Mathematics
Probability II

Québec ⬚⬚

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Probability II

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 Probability II. 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 Probability II.

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

Probability and odds of an event occurring
–   probability of events in a geometric context or another type of context
–   odds of events occurring in a geometric context or another type of context
–   determining the event with the highest probability of occurence
–   problem that involves calculating the probability or the odds of an event occurring in a geometric context

Mathematical expectation
–   determining whether a game situation is fair
–   determining whether a game favours the player or the owner of the game
–   problem related to mathematical expectation, which may or may not be presented in a geometric context

Compound probability and conditional probability
–   calculating the probabilities of various events or of their complementary events
–   given a written description and a partially completed probability tree diagram, calculating the conditional probability of a situation
–   given a written description and a partially completed contingency table, calculating the conditional probability of a situation
–   verifying statements describing events which may or may not be complementary
–   evaluating statements describing the conditional probability or another type of probability of events, given a situation described in writing and illustrated by either a contingency table or a probability tree diagram

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 cognitive 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.

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.

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	PROBABILITY AND ODDS OF AN EVENT OCCURRING IN A GEOMETRIC CONTEXT OR ANOTHER TYPE OF CONTEXT 30%	MATHEMATICAL EXPECTATION 30%	COMPOUND PROBABILITY AND CONDITIONAL PROBABILITY 40%
STRUCTURING 5%	Given a number of expressions, choose the one that can be used to calculate the probability or the odds of an event occurring in a geometric context. **1** **5%**		
OPERATING 35%	Determine the probability or the odds of an event occurring in a geometric context. **2** **5%**		Calculate the probability of various events or of their complementary events, using the appropriate model. **9** **10%**
			Determine the conditional probabilities of two events. The situation is described in writing and illustrated by a partially completed probability tree diagram. **10** **10%**
			Determine the conditional probabilities of two events. The situation is described in writing and illustrated by a partially completed contingency table. **11** **10%**
ANALYZING 40%	Determine whether statements describing the probability or the odds of certain events occurring are true or false. **3** **5%**	Determine in which situation a game is fair. **6** **10%**	Given statements describing events that may or may not be complementary, determine which statements are true. **12** **5%**
	Determine the event with the highest probability of occurrence, given the odds of two events occurring and the probability of a third event. **4** **5%**	Determine whether a game favours the player or the owner of the game. **7** **10%**	Determine whether statements describing the conditional probability or another type of probability of events are true or false. The situation is described in writing and illustrated by a contingency table or a probability tree diagram. **13** **5%**
SYNTHESIZING 20%	Solve a problem that involves calculating the probability or the odds of an event occurring in a geometric context. **5** **10%**	Solve a problem that involves calculating mathematical expectation in a geometric context or another type of context. **8** **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

Given a number of expressions, choose the one that can be used to calculate the probability or the odds of an event occurring by comparing lengths or areas. The situation is described by a geometric figure.
(structuring)   /5

Dimension 2

Determine the probability or the odds (for or against) of an event occurring in a geometric context. Formulas are not required to calculate the areas. The students must clearly show all their work.
(operating)   /5

Dimension 3

Given a description of a simple random experiment, determine whether statements describing the probability or the odds of various events occurring are true or false.
(analyzing)   /5

Dimension 4

Determine the event with the highest probability of occurrence, given the odds of a first event occurring, the odds against a second event occurring and the probability of a third event. The students must clearly show all their work.
(analyzing)   /5

Dimension 5

Solve a problem that involves calculating the probability or the odds (for or against) of an event occurring in a geometric context by calculating and then comparing the areas of two or three figures. The students must clearly show all their work.
(synthesizing)   /10

Dimension 6

Determine which random game situation is fair, given a description of various winning or losing situations based on the outcomes of a game. The students must clearly show all their work.
(analyzing)   /10

Dimension 7

After comparing two random games, determine which one favours the player or the owner of the game, given a description of various winning or losing situations based on the outcomes of a game. The students must clearly show all their work.
(analyzing)   /10

Dimension 8

Solve a problem related to mathematical expectation, which may or may not be presented in a geometric context. Formulas are not required to calculate the areas. The students must clearly show all their work.
(synthesizing)   /10

Dimension 9

Calculate the probability of various events or of their complementary events in a random situation with or without replacement, using an appropriate model, the rule of multiplication and, if necessary, the rule of addition. The calculation should require two or three steps. The students must clearly show all their work.
(operating)   /10

Dimension 10

Determine the conditional probabilities of two events. The random situation is described in writing and illustrated by a partially completed probability tree diagram. The students must clearly show all their work.
(operating)   /10

Dimension 11

Determine the conditional probabilities of two events. The random situation is described in writing and illustrated by a partially completed contingency table. The students must clearly show all their work.
(operating)   /10

Dimension 12

Given statements describing the probabilities of various events that may or may not be complementary, determine which statements are correct. The random experiment consists of no more than three steps and is described in full by a tree diagram, a table or a probability tree diagram. The students must justify their answers.
(analyzing)   /5

Dimension 13

Determine whether statements describing the conditional probability or another type of probability of various events are true or false. The random situation is described in writing and illustrated by a probability tree diagram or a contingency table. The students must justify their answers.
(analyzing)   /5

6. JUSTIFICATION OF CHOICES

In the examination, 5% of the items test the students' **STRUCTURING** skills by verifying their understanding of certain concepts:
– the probability or odds of an event occurring in a geometric context

In the examination, 35% of the items test the students' **OPERATING** skills by verifying whether they have mastered certain operations or transformations:
– calculating the odds of an event occurring
– calculating the probabilities of various events or of their complementary events
– calculating the conditional probabilities of two events in a situation described in writing and illustrated by a table or a probability tree diagram

In the examination, 40% of the items test the students' skill in **ANALYZING** information; they involve verifying whether the students have the ability to make connections:
– by verifying statements describing the probability or the odds of certain events occurring
– by verifying statements describing events that may or may not be complementary
– by verifying statements describing the conditional probability or another type of probability
– by determining whether a game situation is fair
– by comparing the probabilities and the odds of various events occurring
– by determining which game favours the player or the owner of the game

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; however, they are not permitted to use a graphing calculator.

C. PASS MARK

The pass mark is set at 60 out of 100.