture within the classroom
  - Use multi-cultural illustrations and contributions of other cultures to mathematical knowledge
  - Modify lessons and assignments to fit the needs of individuals in the classroom
  
- III-C Acquire knowledge, attitudes, and skills essential to meeting family responsibilities whether living alone or with others**
  - Connect skills in mathematics to household maintenance, budgeting, cooking, shopping, etc.
  
- III-D Recognize that God’s unconditional love gives one self-worth**
  - Demonstrate forgiveness and continued relationship, even with the “difficult” student
  
- V-B Incorporate into one’s lifestyle the principles that promote health; nutrition, exercise, water, sunlight, temperance, air, rest, trust in God.**
  - Encourage wholesome lifestyle choices and activities that will give the best opportunity for careful reasoning and accomplishment of tasks
  
- V-F Recognize the interaction of physical, mental, and spiritual health with emotional and social well-being**
  - Connect the goals of character development and of Adventist education as the same — the development of the entire person
  
- VI-B Use critical and creative thinking skills in “real world” experiences**
  - Connect real-life situations to applications of mathematics
  - Teach students to analyze their solutions and identify the strengths and weaknesses of solutions
  - Encourage students to approach mathematics creatively and to test observations to make sure work is consistent
  
- VI-C Develop one’s intellectual potential in natural sciences and mathematics, arts and humanities, social sciences and applied arts**
  - Plan a variety of instructional strategies to give greater opportunity for understanding mathematical principles
  - Encourage high standards in work accomplished

*Journey to Excellence Through Secondary Mathematics Instruction*

**VI-D Utilize effective study techniques to locate, organize, and learn information**

- Encourage the development of consistent, positive study skills as the best opportunity for success
- Expect all submitted work to be presented in a neat, legible, and logical manner
- Guide students to the ethical use of the Internet and other technologies

**VI-E Apply the principles of lifelong learning**

- Encourage continuing growth and participation in progressing levels of mathematics education throughout academy and higher education
- Share the vision of the excitement of continuing to learn throughout life

**VI-F Approach all intellectual pursuits from a Biblical perspective**

- Showcase God as the author of mathematics and that the order and harmonious functioning of mathematics are reflections of a God of creative order, both geometrically and algebraically

**VII-A Communicate effectively through the avenues of reading, writing, listening, speaking, and nonverbal language**

- Develop problem-solving skills through careful reading and analysis of information given, then translate into mathematical language for solution
- Use journal writing, student-to-student tutoring, illustrations, etc. to develop more comprehensive skills in mathematics, rather than seeing mathematics as a subject that deals with numbers only
- Encourage listening as an essential skill in learning as well as respecting the viewpoints of others

**VII-D Recognize how media and information technology impacts communication**

- Teach students to be discriminating in the information received and that how information is communicated to increase knowledge has its foundation in God's wisdom

**VIII-A Develop responsible decision making skills**

- Teach that both positive and negative choices have an impact upon self and others
- Teach that all true decision-making is based upon Biblical principles

**VIII-B Appropriately manage one's personal finances**

- Instruct in the principle of tithing as the basis for successful financial planning

**VIII-C Acquire skill in the use of technologies**

- Use current technologies (graphing calculators, computer programs and skills) to enhance one's learning experiences through demonstration and hands-on experiences

**VIII-E Value cooperation and teamwork when interacting in groups**

- Establish relationship with parent, administration, teacher, and student to enhance the learning experience
- Use cooperative learning experiences in the classroom to involve more individuals in the educational experience
- Teach respect for the opinions and ideas of others when working together

**VIII-F Develop conflict resolution skills**

- Work within the classroom for positive, Biblically-based resolution of conflict which may arise between teacher and student or between student and student

**VIII-G Manage time effectively**

- Teach responsible work habits in the mathematics classroom where positive interaction is possible to solve problems
- Teach that what becomes habit on a daily basis helps most for tests and exams

*Journey to Excellence Through Secondary Mathematics Instruction*

- IX-A View God as the Author of beauty both in His creation and in human expression**  
 Connect natural shapes with the mathematics of shape and number, symmetry and order
- X-A Develop an awareness of career options and opportunities in a changing world, as well as in the church**  
 Use textbooks, posters, newspapers, etc. to expose students to careers in mathematics  
 Invite guests to share with classes how they use mathematics in their work experience
- X-B Recognize the role of useful work in personal development and maintaining self-worth**  
 Challenge each one to set goals in mathematics that are attainable and measurable, and to establish higher goals when one goal is achieved
- X-C Develop skills that will enhance employability**  
 Teach that mathematical skills are among the most important skills for good employability  
 Encourage the development of mental math skills for effective job performance
- X-D Experience the joy of serving others**  
 Teach students to help those who are struggling with math to engender a sense of accomplishment and greater math understanding for all
- X-F Always put forth one's best effort in every task**  
 Demonstrate that one's best effort is all that is asked of anyone in any circumstance, and that by so doing an individual's self-esteem and sense of accomplishment is enhanced



# NCTM Standards and Expectations 9 – 12 and NAD Mathematics Curriculum Guidelines

The *National Council of Teachers of Mathematics* (NCTM) standards and expectations have been incorporated into the NAD mathematics curriculum as the standard of instruction throughout the North American Division. Whether teaching a distinctive integrated curriculum or separate, but integrated, courses in Algebra and Geometry (as reflected in the course content of this document), the same Essential Learnings are appropriate for both. It is left to the individual teacher of mathematics to prepare course content according to the NAD Essential Learnings in conjunction with state/provincial requirements and course content as specified for each grade level.

## **Number and Operations Standard**

All students should be enabled to—

*Understand numbers, ways of representing numbers, relationships among numbers, and number systems*

- Develop a deeper understanding of very large and very small numbers and various representations of them;
- Compare and contrast the properties of numbers and number systems, including the rational and real numbers, and understand complex numbers as solutions to quadratic equations that do not have real solutions;
- Understand vectors and matrices as systems that have some of the properties of the real-number system;
- Use number-theory arguments to justify relationships involving whole numbers.

*Understand meanings of operations and how they relate to one another*

- Judge the effects of such operations as multiplication, division, and computing powers and roots on the magnitudes of quantities;
- Develop an understanding of properties of, and representations for, the addition and multiplication of vectors and matrices;
- Develop an understanding of permutations and combinations as counting techniques.

*Compute fluently and make reasonable estimates*

- Develop fluency in operations with real numbers, vectors and matrices, using mental computation or paper-and-pencil calculations for simple cases and technology for more-complicated cases;
- Judge the reasonableness of numerical computations and their results.

## **Algebra Standard**

All students should be enabled to—

*Understand patterns, relations and functions*

- Generalize patterns using explicitly defined and recursively defined functions;
- Understand relations and functions and select, convert flexibly among, and use various representations for them;
- Analyze functions of one variable by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior;
- Understand and perform transformations such as arithmetically combining, composing, and inverting commonly used functions, using technology to perform such operations on more-complicated symbolic expressions;

## *NCTM Standards and Expectations 9 – 12 and NAD Mathematics Curriculum Guidelines*

- Understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic and periodic functions;
- Interpret representations of functions of two variables.

### *Represent and analyze mathematical situations and structures using algebraic symbols*

- Understand the meaning of equivalent forms of expressions, equations, inequalities, and relations;
- Write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency—mentally or with paper and pencil in simple cases and using technology in all cases;
- Use symbolic algebra to represent and explain mathematical relationships;
- Use a variety of symbolic representations, including recursive and parametric equations, for functions and relations;
- Judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology.

### *Use mathematical models to represent and understand quantitative relationships*

- Identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships;
- Use symbolic expressions, including iterative and recursive forms, to represent relationships arising from various contexts;
- Draw reasonable conclusions about a situation being modeled.

### *Use change in various contexts*

- Approximate and interpret rates of change from graphical and numerical data.

## **Geometry Standard**

All students should be enabled to—

### *Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships*

- Analyze properties and determine attributes of two- and three-dimensional objects;
- Explore relationships (including congruence and similarity) among classes of two- and three-dimensional geometric objects, make and test conjectures about them, and solve problems involving them;
- Establish the validity of geometric conjectures using deduction, prove theorems, and critique arguments made by others;
- Use trigonometric relationships to determine lengths and angle measures.

### *Specify locations and describe spatial relationships using coordinate geometry and other representational systems*

- Use Cartesian coordinates and other coordinate systems, such as navigational, polar, or spherical systems, to analyze geometric situations;
- Investigate conjectures and solve problems involving two- and three-dimensional objects represented with Cartesian coordinates.

### *Apply transformations and use symmetry to analyze mathematical situations*

- Understand and represent translations, reflections, rotations, and dilations of objects in the plane by using sketches, coordinates, vectors, function notation, and matrices;
- Use various representations to help understand the effects of simple transformations and their compositions.

## *NCTM Standards and Expectations 9 – 12 and NAD Mathematics Curriculum Guidelines*

*Use visualization, spatial reasoning, and geometric modeling to solve problems*

- Draw and construct representations of two- and three-dimensional geometric objects using a variety of tools;
- Visualize three-dimensional objects and spaces from different perspectives and analyze their cross-sections;
- Use vertex-edge graphs to model and solve problems;
- Use geometric models to gain insights into, and answer questions in, other areas of mathematics;
- Use geometric ideas to solve problems in, and gain insights into, other disciplines and other areas of interest such as art and architecture.

### **Data Analysis and Probability Standard**

All students should be enabled to—

*Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them*

- Understand the differences among various kinds of studies and which types of inferences can legitimately be drawn from each;
- Know the characteristics of well-designed studies, including the role of randomization in surveys and experiments;
- Understand the meaning of measurement data and categorical data, of univariate and bivariate data, and of the term variable;
- Understand histograms, parallel box plots, and scatterplots and use them to display data;
- Compute basic statistics and understand the distinction between a statistic and a parameter.

*Select and use appropriate statistical methods to analyze data*

- For univariate measurement data, be able to display the distribution, describe its shape, and select and calculate summary statistics;
- For bivariate measurement data, be able to display a scatterplot, describe its shape, and determine regression coefficients, regression equations, and correlation coefficients using technological tools;
- Display and discuss bivariate data where at least one variable is categorical;
- Recognize how linear transformations of univariate data affect shape, center, and spread;
- Identify trends in bivariate data and find functions that model the data or transform the data so that they can be modeled.

*Develop and evaluate inferences and predictions that are based on data*

- Use simulations to explore the variability of sample statistics from a known population and to construct sampling distributions;
- Understand how sample statistics reflect the values of population parameters and use sampling distributions as the basis for informal inference;
- Evaluate published reports that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions;
- Understand how basic statistical techniques are used to monitor process characteristics in the workplace.

*Understand and apply basic concepts of probability*

- Understand the concepts of sample space and probability distribution and construct sample spaces and distributions in simple cases;
- Use simulations to construct empirical probability distributions;
- Compute and interpret the expected value of random variables in simple cases;
- Understand the concepts of conditional probability and independent events;
- Understand how to compute the probability of a compound event.

**Measurement Standard**

All students should be enabled to—

*Understand measurable attributes of objects and the units, systems, and processes of measurement*

- Make decisions about units and scales that are appropriate for problem situation involving measurement.

*Apply appropriate techniques, tools, and formulas to determine measurements*

- Analyze precision, accuracy, and approximate error in measurement situations;
- Understand and use formulas for the area, surface area, and volume of geometric figures, including cones, spheres, and cylinders;
- Apply informal concepts of successive approximations, upper and lower bounds, and limit in measurement situations;
- Use unit analysis to check measurement computations.

**Problem Solving Standard**

All students should be enabled to—

- Build new mathematical knowledge through problem solving;
- Solve problems that arise in mathematics and in other contexts;
- Apply and adapt a variety of appropriate strategies to solve problems;
- Monitor and reflect on the process of mathematical problem solving.

**Reasoning and Proof Standard**

All students should be enabled to—

- Recognize reasoning and proof as fundamental aspects of mathematics;
- Make and investigate mathematical conjectures;
- Develop and evaluate mathematical arguments and proofs;
- Select and use various types of reasoning and methods of proof.

**Communication Standard**

All students should be enabled to—

- Organize and consolidate their mathematical thinking coherently and clearly to peers, teachers, and others
- Analyze and evaluate the mathematical thinking and strategies of others;
- Use the language of mathematics to express mathematical ideas precisely.

**Connections Standard**

All students should be enabled to—

- Recognize and use connections among mathematical ideas;
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole;
- Recognize and apply mathematics in contexts outside of mathematics.

*NCTM Standards and Expectations 9 – 12 and NAD Mathematics Curriculum Guidelines*

**Representation Standard**

All students should be enabled to—

- Create and use representations to organize, record and communicate mathematical ideas;
- Select, apply and translate among mathematical representations to solve problems;
- Use representations to model and interpret physical, social and mathematical phenomena.

**The following courses in the NAD Mathematics Curriculum Guide detail the Essential Learnings for meeting the NCTM standards:**

**Pre-Algebra  
Algebra I  
Geometry**

**Algebra II  
Precalculus  
Calculus**



## RECOMMENDED COURSE SEQUENCE OPTIONS

*Student who is not ready for Algebra I in 9<sup>th</sup> grade:*

Year One	Pre-Algebra
Year Two	Algebra I
Year Three	Geometry or Algebra II
Year Four	Algebra II or Geometry

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*Student who is ready for Algebra I in 9<sup>th</sup> grade:*

Year One	Algebra I
Year Two	Geometry or Algebra II
Year Three	Algebra II or Geometry
Year Four	Precalculus or Other Adv. Math

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*Student who has completed Algebra I in 8<sup>th</sup> grade:*

Year One	Geometry or Algebra II
Year Two	Algebra II or Geometry
Year Three	Precalculus
Year Four	Calculus or Other Adv. Math



# PRE-ALGEBRA

	<u>Carnegie Unit</u>	<u>Semester Periods</u>
Units of Credit	1	10

Pre-Algebra is designed to strengthen students' mathematical skills in preparation for Algebra I and Geometry.

## COURSE OVERVIEW

Pre-Algebra is designed to help the student make the transition from basic elementary mathematics to Algebra I and Geometry and provides a foundation for understanding a broad spectrum of mathematical topics.

## COURSE GOALS

The Pre-Algebra course will enable students to:

1. reinforce skills in arithmetic computations
2. use ratio and proportion and their applications
3. develop skills with variables and solution of equations
4. understand basic concepts of function
5. identify and use designs and patterns in Algebra and Geometry
6. understand the different dimensions in Geometry and the measurements associated with each
7. analyze statistical data and use the ideas of probability

PROCESSES					PRE-ALGEBRA Essential Learnings	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>COMPUTATION</b>					
	✓				Computing with exponents (using technology)					●
	✓				Estimating and rounding (using technology)				●	●
	✓				Determining order of operations (using technology)					●
	✓	✓			Using technology to solve real world problems involving exponents, estimating and rounding					●
	✓			✓	Modeling signed numbers					●
✓					Performing operations on signed numbers					●
		✓			Applying signed numbers to real world problems					●
✓				✓	Square roots, calculations					●
					<b>RATIO AND PROPORTION</b>					
✓	✓	✓		✓	Expressing ratios as fractions, decimals and percents	●				●
✓	✓		✓		Using ratios to compare quantities, analyze change and express rates					●
		✓			Using proportions to find unknown values	●				●
	✓	✓			Applying ratio and proportion	●				●
	✓				Identifying and applying properties of similar figures			●		
	✓	✓		✓	Using ratios to construct scale drawings	●				●
	✓	✓		✓	Finding and applying trigonometric ratios			*		
					<b>VARIABLES AND EQUATIONS</b>					
✓					Variables in expressions	●				
✓					Evaluating expressions	●				●
✓					Distributive property	●				●
✓					Simplifying expressions	●				●
	✓	✓			Applying algebraic methods to problem solving	●				

● = requisite \* = discretionary

PROCESSES					PRE-ALGEBRA Essential Learnings	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>VARIABLES AND EQUATIONS-continued</b>					
		✓			Using formulas	●		●		
			✓		Using number sense	●				●
	✓	✓		✓	Understanding and solving equations using manipulatives	●				
		✓			Isolating the variable	●				●
		✓			Solving two step equations	●				●
		✓			Synthesizing and applying properties of equality	●				●
					<b>FUNCTIONS</b>					
✓				✓	Expressing relationships between linear quantities	●				
				✓	Graphing relationships between quantities	●				
				✓	Identifying linear functions	●				
				✓	Slope and intercept	●				●
	✓	✓		✓	Applying linear functions	●				
	✓			✓	Recognizing the relationship between equations and their graphs	●				
				✓	Quadratic functions	*				
					<b>DESIGNS AND PATTERNS</b>					
	✓			✓	Understanding and using symmetry			●		
	✓		✓	✓	Finding number patterns					●
✓	✓			✓	Expressing patterns using variables	●				
	✓			✓	Relating number sequences to patterns of figures	●				●
	✓			✓	Understanding and using tessellations			*		

● = requisite \* = discretionary

PROCESSES					PRE-ALGEBRA Essential Learnings	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>GEOMETRY</b>					
	✓			✓	Drawing three dimensional solids			●		
			✓	✓	Measuring and comparing sizes in two and three dimensions			●	●	
	✓			✓	Finding perimeters and areas of regular polygons and circles	●		●	●	●
	✓			✓	Finding surface areas of solids			●	●	●
	✓			✓	Finding volumes of solids			●	●	●
				✓	Angles and angle relationships			●	●	●
	✓			✓	Using properties of right triangles			●		●
					<b>DATA ANALYSIS AND PROBABILITY</b>					
✓	✓			✓	Data representation on maps, graphs, and spreadsheets		*			
	✓		✓	✓	Interpretation of maps, graphs, and spreadsheets		*			
		✓		✓	Scatter Plots		*			
				✓	Quadratic functions	*				
		✓		✓	Measures of central tendency		*			*
	✓				Probability and odds		*			*
	✓			✓	Simulations		*			
	✓			✓	Counting and tree diagrams		*			
	✓			✓	Grouping and sample types		*			
				✓	Population sizes		*			

● = requisite \* = discretionary

# ALGEBRA I

## (Year One Integrated Mathematics)

	<u>Carnegie Unit</u>	<u>Semester Periods</u>
Units of credit	1	10
Prerequisite	Mathematics Grade 8 and/or Pre-Algebra	

Algebra I is designed to provide a solid mathematical foundation as well as fulfill the requirements for high school graduation and prepare students for Geometry, Algebra II, and standardized tests such as the SAT and ACT.

### COURSE OVERVIEW

Algebra I is designed as an integrated curriculum using algebraic skills with extensions to topics in arithmetic, geometry, statistics, and probability. The curriculum content has been extended to include a wider range of essential skills in algebra for continuation of study in mathematics. Problem-solving and beginning use of technology (calculator usage) are important aspects of this course.

### COURSE GOALS

Algebra I will enable students to:

- consolidate their skills with the real number system
- develop essential algebraic skills
- use a variety of skills to solve linear and quadratic equations, including the concept of variation
- distinguish between functions and relations and their applications to graphing
- use patterns; understand geometric shapes and relationships
- give further study to measurements in geometry
- explore statistical data and its use in understanding variability and dispersion
- perform basic skills with matrices

PROCESSES					ALGEBRA I (Year One Integrated Mathematics) Essential Learnings	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>REAL NUMBER SYSTEMS</b>					
✓				✓	Operations on real numbers					●
	✓			✓	Models for integers and integer operations					●
✓				✓	Absolute value, inequality and number line	●			●	●
				✓	Scientific notation				●	●
✓					Properties of inequalities	●				
	✓				Rates, ratios and percents					●
		✓	✓		Squares, square roots, approximations and their applications				●	●
	✓	✓			Pythagorean theorem and applications			●	●	●
	✓				Distance and midpoint formulas	●		●	●	●
✓	✓			✓	Properties of real numbers: opposites, inverses, order, closure, identity and distributive properties					●
✓					Hierarchy of real-number subsets					●
					<b>ALGEBRAIC SKILLS</b>					
	✓				Informal notions of variable, evaluating formulas	●				
		✓		✓	Writing and evaluating variable expressions	●				
			✓		Order of operations	●				●
			✓		Equivalent and nonequivalent expressions	●				
		✓		✓	Simplifying and performing operations on polynomial, radical, and rational expressions	●				●
				✓	Products, quotients and powers of monomials	●				●
	✓				Multiplying and dividing a polynomial by a monomial, and interpreting with area models	●				●
	✓	✓			Properties of exponents and exponential functions	●				●
			✓		Factoring monomials, binomials, and trinomials	●				

● = requisite \* = discretionary

PROCESSES					ALGEBRA I (Year One Integrated Mathematics) Essential Learnings	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>ALGEBRAIC SKILLS-continued</b>					
		✓	✓		Solving formulas	●			●	
✓	✓				Special products: $(a \pm b)^2$ and $(a + b)(a - b)$ and area models	●		●		
	✓	✓			Compound interest, population growth, depreciation and other exponential applications	●			●	●
					<b>EQUATIONS AND INEQUALITIES</b>					
✓				✓	Writing equations and inequalities for given conditions	●				
✓	✓			✓	Solving linear equations and inequalities by equivalent operation	●				
		✓	✓		Solving absolute-value equations and inequalities	●				
		✓	✓		Solving radical equations	●				
		✓		✓	Use of zero product property	●				
	✓	✓	✓	✓	Solve quadratic equations by factoring, graphing, and the quadratic formula	●				
		✓		✓	Evaluating formulas/expressions	●				●
	✓	✓	✓		Using tables to generate equations	●				
	✓	✓	✓	✓	Solving problems that can be modeled by linear equations and inequalities; use of “and”, “or” statements in one variable	●				
✓		✓			Using graphs to solve linear equations and inequalities	●				
		✓		✓	Solving systems of linear equations and inequalities by graphing, substitution, or linear combination (addition)	●				
	✓	✓			Ratio and proportion applications					●
✓	✓			✓	Writing formulas to express variation relationships given in written, tabular and graphical form (implicit slope definition)	●				

PROCESSES					ALGEBRA I (Year One Integrated Mathematics) Essential Learnings	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>FUNCTIONS, RELATIONS AND GRAPHS</b>					
		✓			Solutions of equations in two variables	●				
				✓	Graphing relations	●				
			✓		Graphing linear inequalities	●				
✓				✓	Input-output model of a function	●				
	✓				Slope-intercept form of linear functions, parallel and perpendicular lines	●		●		
	✓	✓	✓		Writing equations for lines satisfying given conditions	●				
				✓	Coordinate system, ordered pairs, paired data, and scatter diagrams	●	●			
			✓	✓	Intuitive line fitting and interpretation of linear graphs	●	●			
✓			✓		Predicting rules for well-behaved data	●				
				✓	Using rules to produce linear graphs	●				
✓	✓				Graphing related families of lines; slope and intercept	●				
✓				✓	Quadratic graphs and paired data	●				
			✓		Families of lines: $m$ as a stretch, and $b$ as a translation	*		*		
					<b>PATTERNS &amp; GEOMETRIC FIGURES</b>					
		✓	✓		Generalizing number and geometric patterns	●		●		●
✓					Concepts of point, line, ray, plane, space, parallel, perpendicular, bisection, symmetry, polygon, and circle			●		
		✓	✓		Predicting from patterns	●		●		
	✓				Relations in space, informal loci			*		
				✓	Segment and angle measurement and congruence			*	*	
				✓	Construction and locus discoveries			*		
	✓			✓	Angle relationships			*		
	✓				Polygons			*	*	

● = requisite \* = discretionary

PROCESSES					ALGEBRA I (Year One Integrated Mathematics) Essential Learnings	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>GEOMETRIC MEASUREMENTS</b>					
✓			✓		Properties of polygons and angles: triangle sum, polygon sum, exterior angles of polygons and angles of regular polygons			*		
	✓		✓		Generation and solution of equations related to angle measures	*		*		*
	✓	✓			Perimeter and area of polygons and circles			*	*	*
					<b>EXPLORING DATA</b>					
✓	✓			✓	Graphing nonlinear paired data		●			
			✓	✓	Sorting and sequencing data		●			
✓				✓	Mean, median and variability		●			●
		✓			Variations: direct, inverse, square and joint	●				●
	✓	✓		✓	Interpretations of direct and inverse variation graphs in terms of rate, constants of variation, and effect of parameter changes on graphs	●				
✓	✓			✓	Domain and range	●				
✓			✓	✓	Presentations of data; tables, matrices, frequency distributions, stem-and-leaf plots, line graphs, circle graphs, boxplots, and percentiles		●			
✓					Dispersion, measures of dispersion, box and whisker plots		●		●	
					<b>MATRICES</b>					
	✓		✓	✓	Writing and interpreting information matrices	*				*
	✓	✓	✓		Performing and interpreting sums and products of matrices	*				*



# **GEOMETRY**

## **(Year Two Integrated Mathematics)**

	<u>Carnegie Unit</u>	<u>Semester Periods</u>
Units of Credit	1	10
Prerequisite	Algebra I or its equivalent	

Geometry is designed to provide a solid foundation in geometry with connections to other disciplines in mathematics, as well as fulfill the requirements for high school graduation and prepare students for Algebra II and standardized tests such as the SAT and ACT.

### **COURSE OVERVIEW**

Geometry is designed as an integrated curriculum with extensions to algebra and trigonometry and introduces the student to logical structures as it applies to problem solving, reasoning and proof. Various methods of approach – both algebraic and geometric – will be used.

### **COURSE GOALS**

Geometry will enable students to:

- develop skills in logical reasoning and proof
- extend geometric shapes to the coordinate plane
- relate patterns in shape to algebraic manipulations and geometric proof
- continue to build skill in measurements in the plane and space
- use transformations to manipulate shapes
- use trigonometry to solve right and oblique triangles

PROCESSES					<p style="text-align: center;"><b>GEOMETRY</b> <b>(Year Two Integrated Mathematics)</b> <b>Essential Learnings</b></p>	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>LOGIC</b>					
✓			✓		Statements and negations					
✓			✓		Conjunctions and disjunctions (conditional statements)					
✓			✓		Implications and their translations and properties					
✓			✓		Converses					
✓			✓		Double implications (biconditionals)					
✓			✓		Flow proofs					
✓			✓		Introduction to inductive versus deductive reasoning and counterexamples, indirect proof			●		
					<b>GEOMETRIC SHAPES AND THE COORDINATE PLANE</b>					
			✓	✓	Introduction of geometric tools such as: models, protractors, compasses; use of algebra to express geometric concepts	●		●	●	
✓				✓	Describing 1-, 2-, 3-D figures			●		
✓	✓			✓	Drawing and sketching 2-, 3-D figures			●		
		✓		✓	Angle relationships			●	●	●
✓	✓			✓	Symmetry			●		
	✓			✓	Slope	●		●	●	●
	✓			✓	Parallels and perpendiculars on the plane	●		●		
		✓		✓	Midpoint and distance formulas	●		●	●	●
			✓	✓	Coordinates for triangles and quadrilaterals	●		●	●	●
✓	✓		✓		Deductions based on coordinates			●		
	✓			✓	Vectors	+		+	+	

⊕ = underpinning of calculus

● = requisite \* = discretionary

PROCESSES					<p style="text-align: center;"><b>GEOMETRY</b> <b>(Year Two Integrated Mathematics)</b> <b>Essential Learnings</b></p>	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>PATTERNS IN SHAPES</b>					
				✓	Triangle sum and classification of triangles	●		●		●
				✓	Polygon sum property, exterior angle property, angles in regular polygons	●		●		●
✓		✓	✓	✓	Properties of quadrilaterals leading to hierarchy of quadrilaterals	●		●		
				✓	Inscribed angle property	●		●		●
				✓	Properties of triangles	●		●		●
				✓	Equations, properties of circles	●		●		●
			✓	✓	A minimal deductive system for typical proofs about supplements, complements, angles formed by parallel lines	●		●		
			✓	✓	A minimal deductive system for proofs about congruent and similar triangles (e.g., earlier work with patterns for unique triangles are postulated)	●		●		
✓			✓	✓	Patterns for congruent triangles: ASA, AAS, SAS, SSS			●		
✓			✓	✓	Ambiguous patterns AAA, SSA			●		
					<b>MEASUREMENT IN THE PLANE</b>					
			✓	✓	Distinctions among 1-, 2-, 3-D measures			●	●	
				✓	Perimeter and circumference in the plane	●		●	●	●
	✓			✓	Areas of squares, rectangles, parallelograms, triangles, trapezoids	●		●	●	●
	✓	✓		✓	Pythagorean theorem	●		●	●	●
	✓	✓		✓	Special right triangles	●		●	●	●
	✓	✓		✓	Geometric probability using 2-D models	●	●	●		
		✓		✓	Surface area and volume of a prism, cylinder, pyramid, cone and sphere			●	●	●
				✓	Similar figures in space and ratios of similarity for 1-, 2-, 3-D measures			●	●	●
	✓	✓		✓	Geometric probability using 3-D models	*	*	*		

PROCESSES					<p style="text-align: center;"><b>GEOMETRY</b> <b>(Year Two Integrated Mathematics)</b> <b>Essential Learnings</b></p>	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>TRANSFORMATIONS</b>					
				✓	Reflections over x- and y-axes and the line $y = x$	●		●		
				✓	Translations, vectors	●		●		
				✓	Rotations by multiples of 90 degrees	●		●		
				✓	Dilations $(x, y) \rightarrow (ax, ay)$	●		●		
	✓			✓	Stretches $(x, y) \rightarrow (ax, by)$			●		
				✓	Invariants (fixed values)			●		
		✓			Definitions and uses of congruence and similarity			●		
				✓	Tessellations			*		
					<b>TRIGONOMETRY</b>					
				✓	Right angle properties (constant ratios)	●		●	●	
	✓	✓		✓	Applications of trigonometric ratios	●		●	●	●
	✓			✓	Unit circle	*		*	*	
		✓		✓	Law of sines	*				*
		✓		✓	Law of cosines	*				*

# ALGEBRA II

## (Year Three Integrated Mathematics)

	<u>Carnegie Units</u>	<u>Semester Periods</u>
Units of credit	1	10
Prerequisite	Algebra I and Geometry or their equivalents	

Algebra II is designed as a course to enrich a student's experience in mathematical skills and helps a student to fulfill high school graduation requirements.

### COURSE OVERVIEW

Algebra II is an integrated course for students which gives focus to developing skills on the domain of the real and complex number systems as the basis for understanding various types of functions in preparation for studying Calculus and other areas of higher mathematics. Emphasis will be given to real-world problem solving skills and an enhanced use of technology (graphing calculators).

### COURSE GOALS

Algebra II will enable students to:

1. develop skills in the real and complex number systems
  - extend their skills in patterns and properties of numbers, including sequences, series, and limits
- I. solve linear and quadratic equations and their extensions in 2-D
  - A. study a variety of functions – linear, polynomial, exponential, logarithmic, rational, and circular – and their use in a wide variety of problem-solving situations
  - a. develop skills with matrices with their applications to transformations
    - extend their skills in probability and statistics

PROCESSES						CONTENT				
Communication	Connections	Problems Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>ALGEBRA II</b> <b>(Year Three Integrated Mathematics)</b> <b>Essential Learnings</b>					
					<b>REAL AND COMPLEX NUMBER SYSTEMS</b>					
					Rational and irrational numbers					●
				✓	Rational exponents	●				●
✓			✓		Real numbers and field properties					●
					Imaginary numbers	●				●
		✓			Operations with complex numbers	●				●
				✓	Hierarchy of complex numbers					●
✓					Finite systems	●				●
✓					Radical equations	●				
	✓		✓		Algebraic proof	●				
					<b>PATTERNS AND PROPERTIES OF NUMBERS</b>					
			✓		Extending and generalizing patterns of numbers, array and geometric figures	●		●		●
	✓				Sequences and series	●				
			✓		Recursive formulas	●				●
		✓			Finite differences	●				●
		✓	✓		“Explaining” number tricks					●
✓				✓	Field Properties	●				●
					<b>LINEAR EQUATIONS AND INEQUALITIES</b>					
		✓			Solving linear equations and inequalities	●				
	✓				Slope-intercept form of linear equations; parallel and perpendicular lines	●		●		
✓					Absolute value	●				●
					Literal equations and formulas	●				
✓			✓		Logical connectives: “and”, “or”	●				

PROCESSES					ALGEBRA II (Year Three Integrated Mathematics) Essential Learnings	CONTENT				
Communication	Connections	Problems Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>LINEAR EQUATIONS AND INEQUALITIES-continued</b>					
	✓	✓			Solutions of systems of linear equations by graphing, tables, substitution and addition	●				
				✓	Solutions of systems of linear inequalities by graphing	●				
	✓		✓		Linear programming	●				
				✓	Absolute value inequalities	●				●
					<b>QUADRATIC EQUATIONS AND RELATIONS</b>					
✓					Quadratic functions	●				
		✓			Solving quadratic equations by graphing, the quadratic formula, and factoring	●				●
	✓	✓			Conics: locus definitions, optical properties and applications	●		●		
				✓	Completing the square	●				
✓			✓		Discriminant	●				
					<b>FUNCTIONS AND GRAPHS</b>					
✓	✓				Functions and relations, input-output model and function notations	●				
✓	✓			✓	Step functions	●				
✓	✓			✓	Translations, effects of parameter changes on linear and quadratic relations and functions	●				
		✓			Graphical solution of nonlinear systems	●				
	✓			✓	Graphical introduction of exponential, logarithmic, sine, cosine and tangent functions	+		+		
✓	✓			✓	Characteristics of graphs: symmetry, maxima/minima, increasing-decreasing, excluded regions and periodicity	+		+		

⊕ = underpinning of calculus

● = requisite \* = discretionary

PROCESSES					ALGEBRA II (Year Three Integrated Mathematics) Essential Learnings	CONTENT				
Communication	Connections	Problems Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>POLYNOMIALS AND POLYNOMIAL FUNCTIONS</b>					
✓					Exponent laws	●				●
		✓			Sum, product of monomials and polynomials	●				
	✓	✓		✓	Binomial theorem and Pascal's triangle	●	●			●
		✓			Graphing polynomial functions	●				
		✓			Roots by graphical estimation	●				
✓		✓			Remainder and Factor Theorems	●				
✓					Fundamental Theorem of Algebra	●				
✓				✓	Inverse functions	●				
					<b>EXPONENTIAL AND LOGARITHMIC FUNCTIONS</b>					
				✓	Graphing exponential and logarithmic functions	●				
	✓	✓			Exponential growth and decay, applications and modeling	●				●
	✓	✓			Logarithmic applications	●				
		✓			Solutions of simple exponential and logarithmic equations	●				
✓	✓				Properties of exponents and logarithms	●				●
			✓		Simplifying exponential and logarithmic expressions	●				●
					<b>CIRCULAR FUNCTIONS</b>					
	✓			✓	Sine, cosine and tangent graphs and periodic behavior	+		+		
✓	✓				Degree and radian measures	+		+		+
	✓	✓			Applications of periodic motion	+		+		
	✓	✓			Solving simple trigonometric equations involving real-world phenomena	+		+		
			✓	✓	Graphical properties of $y = a \sin bx$ and $y = a \cos bx$	+		+		

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PROCESSES					ALGEBRA II (Year Three Integrated Mathematics) Essential Learnings	CONTENT				
Communication	Connections	Problems Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>RATIONAL EXPRESSIONS AND FUNCTIONS</b>					
			✓		Operations on rational expressions	●				●
	✓	✓			Fractional equations and applications	●				
	✓	✓		✓	Inverse variation	●				
		✓		✓	Graphing simple rational functions	●				
✓				✓	Asymptotes	+				
✓		✓		✓	Rational functions and horizontal and vertical asymptotes, holes	+				
					<b>MATRICES</b>					
	✓			✓	Information matrices		●			
		✓			Directed graphs, drawings and networks	●				
		✓			Sums and products of matrices	●				●
	✓		✓		Transformations of geometric figures by matrices	●		●		
	✓				Inverse of a square matrix, solution of linear system	●				●
					<b>PROBABILITY AND STATISTICS</b>					
	✓	✓			Counting situations, tree diagrams		●			
	✓	✓			Simple probability experiments and applications		●			●
	✓	✓		✓	Theoretical probability and simulations		●			
		✓			Sampling techniques, random numbers		●			
			✓	✓	Mean and standard deviation		*		*	*
			✓		Normal distribution		*		*	
		✓			Conditional probability		*			
	✓	✓			Permutations and combinations	*	*			*
	✓	✓			Linear regression and correlation	*	*		*	*

✚ = underpinning of calculus

● = requisite \* = discretionary

PROCESSES					ALGEBRA II (Year Three Integrated Mathematics) Essential Learnings	CONTENT				
Communication	Connections	Problems Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>SEQUENCES, SERIES, AND LIMITS</b>					
	✓	✓			Arithmetic and geometric sequences	●				●
	✓	✓			Arithmetic and geometric series	●				●
	✓		✓		Infinite geometric series	●				●
✓				✓	Sigma notation	+				
✓			✓		Secant and tangent lines, the notion of limiting behavior	+		+		
	✓			✓	Area under a curve	+		+		

# PRECALCULUS

## (Year Four Integrated Mathematics)

	<u>Carnegie Unit</u>	<u>Semester Periods</u>
Units of credit	1	10
Prerequisite	Algebra II or its equivalent	

Precalculus is an optional course for high school graduation designed to enrich the motivated student in mathematics with skills for the study of Calculus and topics in discrete mathematics.

### COURSE OVERVIEW

Precalculus is an integrated mathematics course designed to provide an enrichment course strongly recommended for students planning careers requiring higher mathematical skills. Strong emphasis will be given to problem-solving skills, cross-curricular topics, and increased use of technology. Individual schools are enabled to select at least two of five discrete topics to further enrich student's appreciation of mathematics depending upon group interests and needs.

### COURSE GOALS

Precalculus will enable students to:

1. extend their use of a wide variety of functions to analyze the nature of different types of functions and their applications to the real and complex number systems as well as real-life problem-solving situations
2. develop skill applying algebraic and functional skills to 2-D and 3-D geometry
3. develop skills in writing and using Cartesian and parametric equations, as well as the use of Cartesian and polar coordinates in 2-D
4. introduce the concept of limit as it applies to differentiation and antidifferentiation
5. enrich the skills of students in the following discrete areas:
  - Analytic Geometry in 3-D
  - Systems of Equations and Inequalities
  - Matrices and Determinants
  - Sequences, Series, and Probability
  - Further Explorations in Calculus

PROCESSES					<p style="text-align: center;"><b>PRECALCULUS</b> <b>(Year Four Integrated Mathematics)</b> <b>Essential Learnings</b></p>	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>TRANSFORMATION OF FUNCTIONS</b>					
	✓			✓	Combining functions using the 4 basic operations; composite functions	+				+
✓	✓				Identifying characteristics of functions: even, odd, periodic, piece-wise, domain, range, continuity, end behavior	+				
✓				✓	Knowing parent functions: absolute-value, quadratic, radical, reciprocal, greatest integer (step), trigonometric, exponential, logarithmic	+		+		
	✓				Inverse functions	+				
	✓			✓	Transforming parent functions under translations, stretches, and compressions	+				
					<b>POLYNOMIAL AND RATIONAL FUNCTIONS</b>					
		✓	✓	✓	Sketching and analyzing graphs of quadratic and polynomial functions	+				
		✓			Division of polynomials	+				
✓	✓				Real zeros of polynomial functions, identify the number of zeros	+				
✓				✓	Performing operations on complex numbers and plot numbers in the complex plane	+				+
	✓	✓			Determining the domain and asymptotes of rational functions and sketch their graph	+				
		✓			Partial fractions	+				
✓	✓				Fundamental theorem of algebra	+				
					<b>EXPONENTIAL AND LOGARITHMIC FUNCTIONS</b>	+				
	✓			✓	Recognizing, evaluating and graphing exponential and logarithmic functions	+				
		✓			Rewriting logarithmic functions with a different base	+				+
✓		✓			Natural logarithms, base $e$ and its applications	+				+
	✓			✓	Properties of logarithms to manipulate logarithmic expressions	+				
		✓			Solving exponential and logarithmic equations	+				

PROCESSES					<p style="text-align: center;"><b>PRECALCULUS</b> <b>(Year Four Integrated Mathematics)</b> <b>Essential Learnings</b></p>	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>EXPONENTIAL AND LOGARITHMIC FUNCTIONS-continued</b>					
	✓	✓			Practical applications of exponential and logarithmic functions	+				
					<b>TRIGONOMETRIC FUNCTIONS</b>					
✓	✓				Radian and degree measures and their conversions				+	+
✓	✓				Using the unit circle to define the trigonometric ratios	+		+		
	✓			✓	Graphing trigonometric functions and their transformations	+		+		
	✓			✓	Inverse trigonometric functions	+		+		
	✓	✓			Applications and models of trigonometric functions	+		+		
		✓			Special angles $0^\circ \leq x \leq 360^\circ$ , $0 \leq x \leq 2\pi$					
					<b>ANALYTIC TRIGONOMETRY AND VECTORS IN 2-D</b>					
	✓	✓			Use the reciprocal, quotient and cofunction identities	+				
	✓		✓		Use of the following identities: sum and difference, double-angle, power-reducing, and half-angle, product to sum and sum to product identities	+				
		✓			Solving trigonometric equations	+				
		✓			Law of sines and law of cosines	+		+		
		✓			Areas of oblique triangles	+		+		
✓	✓			✓	Vectors as directed line segments, unit vectors	+		+		
		✓		✓	Operations on vectors; dot product	+		+		+
	✓			✓	Trigonometric form of a complex number	+				+
		✓		✓	Using De Moivre's theorem to find powers and roots of complex numbers	+				+
					<b>ANALYTIC GEOMETRY IN 2-D</b>					
	✓	✓			Inclination of a line; angle between 2 lines; distance from a point to a line and the graph	+		+		
	✓			✓	Writing the general and standard forms for the conic sections	+		+		

⊕ = underpinning of calculus

● = requisite \* = discretionary

PROCESSES					<p style="text-align: center;"><b>PRECALCULUS</b>  <b>(Year Four Integrated Mathematics)</b>  <b>Essential Learnings</b></p>	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>ANALYTIC GEOMETRY IN 2-D-continued</b>					
	✓		✓		Determining the geometric components of conic graphs: center, foci, vertices, asymptotes, where applicable	+		+		
	✓			✓	Writing rectangular and parametric equations and convert from one to the other	+				
	✓			✓	Converting complex numbers from rectangular to polar coordinates and vice versa	+				+
	✓			✓	Graphing polar equations	+		+		
					<b>LIMITS</b>					
✓	✓		✓		Definition of a limit; properties of a limit	+			+	+
			✓		Continuity of functions	+				
		✓	✓		Find the limits of functions; finite and infinite limits	+			+	
	✓	✓			Using the tangent line to approximate slope of a function at a point	+		+		
✓	✓			✓	Definition of the derivative as the limiting slope of a function	+			+	
	✓	✓		✓	Limits of summation to find areas bounded by a function	+			+	

**AT LEAST TWO (2) OF THE FOLLOWING FIVE (5) TOPICS  
SHOULD BE INCLUDED AS PART OF THE PRECALCULUS COURSE**

1. ANALYTIC GEOMETRY IN 3-D
2. SYSTEMS OF EQUATIONS AND INEQUALITIES
3. MATRICES AND DETERMINANTS
4. SEQUENCES, SERIES, AND PROBABILITIES
5. FURTHER EXPLORATIONS IN CALCULUS

PROCESSES					PRECALCULUS (Year Four Integrated Mathematics) Essential Learnings	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>ANALYTIC GEOMETRY IN 3-D</b>					
✓	✓			✓	Three-dimensional coordinate system; distance and midpoint, equation of a sphere	●			●	●
	✓			✓	Vectors in space, angle between vectors, parallelism	●				
	✓			✓	Cross-product of 2 vectors: algebraic and geometric properties	●			●	
	✓	✓			Parametric, symmetric and Cartesian equations of lines and planes in 3-D	●		●		
		✓			Distance between a point and a plane	●			●	
	✓			✓	Sketching planes in 3-D	●			●	
					<b>SYSTEMS OF EQUATIONS AND INEQUALITIES</b>					
		✓			Solving systems of equations by substitution, addition, graphing and Gaussian or Gauss-Jordan elimination	●				
		✓			Solving systems of equations in row-echelon form and back substitution	●				
	✓	✓			Solving multivariate linear systems, partial fractions	●				
		✓		✓	Systems of inequalities and applications in linear programming	●				
					<b>MATRICES AND DETERMINANTS</b>					
		✓			Operations with matrices: addition, scalar and matrix multiplication	●				●
		✓			Inverse matrices and their use in solving systems of linear equations	●				●

PROCESSES						CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>MATRICES AND DETERMINANTS-continued</b>					
	✓			✓	Determinants of a square matrix	●				●
	✓	✓			Applications of matrices and determinants; Cramer's rule	●				●
					<b>SEQUENCES, SERIES, AND PROBABILITY</b>					
				✓	Using sequences, factorial and summation to write the terms and sums of a sequence	●				●
	✓	✓		✓	Arithmetic and geometric sequences and series; sum of infinite geometric series	●				●
✓			✓		Mathematical induction	●				●
	✓	✓		✓	Binomial theorem; Pascal's triangle	●				●
✓		✓		✓	Fundamental counting principle; permutations and combinations		●			●
	✓	✓			Probability		●			●
					<b>FURTHER EXPLORATIONS IN CALCULUS</b>					
		✓	✓	✓	Finding derivatives of algebraic functions using power rule, constant multiple rule, product rule, quotient rule, sum rule and chain rule	+				
✓			✓	✓	Integration notation and terminology	+				
	✓	✓			Applying integration formulas of the indefinite integral	+				

⊕ = underpinning of calculus

● = requisite \* = discretionary

# CALCULUS

	<u>Carnegie Unit</u>	<u>Semester Periods</u>
Units of credit	1	10
Prerequisite	Precalculus or its equivalent	

Calculus has been designed as an enrichment course in mathematics for meeting high school graduation requirements, prepare them to write a challenge exam for Calculus I in college/university, or prepare them for the AP Calculus examinations, if desired.

## COURSE OVERVIEW

Calculus has been designed to give strong emphasis to the development of the concept of limit and its applications to the derivative and integral. Problem-solving and reasoning skills are strong components of this course.

## COURSE GOALS

Calculus will enable students to:

1. develop skills in the use of limit, concept of infinity, and continuity of functions
2. develop the derivative as the limit of a slope function and understand and use the rules for differentiation
3. apply the derivative to many problem-solving situations
4. understand the use of the derivative in interpreting graphs
5. apply the antiderivative formulas for definite and indefinite integrals
6. solve problems using the concept of antiderivative
7. explore further skills in Calculus for preparation of the AP exams

PROCESSES					CALCULUS Essential Learnings	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>FUNCTIONS, GRAPHS, AND LIMITS</b>					
	✓			✓	Drawing and analyzing the graphs of rational, inverse trigonometric, base $e$ exponential, natural logarithmic, elementary implicit and composite functions, for domain, range and intercepts	●		●		
		✓			Model inverse trigonometric, base $e$ exponential, natural logarithmic, elementary implicit and composite functions, to solve problems	●				
	✓			✓	Converting $y = a^x$ to $y = e^{x(\ln a)}$	●				
		✓			Determining points where $f(x) = 0$	●				
✓				✓	Demonstrate an understanding of the concept of limit and notation	●			●	
	✓	✓	✓		Evaluating the limit of a function analytically, graphically, and numerically	●		●	●	
	✓		✓		Distinguishing between the limit of a function as $x$ approaches $a$ and the value of $f(a)$	●			●	
	✓		✓		Demonstrating the concept of one-sided limits	●			●	
		✓			Determining limits with a result of infinity	●			●	●
		✓			Evaluating limits as $x$ approaches infinity	●			●	●
		✓		✓	Determining vertical and horizontal asymptotes	●		●		
		✓		✓	Determining (dis)continuity of a function	●				
					<b>THE DERIVATIVE</b>					
	✓			✓	Describe geometrically the secant and tangent line at a point $x = a$			●		
	✓			✓	Define and use the derivative as a limit of the slope at a point $x = a$	●			●	
✓				✓	Using alternate notations for the derivative interchangeably	●				
			✓		Determine when a function is non-differentiable	●				
	✓	✓			Determining the equation of a tangent line to a curve at a given point	●		●		
	✓	✓			Calculating the average velocity and instantaneous velocity	●			●	
✓				✓	Distinguishing between average and instantaneous velocity	●				

● = requisite \* = discretionary

PROCESSES					<p style="text-align: center;"><b>CALCULUS</b> <b>Essential Learnings</b></p>	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>THE DERIVATIVE-continued</b>					
		✓			Computing derivatives for algebraic, reciprocal, exponential, trigonometric, inverse trigonometric, and implicit functions	●				
		✓	✓	✓	Using the constant multiple, sum, product, quotient, power, and chain rules	●				
		✓	✓		Using the technique of logarithmic differentiation	●				
		✓		✓	Computing higher order derivatives	●				
					<b>DERIVATIVES AND GRAPHS OF FUNCTIONS</b>					
✓	✓			✓	Graphing $f(x)$ , $f'(x)$ , $f''(x)$ to determine increasing/decreasing functions and concavity	●				
✓	✓	✓		✓	Determining minimum/maximum points and points of inflection; mean value theorem	●		●		
✓	✓	✓		✓	Using Newton's formula to find solutions of equations, $f(x) = 0$	●				
		✓		✓	Using the tangent line approximations to estimate values of a function near a point	●		●		
	✓	✓	✓		Solving problems involving displacement, velocity, acceleration, related rates, maximum/minimum	●		●		
					<b>ANTIDIFFERENTIATION</b>					
✓			✓	✓	Using antiderivative notation	●				
		✓			Computing the antiderivative for constant, algebraic, reciprocal, exponential, and trigonometric functions	●				
		✓			Solving initial value problems given the integral	●				
		✓	✓		Integrating using techniques of substitution	●				
	✓	✓			Solving problems involving differential equations	●		●		
	✓	✓			Solving problems involving indefinite and definite integrals	●		●		

PROCESSES					<p style="text-align: center;"><b>CALCULUS</b> <b>Essential Learnings</b></p>	CONTENT				
Communication	Connections	Problem Solving	Reasoning and Proof	Representation		Algebra	Data Analysis/Probability	Geometry	Measurement	Number and Operations
					<b>ADDITIONAL TOPICS FOR ADVANCED PLACEMENT (AP) CALCULUS</b>					
	✓	✓			Differentiating and integrating a multitude of function types	●				
	✓	✓			Differentiating vector and parametrically defined functions	●		●		
	✓	✓		✓	Testing for convergence of series of real numbers and functions	●			●	
	✓	✓		✓	Defining and applying power series	●			●	

# **Appendix**



***JOURNEY TO EXCELLENCE***



## GOALS for the Curriculum in Seventh-day Adventist Schools

*Each student will:*

<b>I ACCEPTANCE OF GOD</b>	Surrender one's whole life to God; develop a relationship with Jesus Christ; and allow the Holy Spirit to work in one's life.
<b>II COMMITMENT TO THE CHURCH</b>	Desire to know, live, and share the message and mission of the Seventh-day Adventist Church.
<b>III FAMILY &amp; INTERPERSONAL RELATIONSHIPS</b>	Develop a sense of self-worth, skills in interpersonal relationships, an understanding of the responsibilities of family membership, and the ability to respond with sensitivity to the needs of others.
<b>IV RESPONSIBLE CITIZENSHIP</b>	Develop an understanding of cultural and historical heritages, affirm a belief in the dignity and worth of others, and accept responsibility for one's local, national, and global environments.
<b>V HEALTHY BALANCED LIVING</b>	Accept personal responsibility for achieving and maintaining optimum physical, mental, and spiritual health.
<b>VI INTELLECTUAL DEVELOPMENT</b>	Adopt a systematic, logical, and biblically-based approach to decision-making and problem-solving when applied to a developing body of knowledge.
<b>VII COMMUNICATION SKILLS</b>	Recognize the importance of effective communication and develop the requisite skills.
<b>VIII PERSONAL MANAGEMENT</b>	Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.
<b>IX AESTHETIC APPRECIATION</b>	Develop an appreciation of the beautiful, both in God's creation and in human expression, while nurturing individual ability in the fine arts.
<b>IX CAREER AND SERVICE</b>	Develop a Christian work ethic with an appreciation for the dignity of service.



# Goals and Essential Core Elements for Curriculum in Seventh-day Adventist Schools

## GOALS:

The following goals have been established to support the unique philosophy of Adventist education. Each student will:

## ESSENTIAL CORE ELEMENTS:

Essential core elements clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:

ACCEPTANCE OF GOD

**I. Surrender one’s whole life to God; develop a relationship with Jesus Christ; and allow the Holy Spirit to work in one’s life.**

1. Accept God as the Creator and the Redeemer.
2. Have a growing knowledge of God’s Word and enjoyment in its study.
3. Embrace God’s gift of grace by accepting Christ as one’s personal Savior.
4. Discover the importance and power of prayer and faith in one’s relationship with Jesus.
5. Value God’s revelation of Himself through inspired writings and creation.
6. Respond to God’s love by using one’s spiritual gifts to serve others.
7. Recognize that God gave the Ten Commandments to show us how to love Him and each other.
8. Value and participate in worship alone and with others.

COMMITMENT TO THE CHURCH

**II. Desire to know, live, and share the message and mission of the Seventh-day Adventist Church.**

- Be an active participant in one’s local church.
- Understand how the organization of the Seventh-day Adventist church facilitates its mission.
- Become involved in spreading the gospel throughout the world.
- Accept the fundamental beliefs of the Seventh-day Adventist church.
- Appreciate the heritage of the Seventh-day Adventist church.
- Relate to lifestyle choices and cultural issues based on biblical principles.

### **GOALS:**

The following goals have been established to support the unique philosophy of Adventist education. Each student will:

### **ESSENTIAL CORE ELEMENTS:**

Essential core elements clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:

#### **FAMILY & INTERPERSONAL RELATIONSHIPS**

**III. Develop a sense of self-worth, skills in interpersonal relationships, an understanding of the responsibilities of family membership, and the ability to respond with sensitivity to the needs of others.**

- A. Recognize that God’s ideal for the basic unit of society is the family.
- B. Develop an appreciation for the diversity of individuals.
- C. Acquire knowledge, attitudes and skills essential to meeting family responsibilities whether living alone or with others.
- D. Recognize that God’s unconditional love gives one self-worth.
- E. Value sexuality in the context of God’s ideal.

#### **RESPONSIBLE CITIZENSHIP**

**IV. Develop an understanding of cultural and historical heritages, affirm a belief in the dignity and worth of others, and accept responsibility for one’s local, national, and global environments.**

- 1. Exhibit concern and sensitivity for other peoples and cultures.
- 2. Participate actively in local, national, and global communities.
- 3. Understand the functions of governments and their impact on individuals and society.
- 4. Use a biblical perspective to analyze history and current events.
- 5. Assume an active role in nurturing and preserving God’s creation.

## GOALS:

The following goals have been established to support the unique philosophy of Adventist education. Each student will:

## ESSENTIAL CORE ELEMENTS:

Essential core elements clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:

### HEALTHY BALANCED LIVING

**V. Accept personal responsibility for achieving and maintaining optimum physical, mental, and spiritual health.**

1. Recognize that God’s ideal for quality living includes a healthy lifestyle.
2. Incorporate into one’s lifestyle the principles that promote health: nutrition, exercise, water, sunlight, temperance, air, rest, trust in God.
3. Avoid at-risk behaviors.
4. Apply Christian principles in recreation and sports.
5. Achieve a balance in work and leisure; balancing physical, mental, social, and spiritual activities.
6. Recognize the interaction of physical, mental, and spiritual health with emotional and social well-being.

### INTELLECTUAL DEVELOPMENT

**VI. Adopt a systematic, logical, and biblically-based approach to decision-making and problem-solving when applied to a developing body of knowledge.**

1. Broaden intellectual abilities through the study of God’s Word.
2. Use critical and creative thinking skills in “real world” experiences.
3. Develop one’s intellectual potential in natural sciences and mathematics; arts and humanities; social sciences and applied arts.
4. Utilize effective study techniques to locate, organize, and learn information.
5. Apply the principles of life-long learning.
6. Approach all intellectual pursuits from a biblical perspective.

### **GOALS:**

The following goals have been established to support the unique philosophy of Adventist education. Each student will:

### **ESSENTIAL CORE ELEMENTS:**

Essential core elements clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:

#### **COMMUNICATION SKILLS**

#### **VII. Recognize the importance of effective communication and develop the requisite skills.**

1. Communicate effectively through the avenues of reading, writing, listening, speaking, and non-verbal language.
2. Apply a Christ-centered perspective to all forms of personal expression and media.
3. Understand how sensitivity to the differences of others affects communication.
4. Recognize how media and information technology impacts communication.
5. Utilize communication skills to enhance one's Christian witness.

#### **PERSONAL MANAGEMENT**

#### **VIII. Function responsibly in the everyday world, using Christian principles of stewardship, economy, and personal management.**

1. Develop responsible decision-making skills.
2. Appropriately manage one's personal finances.
3. Acquire skill in the use of technologies.
4. Develop basic home-management skills.
5. Value cooperation and teamwork when interacting in groups.
6. Develop conflict resolution skills.
7. Manage time effectively.

### **GOALS:**

The following goals have been established to support the unique philosophy of Adventist education. Each student will:

### **ESSENTIAL CORE ELEMENTS:**

Essential core elements clarify and expand the goal statements and are intentionally infused into a curriculum that teaches students to:

#### **AESTHETIC APPRECIATION**

**IX. Develop an appreciation of the beautiful, both in God's creation and in human expression, while nurturing individual ability in the fine arts.**

1. View God as the Author of beauty both in His creation and in human expression.
2. Employ biblical principles as the basis for appreciation and expression of creative and performing arts.
3. Develop fine arts talents through practice, performance, and presentation.
4. Use aesthetic expression as a means of communication and service.

#### **CAREER AND SERVICE**

**X. Develop a Christian work ethic with an appreciation for the dignity of service.**

1. Develop an awareness of career options and opportunities in a changing world, as well as in the church.
2. Recognize the role of useful work in personal development and maintaining self-worth.
3. Develop skills that will enhance employability.
4. Experience the joy of serving others.
5. Identify one's interests, abilities, and values; understanding their relationship to career options.
6. Always put forth one's best effort in every task.

