

MATHEMATICS

MTH-5083-1 — OPTIMIZATION

DEFINITION OF THE DOMAIN
FOR SUMMATIVE EVALUATION

AUGUST 1997

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**DEFINITION OF THE DOMAIN
FOR SUMMATIVE EVALUATION**

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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 : *Optimization*. 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 should also pertain to situations in the fields of science and mathematics.

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

- Functions to be optimized of the form $Ax + By + C = 0$
- Systems of inequalities of the first degree with two variables
- Graph of a polygon of constraints
- Coordinates of the vertices of a polygon of constraints
- Verification of whether a point belongs to a polygon of constraints

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	OPTIMIZATION
SKILLS	100%
STRUCTURING 10%	1 Constraints and function to be optimized 10%
MATHEMATIZING 20%	2 Optimization problems 20%
OPERATING 30%	3 Graph of the polygon of constraints 10%
	4 Verification of whether a point belongs to a polygon of constraints 10%
	5 Coordinates of the vertices of a polygon of constraints 10%
ANALYZING OR SYNTHESIZING 40%	6 Optimization problems 40%

Note: The numbers 1 to 6 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

In a problem, indicating the elements necessary to define the constraints and those necessary to define the function to be optimized.

Dimension 2

Translating the constraints of an optimization problem by writing the appropriate system of inequalities.

Dimension 3

Drawing the polygon of constraints defined by a system of inequalities.

Dimension 4

Performing algebraic operations to verify whether a given point belongs to the polygon of constraints.

Dimension 5

Performing algebraic operations to determine the coordinates of the vertices of a polygon of constraints.

Dimension 6

Solving a verbal optimization problem.

6. Explanation of Content and Weighting

In order to respect the objectives of this module, emphasis has been placed on solving optimization problems. The weighting of the skills listed below is based on the program itself and on the time normally required to master these skills.

STRUCTURING	10%
MATHEMATIZING	20%
OPERATING	30%
ANALYZING OR SYNTHESIZING	40%

All the themes relate to optimization, hence the following weighting:

OPTIMIZATION	100%
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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.

