

# MATHEMATICS

MTH-2007-3 Geometry I

**DEFINITION OF THE DOMAIN FOR  
SUMMATIVE EVALUATION**

FEBRUARY 1995

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## **DEFINITION OF THE DOMAIN FOR SUMMATIVE EVALUATION**

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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 entitled *Geometry I*. 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 entitled *Geometry I*.

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

- \* Geometric figures: lines (parallel, intersecting, perpendicular), rays, line segments, diagonals, angles (acute, obtuse, right, straight).
- \* Properties of pairs of angles: complementary, supplementary, adjacent, vertically opposite, alternate interior, alternate exterior, corresponding.
- \* Polygons: triangles (equilateral, isosceles, right triangle, isosceles right triangle, scalene); quadrilaterals (parallelogram, rhombus, square, rectangle, trapezoid).
- \* Pythagorean theorem

#### 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 associate, classify, compare, complete, describe, define, contrast, distinguish, state, enumerate, group, name, rank, organize, recognize, arrange, 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, perform, estimate, evaluate, isolate, measure, reconstruct, solve, draw, transform, verify, and so on.

**ANALYZING or SYNTHESIZING:** Establishing a link between a problem and a given solution finding a solution to 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	GEOMETRIC FIGURES	PAIRS OF ANGLES	POLYGONS	PYTHAGOREAN THEOREM
SKILLS	20%	20%	30%	30%
STRUCTURING	Line; ray; line segment; diagonal; acute, obtuse, right & straight angles; parallel, perpendicular & intersecting lines	Angles: complementary, supplementary, adjacent, vertically opposite, alternate interior, alternate exterior, corresponding	Types of triangles and quadrilaterals	
			5 6%	
25%	1 8%	3 8%	6 3%	
MATHEMATIZING				The Pythagorean theorem
10%				8 10%
OPERATING	Construction of angles	Measure of an angle by deduction	Measure of angles and sides	Measure of the 3rd side
				9 5%
55%	2 12%	4 12%	7 21%	10 5%
ANALYZING OR SYNTHESIZING				Problem solving
				11 10%

Key: The numbers 1 to 11 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 distinguish between the following geometric figures: line, ray, line segment, angle.

### **Dimension 2**

To construct, using a protractor, an angle measuring between  $0^\circ$  and  $180^\circ$ , accurate to within 2 degrees.

### **Dimension 3**

To identify, in certain figures, various types of pairs of angles: complementary, supplementary, adjacent, vertically opposite, alternate interior, alternate exterior, corresponding.

### **Dimension 4**

To find the measure of an angle in a figure by applying the properties of pairs of angles.

### **Dimension 5**

To identify certain triangles (equilateral, isosceles, right, isosceles right, scalene) and quadrilaterals (parallelogram, rhombus, square, rectangle, trapezoid) in a series of figures.

### **Dimension 6**

To describe the characteristics of angles, sides or diagonals in a triangle or quadrilateral.

### **Dimension 7**

To find the measures of angles and sides in a geometric figure containing polygons where some of the measurements are given.

### **Dimension 8**

To state the formula required to solve a problem based on a situation from daily life (Pythagorean theorem or the properties of a triangle with an angle of  $30^\circ$ ,  $45^\circ$ , or  $60^\circ$ .)

### **Dimension 9**

To calculate the length of the third side of a triangle when the lengths of the other two sides are given, using the Pythagorean theorem.

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**Dimension 10**

To calculate, using the Pythagorean theorem, the lengths of two sides of a triangle when the length of the third side is given and one angle measures  $30^\circ$ ,  $45^\circ$  or  $60^\circ$ .

**Dimension 11**

To solve word problems where the situation can be represented by a right triangle for which the measures of two sides or of one side and an angle ( $30^\circ$ ,  $45^\circ$  or  $60^\circ$ ) are known. These problems are taken from everyday life. (The steps in the solution must be clearly indicated.)

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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 such problems: **mathematizing, operating** and **analyzing**.

Since it is also important that students be able to follow 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 on the program itself and the time normally required to master these skills.

STRUCTURING	25%
MATHEMATIZING	10%
OPERATING	55%
ANALYZING OR SYNTHESIZING	10%

With regard to concepts, it is evident that the study of polygons and the Pythagorean theorem is of prime importance. Mastery of these concepts forms the basis of all further study of geometry. The concepts have been weighted as follows:

GEOMETRIC FIGURES	20%
PAIRS OF ANGLES	20%
POLYGONS	30%
PYTHAGOREAN THEOREM	30%

The importance of STRUCTURING has been emphasized because definitions are essential in geometry, and similarly, OPERATING has been emphasized because this part of the program is primarily concerned with the measurement of angles and sides of figures. Moreover, most of the word problems deal with right triangles.

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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, as well as a geometry set (ruler, set-square, protractor, and compass).
- 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.

