

# MATHEMATICS

MTH-3001-3 The Four Operations  
on Polynomials

**DEFINITION OF THE DOMAIN FOR  
SUMMATIVE EVALUATION**

FEBRUARY 1995

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SUMMATIVE EVALUATION**

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# TABLE OF CONTENTS

	Page
1. Introduction . . . . .	1
2. Program Orientations and Consequences for Summative Evaluation . . . . .	2
3. Content of the Program for Purposes of Summative Evaluation . . . . .	3
4. Table of Dimensions . . . . .	4
5. Observable Behaviours . . . . .	5
6. Justification of Choices . . . . .	6
7. Description of the Examination . . . . .	7

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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, and, more specifically, of the module on *The Four Operations on Polynomials*. As such, it gives 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 Definition of the Domain for Summative Evaluation for each module in this program is organized in a similar manner; however, the content of this definition of domain is specific to the module on *The Four Operations on Polynomials*.

The goal of the Definition of the Domain for Summative Evaluation is to prepare 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.

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## 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 career. 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 towards 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 of development 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 or mathematics. For example, examination 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.

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### 3. CONTENT OF THE PROGRAM FOR PURPOSES OF SUMMATIVE EVALUATION

#### Concepts

- \* Numerical coefficients and exponents
- \* Similar monomials
- \* Monomials, binomials, trinomials and polynomials
- \* The four operations on polynomials
- \* Order of operations in an algebraic expression

#### Skills

Each skill is defined within the context of a mathematics program. Given that the adult education *Mathematics* program harmonizes with 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:* to arrange, associate, classify, compare, complete, contrast, define, describe, enumerate, group, name, organize, rank, recognize, state, and so on.

**MATHEMATIZING:** Interpreting a given situation using a mathematical model (arithmetical, algebraic or graphical).  
*Possible actions:* to formalize, illustrate, represent, schematize, symbolize, translate, transpose, and so on.

**OPERATING:** Performing a given operation or transformation.  
*Possible actions:* to calculate, construct, break down, draw, estimate, evaluate, isolate, measure, perform, reconstruct, solve, transform, verify, and so on.

**ANALYZING OR SYNTHESIZING:** Establishing a link between a problem and a given solution solving a given problem.  
*Possible actions:* to conclude, deduce, derive, explain, extrapolate, infer, justify, prove, solve, transfer, and so on.

#### 4. TABLE OF DIMENSIONS

For purposes of summative evaluation, only skills and knowledge (concepts) will be measured. In the table below, essential and representative elements of the program have been grouped by combining concepts with skills. Each combination of one or more concepts with a skill is called a dimension. A given dimension may encompass more than one objective and, conversely, a given objective can be related to more than one dimension.

CONCEPTS	POLYNOMIALS	ORDER OF OPERATIONS IN AN ALGEBRAIC EXPRESSION
SKILLS	50%	50%
STRUCTURING	Numerical coefficient, exponent 1	
	3%	
	Similar monomials 2	
3%		
10%	Monomials, binomials, trinomials, polynomials 3	4%
	4%	
MATHEMATIZING		
OPERATING	+ , - , x , ÷ of two polynomials	Priority of x and ÷ over + and - 5
		25%
90%	4	40%
		Priority of operations between ( ) and [ ] 6
		25%
ANALYZING OR SYNTHESIZING		

Key: The numbers 1 to 6 identify the dimensions.



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## 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**

To determine the value of the numerical coefficient of a monomial, as well as the value of the exponent which is affixed to each of the variables in the monomial.

### **Dimension 2**

To recognize similar monomials in a list of monomials.

### **Dimension 3**

To identify monomials, binomials, trinomials and polynomials from a list of algebraic expressions.

### **Dimension 4**

To add, subtract, multiply and divide two polynomials.

### **Dimension 5**

To solve an algebraic expression, respecting the priority of multiplication and division over addition and subtraction.

### **Dimension 6**

To solve an algebraic expression containing parentheses or brackets, respecting the order of operations.

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## 6. JUSTIFICATION OF CHOICES

Given that the program focuses on helping the students learn how to use various mathematical tools to solve practical problems dealing with everyday situations, the emphasis has been placed on the skills needed to solve these problems: **mathematizing, operating** and **analyzing**.

Since it is also important that students be able to use a systematic procedure to solve a word problem, they should clearly understand the steps involved in solving a problem.

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

STRUCTURING	10%
MATHEMATIZING	0%
OPERATING	90%
ANALYZING OR SYNTHESIZING	0%

With regard to concepts, it is important to first verify students' mastery of the four operations on polynomials before measuring skills in more complex operations.

POLYNOMIALS	50%
ORDER OF OPERATIONS IN AN ALGEBRAIC EXPRESSION	50%

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## **7. DESCRIPTION OF THE EXAMINATION**

### **A. TYPE OF EXAMINATION**

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

### **B. CHARACTERISTICS OF THE EXAMINATION**

- The examination must be taken 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.
- The items must reflect the requirements and restrictions outlined in the objectives of the program.

### **C. PASS MARK**

The pass mark is set at 60 out of 100.

