

MATHEMATICS

MTH-5076-1 — Conics I

**DEFINITION OF THE DOMAIN FOR
SUMMATIVE EVALUATION**

SEPTEMBER 1997

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Direction de la formation générale des adultes
Service de l'évaluation des acquis

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1. Introduction

This definition of the domain for summative evaluation describes and classifies the essential and representative elements of the *Mathematics* program—specifically, for module *Conics I*. It presents an overview of the program, but should by no means replace the program itself. The purpose of defining the domain is to ensure that all summative evaluation instruments are consistent with the overall program.

The organization of this definition of the domain is the same as that of those of other modules. The content of each section is, however, specific to this module.

The goal of the definition of the domain for summative evaluation is to permit the preparation of examinations that are valid from one version to another, from year to year and from one school board to another, taking into account the responsibilities shared by the ministère de l'Éducation and the school boards.

2. Program Orientations and Consequences for Summative Evaluation**Orientations**

The main purpose of the adult education secondary level *Mathematics* program is to help adults understand the mathematical concepts needed to solve problems related to everyday situations, expand their knowledge of mathematics and, ultimately, facilitate access to a future occupation. Consequently, in the program, mathematics is presented as a practical tool for solving common, real-life problems.

Another area of development emphasized in the program involves mastering the mathematical operations used in science and technology for processing the kind of information students encounter in their daily lives, and which enables them to understand various everyday phenomena in terms of quantities and relations. In developing these skills, the *Mathematics* program can also prepare interested adults for studies leading to a career in science.

Whether the aim is to enable students to solve practical problems or to orient them toward a career in science, all the learning activities in the program emphasize the acquisition of a systematic work method.

The program places equal emphasis on mastering the use of a calculator or a microcomputer in the classroom. This particular area is addressed throughout the different learning activities.

Consequences

Evaluation items should deal with either original and practical situations taken from everyday life or those associated with an occupation.

Evaluation items should also pertain to situations in the fields of science and mathematics. For example, problems could deal with such things as the calculation of interest rates or the use of mathematical formulas used in science.

Evaluation should measure the adult's ability to follow the steps involved in solving a problem. It should also verify whether or not the student has mastered a work method.

The use of a calculator is permitted.

3. Content of the Program for Purposes of Summative Evaluation**Concepts**

- **Second-degree equations of the form $y = ax^2 + bx + c$, where $y = 0$**
 - Quadratic formula
 - Factoring
 - Problem-solving
- **Second-degree equations of the form $y = ax^2 + bx + c$**
 - Graph
 - Vertex, axis of symmetry, maximum, minimum, zeros, coordinates at the origin
 - Problem-solving

Skills

Each skill is defined within the context of a mathematics program. Given that the adult education *Mathematics* program corresponds to the mathematics programs in the youth sector, the skills involved are the same for students in both sectors.

- **Structuring:** Being familiar with the fundamentals of mathematics, understanding some mathematical concepts, establishing cognitive relations.
Possible actions: associating, classifying, comparing, completing, describing, defining, contrasting, stating, enumerating, grouping, naming, ranking, organizing, recognizing, arranging, and so on
- **Mathematizing:** Interpreting a given situation using a mathematical model (arithmetical, algebraic or graphical).
Possible actions: formalizing, illustrating, representing, schematizing, symbolizing, translating, transposing, and so on
- **Operating:** Performing a given operation or transformation.
Possible actions: calculating, constructing, breaking down, performing, estimating, evaluating, isolating, measuring, reconstructing, solving, drawing, transforming, verifying, and so on
- **Analyzing or Synthesizing:** Establishing a link between a problem and a given solution or solving a given problem.
Possible actions: concluding, deducing, deriving, explaining, extrapolating, inferring, justifying, proving, solving, transferring, and so on

4. Table of Dimensions

CONCEPTS SKILLS	EQUATIONS OF THE FORM $y = ax^2 + bx + c$, where $y = 0$ 40%	EQUATIONS OF THE FORM $y = ax^2 + bx + c$ 60%
STRUCTURING 5%		5 Vertex, axis of symmetry, maximum, minimum, zeros, coordinates at the origin 5%
MATHEMATIZING 15%	1 Equation corresponding to a problem 5%	6 Equation corresponding to a problem 10%
OPERATING 50%	2 Quadratic formula 15%	7 Graph 30%
	3 Factoring 5%	
ANALYZING OR SYNTHESIZING 30%	4 Problems in everyday life or in the sciences 15%	8 Problems in everyday life or in the sciences 25%

Note: The numbers 1 to 8 identify the dimensions.

5. Observable Behaviours

Examination items should be formulated on the basis of the observable behaviours listed below. The requirements and restrictions specified in the objectives of the program must be observed.

Dimension 1

Formulating a second-degree equation for a word problem dealing with everyday life or the sciences. The equation must be of the form $ax^2 + bx + c = 0$.

Dimension 2

Solving a second-degree equation of the form $ax^2 + bx + c = 0$ by finding the value of the discriminant and using the quadratic formula. The answer must be written as an ordered pair.

Dimension 3

Solving a second-degree equation of the form $ax^2 + bx + c = 0$ using the factoring method. The answer must be written as an ordered pair.

Dimension 4

Using the factoring method or the quadratic formula to solve a problem dealing with everyday life or the sciences.

Dimension 5

Given the graph of a second-degree equation of the form $y = ax^2 + bx + c$, indicating the following elements: vertex, axis of symmetry, maximum, minimum, zeros, coordinates at the origin.

Dimension 6

Using a partially completed table of values, formulating a second-degree equation for a word problem dealing with everyday life or the sciences. The equation must be of the form $y = ax^2 + bx + c$.

Dimension 7

Graphing a second-degree equation of the form $y = ax^2 + bx + c$, clearly indicating the coordinates of the vertex, the y-intercept, the zeros and the equation of the axis of symmetry. The scale for each axis must also be indicated.

Dimension 8

Solving a problem in everyday life, in the sciences or in business, by determining the maximum or minimum, given a second-degree equation of the form $y = ax^2 + bx + c$.

6. Explanation of Content and Weighting

Given that the program focuses on helping the students learn how to use various mathematical tools to solve concrete real-life problems, emphasis has been placed on the skills of mathematizing, operating and analyzing. Emphasis should also be placed on the steps involved in solving a written problem.

The weighting of the skills listed below is based on the program itself and on the time normally required to master these skills.

STRUCTURING	5%
MATHEMATIZING	15%
OPERATING	50%
ANALYZING OR SYNTHESIZING	30%

The concepts have been weighted as follows:

EQUATIONS OF THE FORM $y = ax^2 + bx + c$, where $y = 0$	40%
EQUATIONS OF THE FORM $y = ax^2 + bx + c$	60%

7. Description of the Examination**7.1 Type of Examination**

There will be a written examination consisting of items that will be scored subjectively (free-response or extended-response items). Some items may be scored objectively.

7.2 Characteristics of the Examination

- The examination must be taken at the end of the module, in a single session lasting no more than two hours.
- The distribution of marks should be consistent with the percentages indicated in the table of dimensions.
- Students are permitted to use a calculator.

7.3 Pass Mark

To pass the module, students must obtain 60 out of 100 on the examination.

