

CURRICULUM FRAMEWORK DETAILS

The curriculum framework for Introduction to Calculus and for Advanced Mathematics is stated in terms of big ideas and specific learning outcomes, with details provided as achievement indicators.

Big Ideas describe concepts that broadly encompass a topic and give an overall sense of purpose and meaning to the specific learning outcomes. The big ideas are statements providing direction to guide teachers and students as they navigate and work to connect the details of a mathematics topic. Teachers should share and discuss the big ideas with their students to help them see and make connections to concepts within a topic and to other mathematics concepts that are part of students' prior learning.

Specific Learning Outcomes are statements that identify the specific knowledge, skills, and understandings that students are required to attain by the end of a given course. Each outcome is to be achieved through a variety of learning strategies and experiences.

Achievement Indicators specify the depth and breadth of learning expected for each outcome. They may be used to determine whether students have met the corresponding specific learning outcome. Additional notes are sometimes given as elaborations to help teachers in their planning of the scope and sequence of instruction. The development of the concepts of the outcome do not need to be presented in the

order given. Furthermore, a teacher may choose to develop the concepts of the outcome using indicators other than those listed.

Course Options Overview

These are optional courses and they do not qualify for the compulsory Grade 12 Mathematics credit. They are intended for students who have completed or are completing their compulsory Grade 12 Mathematics credit (usually Pre-Calculus Mathematics 40S). They are designed for students who show an aptitude for, or a strong interest in, mathematics and plan to study further mathematics at the post-secondary level.

Consistent with the scheduling of other high school courses, 55 hours of instruction is required for each half credit and 110 hours is required for each full credit. Each half-credit course is composed of four topics, described in this document.

- ½ credit – Introduction to Calculus
- ½ credit – Advanced Mathematics I (1st half credit – 4 topics)
- ½ credit – Advanced Mathematics II (2nd half credit – 4 topics different from Advanced Mathematics I)
- 1 credit – Introduction to Calculus and Advanced Mathematics I (4 topics)
- 1 credit – Advanced Mathematics I and II (8 topics)

To earn the Introduction to Calculus half credit, a student must successfully complete all four topics with outcomes as described in this document. To earn an Advanced Mathematics half credit, a student must successfully complete four topics from the list of core or additional topics. Alternatively, to earn a full credit, a student must successfully complete eight topics from the list of core or additional topics of Advanced Mathematics. The Advanced Mathematics topics may be chosen by the teacher with the students' interests in mind or they may be chosen by the students with the teacher's approval.

Introduction to Calculus

Students should have taken Pre-Calculus Mathematics 40S prior to the Introduction to Calculus course. In special circumstances, Introduction to Calculus could be taken concurrently with Pre-Calculus Mathematics 40S if the sequence of topics is chosen carefully. The Introduction to Calculus is a half credit consisting of the following four topics:

- Limits
- Derivatives
- Applications of Derivatives
- Integration

Advanced Mathematics

It is recommended that students will have taken Pre-Calculus Mathematics 40S prior to the Advanced Mathematics course. Alternatively, students with an Applied Mathematics 40S credit can take this course and should intentionally choose topics with minimal algebra.

Grade 12 Advanced Mathematics consists of four chosen topics that are different for each half credit. The flexibility of the course allows teachers to choose the topics and encourages the input of students. For a full credit in Advanced Mathematics, eight different topics must be chosen.

The seven core Advanced Mathematics topics have specific learning outcomes (SLOs) and achievement indicators given later in this document. The additional Advanced Mathematics topics' outcomes are to be determined by the teacher or by a student in consultation with the teacher. A suggested (but not comprehensive) list of additional advanced mathematics topics follows. Although the order of the topics is not prescribed, there are some connections among topics. In addition, there is an overview statement for each topic to help teachers and students see connections among prior, current, and future learning with an end goal of choosing appropriate topics.

Core Advanced Mathematics Topics (outcome details provided in this document):

- Complex Numbers and Polar Coordinates
- Statistics
- Number Theory
- Matrices and Systems of Equations
- 3-Dimensional Geometry
- Vectors
- Conic Sections

Additional Advanced Mathematics Topics (outcome details determined by the teacher):

- Fractal geometry
- Calculus topics (to extend beyond Introduction to Calculus content)
- History of mathematics
- Applications of mathematics to computer science (e.g., cryptography)
- Combinatorics extending beyond permutations and combinations (e.g., pigeonhole principle)
- Interdisciplinary project

Specific Learning Outcomes by Course

The following pages present the specific learning outcomes and achievement indicators for all four topics of Introduction to Calculus and for the core topics of Advanced Mathematics.