



Adventist Education

A JOURNEY TO EXCELLENCE

Calculus

2010

**SECONDARY MATHEMATICS STANDARDS
IN SEVENTH-DAY ADVENTIST SCHOOLS**

OFFICE OF EDUCATION | North American Division Seventh-day Adventist Church

Mathematics Standards

OUR GOAL

The goal of Seventh-day Adventist education is about more than quality teachers providing innovative instruction. Adventist education aims to provide student learning infused with Christian faith and an Adventist worldview. To achieve this goal Seventh-day Adventist standards for grades 9-12 subjects have been carefully developed to embody Seventh-day Adventist beliefs and to prepare students for life-long learning, equipping them for earthly service and heavenly citizenship. An education of this kind imparts strong academic knowledge and a clear picture of Christ and His love for mankind.

These standards focus on what students should know, understand and be able to do. They will be a useful tool for teachers in developing lessons and ensure a thorough preparation for college or university when fully implemented across the curriculum.

Seventh-day Adventist Secondary Standards:

1. Provide clear expectations for student learning and accountability.
2. Provide an essential user-friendly tool for developing instruction.
3. Transform textbooks from curriculum guide to a resource for instruction.
4. Provide for a complete and uniform Adventist secondary curriculum.
5. Have been developed exclusively by Seventh-day Adventist educators.
6. Have been aligned with the goals of Journey to Excellence
7. Have been developed using national and state standards, Adventist curriculum guides, and standards compendiums from McRel and Ten Sigma.

RATIONALE

Secondary Mathematics Standards for Seventh-day Adventist Schools seeks to ensure that the beliefs and values of our Adventist Christian faith are integrated into the curriculum. Mathematics instruction from this curriculum should help students learn to see and reflect God's image while developing proficiency in different aspects of mathematics—understanding, representing, applying and analyzing quantitative relationships. This kind of education imparts more than academic knowledge. It fosters the balanced development of the whole person to prepare them for earthly service and heavenly citizenship.

These carefully developed mathematics standards are a practical tool to assist teachers in focusing their instruction so that students achieve competence and are engaged successfully in exploring, planning, solving, and verifying various mathematical situations. These standards reflect multiple perspectives from diverse spiritual and social communities. They provide meaningful connections within mathematics, and between mathematics and other fields of learning. The intent is to capture the essence of what students should learn and retain.

CREDITS

The following resources were referenced in developing *Secondary Mathematics Standards for Seventh-day Adventist Schools*: a sampling of state standards, the National Council of Teachers of Mathematics (NCTM), NAD Curriculum Guide for Mathematics, McREL Compendium of Standards, Ten Sigma Standards, and Journey to Excellence.

STANDARDS CODING

The standards and essential learnings have been coded so that educators can more easily refer to them in their curriculum, instruction, assessment, and professional development activities. The coding system begins with the course abbreviation in letters as follows: CM—Consumer Math, PA—Pre-Algebra, AI—Algebra I, AII—Algebra II, GM—Geometry, PC—Pre-Calculus, and CA—Calculus. The first numeral (PA.3.2) refers to the standard and the second numeral (PA.3.2) refers to the subcategory under the standard.

JOURNEY TO EXCELLENCE

When the standards on the next page have been met the instruction in this course will have also met some of the Goals and Essential Core Elements for the curriculum in Seventh-day Adventist schools listed in *Journey to Excellence*. The number (1.A) refers to the Goal and the letter (1.A) refers to the Essential Core Element that is met.

CONSUMER MATH

1.A,E	7.A,D
2.F	8.A,B,C,D,G
3.C	9.A
4.C	10.A,C,E,F
6.B,C,D,F	

PRE-ALGEBRA, ALGEBRA I, AND ALGEBRA II

1.A,E	7.A,D
2.F	8.A,C,G
3.C	9.A
6.B,C,D,F	10.A,C,F

GEOMETRY

1.A,E	7.A,D
2.F	8.A,C,G
3.C	9.A
6.B,C,D,F	10.A,C,F

PRE-CALCULUS AND CALCULUS

1.A,E	7.A,D
2.F	8.A,C,G
3.C	9.A
6.B,C,D,F	10.A,C,F

Mathematics Standards—Calculus

COURSE FOCUS [Apply the following to each content standard.]

- CA.1 Identify SDA Christian principles and values in correlation with mathematics.
 - CA.1.1 Recognize God as Creator and Sustainer of an ordered universe.
 - CA.1.2 Value God’s inspired writings and created works as a revelation of His precision, accuracy, and exactness.
 - CA.1.3 Develop accountability as expressed in God’s word and laws.
 - CA.1.4 Employ Christian principles as a basis for learning and growth.
 - CA.1.5 Broaden intellectual abilities through the study of mathematics.
 - CA.1.6 Make biblically-based choices when dealing with mathematical data.
 - CA.1.7 Apply biblical principles of Christian morality, integrity, and ethical behavior to mathematical processes.

COURSE ABILITIES [Apply the following to each content standard.]

- CA.2 Develop abilities in mathematics.
 - CA.2.1 Understand mathematical concepts (number sense, algebraic and geometric thinking, measurement, data analysis, and probability).
 - CA.2.2 Utilize the problem-solving process (explore, plan, solve, verify).
 - CA.2.3 Develop higher thinking skills (analyze, evaluate, reason, classify, predict, generalize, solve, relate, interpret, simplify, model, synthesize).
- CA.3 Be able to apply math knowledge and skills to a variety of purposes.
 - CA.3.1 Use a variety of strategies in the problem-solving process (patterns, tables, diagrams, etc.).
 - CA.3.2 Conduct research (locate, observe/gather, analyze, conclude).
 - CA.3.3 Perform calculations with and without technology in life situations.
 - CA.3.4 Read critically and communicate proficiently with mathematical vocabulary.

COURSE CONTENT [understand, represent, apply, analyze]

- CA.4 Be able to understand concepts of differentiation and anti-differentiation.
 - CA.4.1 Understand limits of functions (definition, from graphs, calculating of, properties and behaviors, finite, infinite, one-sided).
 - CA.4.2 Identify continuity of functions (intuitively, definition in terms of limits, and graphically).
 - CA.4.3 Demonstrate knowledge of the derivative (concept, definition, at a point, as a function, applications, linearization and second derivatives).
 - CA.4.4 Demonstrate knowledge of the integral (concept, definition anti-derivatives, techniques, fundamental theorem of calculus, and numerical approximations).
- CA.5 Be able to represent mathematical relationships and situations using calculus.
 - CA.5.1 Interpret applications of the derivative in various situations (optimization, velocity, speed, acceleration, increasing/decreasing, concave up/down and points of inflection).
 - CA.5.2 Solve a variety of situations (physical, biological, or economic) by setting up a Riemann sum and representing its limit as a definite integral.
 - CA.5.3 Identify, graph, and interpret various derivatives and integrals in applied contexts.
 - CA.5.4 Present solutions resulting from applications of derivatives and integrals in conjunction with substitution techniques in finding anti-derivatives.
- CA.6 Be able to apply appropriate techniques, tools, and formulas to interpret and solve problems,
 - CA.6.1 Compute the derivatives of functions using the sum, product, quotient, and chain rules.
 - CA.6.2 Use the integral in specific applications to give accumulated change, find the area of a region, the volume of a solid with known cross sections, the average value of a function, and the distance traveled by a particle along a line.
 - CA.6.3 Demonstrate mathematical proficiency using a graphing utility.
- CA.7 Be able to analyze results and draw appropriate conclusions.
 - CA.7.1 Find and interpret information from graphs, charts, and numerical data.
 - CA.7.2 Predict patterns and generalize trends.
 - CA.7.3 Judge meaning, utility, and reasonableness of findings in a variety of situations, including those carried out by technology.

DEVELOPMENT COMMITTEE MEMBERS

Jim Ingersoll	Southern Union Conference
Moises Carguill	Forest Lake Academy
Kim Carr	Bass Memorial Academy
William Floyd	Greater Atlanta Adventist Academy
David Haley	Hoover Christian School
Durward Hass	Georgia-Cumberland Academy
Carolyn Jensen	Forest Lake Academy

