Mathematics Factoring and Algebraic Fractions

Québec

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Factoring and
Algebraic Fractions

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 Factoring and Algebraic Fractions. 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 Factoring and Algebraic Fractions.

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 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 is permitted for the examinations related to this course.

3. CONTENT OF THE PROGRAM FOR PURPOSES OF SUMMATIVE EVALUATION

Concepts

Factoring
– finding the common factor
– factoring by grouping
– factoring a trinomial of the form $x^2 + bx + c$ or of the form $x^2 + bxy + cy^2$
– factoring a trinomial of the form $ax^2 + bx + c$ or of the form $ax^2 + bxy + cy^2$
– factoring a binomial representing the difference of two squares
– factoring a polynomial into three prime factors

Rational algebraic fractions
– simplification
– product of two algebraic fractions
– quotient of two algebraic fractions
– sum of two algebraic fractions
– difference of two algebraic fractions
– equivalence of two algebraic expressions

Skills

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

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   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.

4. TABLE OF DIMENSIONS

CONCEPTS SKILLS	FACTORING 35%		RATIONAL ALGEBRAIC FRACTIONS 65%	
OPERATING **80%**	Find the common factor. **1**	**5%**	Simplify an algebraic fraction. **8**	**5%**
	Factor by grouping. **2**	**5%**	Simplify the product of two algebraic fractions. **9**	**10%**
	Factor a trinomial of the form $x^2 + bx + c$ or of the form $x^2 + bxy + cy^2$. **3**	**5%**	Simplify the quotient of two algebraic fractions. **10**	**10%**
	Factor a trinomial of the form $ax^2 + bx + c$ or of the form $ax^2 + bxy + cy^2$. **4**	**5%**	Simplify the sum of two algebraic fractions. **11**	**10%**
	Factor a binomial representing the difference of two squares. **5**	**5%**	Simplify the difference of two algebraic fractions. **12**	**10%**
	Factor a polynomial containing two or four terms into three prime factors. **6**	**5%**		
	Factor a trinomial into three prime factors. **7**	**5%**		
ANALYZING **20%**			Verify the equivalence of two algebraic expressions (one of the expressions needs to be simplified). **13**	**10%**
			Verify the equivalence of two algebraic expressions (both expressions need to be simplified). **14**	**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

Find the common factor of all the terms of a polynomial containing no more than six terms.
(operating)   /5

Dimension 2

Factor a polynomial by grouping. The polynomial should contain no more than six terms.
(operating)   /5

Dimension 3

Factor a trinomial of the form $x^2 + bx + c$ or of the form $x^2 + bxy + cy^2$.
(operating)   /5

Dimension 4

Factor a trinomial of the form $ax^2 + bx + c$ or of the form $ax^2 + bxy + cy^2$. The students must clearly show all their work.
(operating)   /5

Dimension 5

Factor a binomial representing the difference of two squares.
(operating)   /5

Dimension 6
Factor a polynomial containing two or four terms into three prime factors using appropriate factoring methods, which must include finding the common factor. The students must clearly show all their work.
(operating)   /5

Dimension 7

Factor a trinomial into three prime factors using appropriate factoring methods, which must include finding the common factor. The students must clearly show all their work. (operating)   /5

Dimension 8

Simplify a rational algebraic fraction whose numerator and denominator are factorable polynomials containing no more than three terms. Each term contains no more than two variables. Simplifying the fraction involves two or three factorizations. If two factorizations are required for the same polynomial, then one of these must involve finding the common factor. The students must clearly show all their work. (operating)   /5

Dimension 9

Simplify the product of two rational algebraic fractions. The polynomials of the numerators and denominators contain no more than three terms. Each term contains no more than two variables. Simplifying the product involves two or three factorizations. If two factorizations are required for the same polynomial, then one of these must involve finding the common factor. The students must clearly show all their work. (operating)   /10

Dimension 10

Simplify the quotient of two rational algebraic fractions. The polynomials of the numerators and denominators contain no more than three terms. Each term contains no more than two variables. Simplifying the quotient involves two or three factorizations. If two factorizations are required for the same polynomial, then one of these must involve finding the common factor. The students must clearly show all their work. (operating)   /10

Dimension 11

Simplify the sum of two rational algebraic fractions. Simplifying the sum involves no more than one factorization. The common denominator should consist of no more than two binomials and one monomial. The students must clearly show all their work. (operating)   /10

Dimension 12

Simplify the difference of two rational algebraic fractions. Simplifying the difference involves no more than one factorization. One numerator and one denominator of the fractions are monomials. The common denominator should consist of no more than two binomials and one monomial. The students must clearly show all their work.
(operating)   /10

Dimension 13

Verify the equivalence of two algebraic expressions by simplifying the expression containing the sum or the difference of two rational algebraic fractions. Simplifying the expression involves no more than three factorizations. The common denominator should consist of no more than two binomials and one monomial. The students must clearly show all their work.
(analyzing)   /10

Dimension 14

Verify the equivalence of two algebraic expressions by simplifying them. Each expression contains the sum or the difference of two rational algebraic fractions. Simplifying the expressions involves no more than three factorizations. The common denominator should consist of no more than two binomials and one monomial. The students must clearly show all their work.
(analyzing)   /10

6.   JUSTIFICATION OF CHOICES

In the examination, 80% of the items test the students' **OPERATING** skills by verifying whether they have mastered certain operations or transformations:
– factoring methods
– simplifying algebraic fractions
– multiplying two algebraic fractions
– dividing two algebraic fractions
– adding two algebraic fractions
– subtracting two algebraic fractions

In the examination, 20% of the items test the students' skill in **ANALYZING** information; they involve verifying whether the students have the ability to make connections:
– by verifying the equivalency of two algebraic expressions

7.   DESCRIPTION OF THE EXAMINATION

A.   TYPE OF EXAMINATION

The summative examination will be a written examination consisting of short- 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; however, they are not permitted to use a graphing calculator.

C.   PASS MARK

The pass mark is set at 60 out of 100.