Mathematics
Conics

Québec

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1. INTRODUCTION

This Definition of the Domain for Summative Evaluation describes and classifies the essential and representative elements of the secondary-level adult education Mathematics program and, more specifically, of the course entitled Conics. 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 course in this program is organized in a similar manner; however, the content of this definition of the domain is specific to the course entitled Conics.

The goal of the Definition of the Domain for Summative Evaluation is to prepare examinations that are valid from one version to another or 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	CONSEQUENCES
The main objective of the secondary-level adult education Mathematics program is to help students fully understand mathematical concepts.	Evaluation should involve verifying whether the student has fully understood the different concepts.
The program is designed to help students master the use of certain mathematical tools used in the field of science and technology or in different trades.	Evaluation items should pertain to situations in the field of science and technology or to situations related to trades.
The program aims to provide students with the skills they need to process information by applying mathematical models and appropriate strategies for solving problems.	Evaluation items should involve performing tasks that require the students to classify information, use mathematical models and solve problems.
The program also aims to improve the students' ability to clearly relate information using mathematical language.	Evaluation items should involve performing tasks that require the use of mathematical language. The appropriateness and clarity of the language used should be taken into account in the marking process.
The program is intended to help students develop a systematic work method.	Evaluation items should require the students to present their work in a clear and structured manner. This should be taken into account in the marking process.
The program will help students master the use of technological tools.	The use of a scientific calculator or graphing calculator is permitted for the examinations related to this course.

3. CONTENT OF THE PROGRAM FOR PURPOSES OF SUMMATIVE EVALUATION

Concepts

Circle
– graph of the region defined by a circle that corresponds to an inequality
– general form of an equation of a circle, given the coordinates of its centre and the measure of its radius
– equation of a line tangent to a circle, given the point of tangency and the equation of the circle

Parabola
– graph of the region defined by a parabola that corresponds to an inequality
– standard form of the equation of a parabola, given the coordinates of its vertex and its focus

Ellipse
– graph of the region defined by an ellipse centred at the origin that corresponds to an inequality

Hyperbola
– graph of the region defined by a hyperbola centred at the origin that corresponds to an inequality

All conics
– domain and range of two relations defined by means of interval or set-builder notation
– standard equation or inequality of two relations, given their graph
– equation of a relation representing a conic, given the description of its locus
– equation of a relation representing a conic, given the equation or the characteristics of another conic
– problem involving a conic, given a description of the situation and a figure, but not the equation
– problem involving a conic, given the equation

Skills

Each skill is defined within the context of a mathematics program.

Structuring	Being familiar with the fundamentals of mathematics, understanding some mathematical concepts and establishing simple relations among them.

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 (arithmetic, 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, transform, verify, and so on.

Analyzing	Demonstrating, in an organized fashion, the complex connections between concepts or definitions and their related actions and illustrations.

Possible actions: to conclude, correct, deduce, derive, demonstrate, explain, extrapolate, infer, justify, and so on.

Synthesizing	Effectively integrating a variety of concepts and skills to solve a problem.

Possible actions: to solve a problem.

4. TABLE OF DIMENSIONS

CONCEPTS SKILLS	CIRCLE 20%	PARABOLA 15%	ELLIPSE HYPERBOLA 10%	ALL CONICS 55%
STRUCTURING **10%**				Describe the domain and range of two relations using set-builder or interval notation. **7** **10%**
MATHEMATIZING **30%**	Graph the region defined by a circle that corresponds to an inequality. **1** **10%**	Graph the region defined by a parabola that corresponds to an inequality. **4** **10%**	Graph the region defined by an ellipse or a hyperbola centred at the origin that corresponds to an inequality. **6** **10%**	
OPERATING **30%**	Determine the general form of the equation of a circle, given the coordinates of its centre and the measure of its radius. **2** **5%**	Determine the standard form of the equation of a parabola, given the coordinates of its vertex and its focus. **5** **5%**		Determine the standard form of the equation or inequality of two relations, given their graph. **8** **10%**
	Determine the equation of a line tangent to a circle, given the point of tangency and the equation of the circle. **3** **5%**			Determine the equation of a relation representing a conic, given the description of its locus. **9** **5%**
ANALYZING **10%**				Determine the equation of a relation representing a conic, given the equation or the characteristics of another conic. **10** **10%**
SYNTHESIZING **20%**				Solve a problem involving a conic, given a description of the situation and a figure, but not the equation. **11** **10%**
				Solve a problem related to a conic, given the equation. **12** **10%**

5. OBSERVABLE BEHAVIOURS

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

Dimension 1

In a Cartesian plane, draw the region defined by a circle that corresponds to the general form of an inequality. Write the coordinates of the centre of this circle. Draw a radius and indicate its measure.
(mathematizing)   /5

Dimension 2

Determine the general form of the equation of a circle, given the coordinates of its centre (h, k) and the measure of its radius (r).
(operating)   /5

Dimension 3

Determine the equation of a line tangent to a circle, given the coordinates of the point of tangency (x_1, y_1) and the standard form of the equation of the circle.
(operating)   /5

Dimension 4

In a Cartesian plane, draw the region defined by a parabola that corresponds to an inequality given in standard form. Write the coordinates of the focus and the vertex of this parabola. Draw the axis of symmetry and the directrix of this parabola.
(mathematizing)   /10

Dimension 5

Determine the standard form of the equation of a horizontal or vertical parabola, given the coordinates of its vertex (h, k) and the coordinates of its focus (x_1, y_1).
(operating)   /5

Dimension 6

In a Cartesian plane, draw the region defined by an ellipse centred at the origin that corresponds to an inequality given in standard form. Write the coordinates of the vertices and the foci of this ellipse.

or

In a Cartesian plane, draw the region defined by a hyperbola centred at the origin that corresponds to an inequality given in standard form. Write the coordinates of the vertices and the foci of this hyperbola. Draw the asymptotes of the hyperbola.
(mathematizing)   /10

Dimension 7

Using set-builder or interval notation, describe the domain and range of two relations among the following: circle, parabola, ellipse centred at the origin, hyperbola centred at the origin, or one of the regions of the plane defined by one of these loci. The relations are given in a graph.
(structuring)   /10

Dimension 8

Determine the standard form of an equation or inequality that corresponds to a graph of two relations among the following: circle, parabola, ellipse centred at the origin, hyperbola centred at the origin, or one of the regions of the plane defined by one of these loci.
(operating)   /10

Dimension 9

Determine the equation of a relation that represents a conic, given the description of its locus.
(operating)   /5

Dimension 10

Determine the equation of a relation that represents a conic defined by another conic for which the equation or certain characteristics are given. The students must clearly show all their work.
(analyzing)   /10

Dimension 11

Solve a problem involving a conic. The description of the situation includes a diagram. Solving the problem requires finding the equation that describes the conic, and may require determining the coordinates of certain points and calculating the distance between these points. The students must clearly show all their work.
(synthesizing)   /10

Dimension 12

Solve a problem involving a conic, given the equation. Solving the problem may require determining the coordinates of certain points, calculating the distance between these points or determining the equation of another conic. The students must clearly show all their work.
(synthesizing)   /10

6. JUSTIFICATION OF CHOICES

In the examination, 10% of the items test the students' **STRUCTURING** skills by verifying their ability to describe the domain and range of two relations by means of set-builder or interval notation.

In the examination, 20% of the items test the students' **MATHEMATIZING** skills by verifying whether they are able to translate a given situation into a mathematical model:
– graphing a conic, given its equation or corresponding inequality, or, given its inequality and corresponding equation

In the examination, 40% of the items test the students' **OPERATING** skills by verifying whether they have mastered certain operations or transformations:
– determining the general form of the equation of a circle, given the coordinates of its centre and the measure of its radius
– determining the standard form of the equation of a parabola, given the coordinates of its vertex and its focus
– determining the equation of a line tangent to a circle, given the point of tangency and the equation of the circle
– determining the equation of a relation representing a conic, given its locus

In the examination, 10% of the items test the students' **ANALYZING** skills by verifying their ability to make connections between the equation of a relation that represents a conic and the written description of another conic.

In the examination, 20% of the items test the students' **SYNTHESIZING** skills by verifying their ability to:
– solve problems
– use a rigorous work method
– communicate clearly using mathematical language

7. DESCRIPTION OF THE EXAMINATION

A. TYPE OF EXAMINATION

The summative examination will be a written examination consisting of multiple-choice, short-response or extended-response items.

The items should take into account the restrictions and the requirements specified in the dimensions and the objectives of the program. The weighting of marks should be consistent with the percentages set out in the table of dimensions.

B. CHARACTERISTICS OF THE EXAMINATION

The examination will be administered in a single session lasting no more than two and a half hours.

Students are permitted to use a scientific calculator or a graphing calculator.

C. PASS MARK

The pass mark is set at 60 out of 100.