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Guide for Parents

MINISTERIAL EXAMINATIONS

Mathematics

Secondary IV

Cultural, Social and Technical Option	563-420
Technical and Scientific Option	564-420
Science Option	565-420

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Votre gouvernement

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INTRODUCTION

This guide is designed to inform parents about the Secondary IV ministerial examination in mathematics for each of the three options in the curriculum:

- *Cultural, Social and Technical* Option
- *Technical and Scientific* Option
- *Science* Option

The guide presents the structure of the exam and the administration procedures, as well as excerpts from past ministerial examinations.

The Information Document, which provides complementary information, is also a recommended resource.

SECTION 1 MINISTERIAL EXAMINATIONS

NATURE AND OBJECTIVES OF THE EXAMINATIONS

The Secondary IV and V ministerial examinations are set by the Minister of Education for the certification of studies and for awarding the Secondary School Diploma. Every year, the Ministère organizes three exam sessions for these examinations: one in December/January, one in May/June and one in August.

Each ministerial examination is designed to evaluate the learning set out in the Québec Education Program and is based on the Framework for the Evaluation of Learning and the Progression of Learning.

As everyone enrolled in any given exam session must write the same examination, the dates and times indicated in the official schedule must be respected. Only the Minister may authorize changes to the set schedule.

CONDITIONS FOR ADMINISTERING THE EXAMINATIONS

Educational institutions are the main entities responsible for making the necessary arrangements for the exams to take place (e.g. providing examination rooms), regardless of the education model (teaching provided at school or homeschooling).

To ensure equity and justice, the exam conditions must be the same for all candidates in Québec who write the exams. For this reason, the individuals designated to administer the examinations are given precise instructions to follow.

During an examination, it is forbidden for anyone to help the candidates in any way whatsoever by, for example, clarifying the task, providing additional information, explaining or translating words or expressions, or reformulating instructions. Examinations where a staff member has overstepped the boundaries of their role may be declared invalid by the Ministère.

Measures that adapt the conditions for administering ministerial examinations may be taken to enable candidates with specific needs to demonstrate their learning. In order to request special measures, please communicate with the educational institution responsible for administering the examination at the beginning of the school year or, in the context of homeschooling, when setting up the learning project. The educational institution will analyze the candidate's needs and determine which adaptive measures will be permitted, if any.

SECTION 2 OVERVIEW OF THE EXAMINATION FOR MATHEMATICS

EVALUATION OF THE COMPETENCY

The Secondary IV mathematics examination is designed to evaluate Competency 2, *Uses mathematical reasoning*.

For each exam session, the Ministère develops an examination for each of the three options in the mathematics curriculum:

- *Cultural, Social and Technical* Option
- *Technical and Scientific* Option
- *Science* Option

The candidate writes the examination for **one** of the three options.

SUMMARY OF THE EXAMINATION

The mathematics examination takes place in an exam room at a specific time, as set out in the official schedule, and lasts 3 hours.

In the examination for each option, the candidate must solve different mathematical problems that focus on the main concepts and processes outlined for that option in the Québec Education Program.

CONTENT OF THE EXAMINATION

Table 1 on the following page indicates the branches of mathematics that candidates will be tested on in the examination for each option.

TABLE 1 – APPROXIMATE RELATIVE IMPORTANCE OF EACH BRANCH OF MATHEMATICS IN THE EXAMINATIONS

Option	Algebra	Statistics and Probability	Geometry
Cultural, Social and Technical Option	From 28% to 36%	From 12% to 20%	From 46% to 54%
Technical and Scientific Option	From 36% to 48%	From 16% to 28%	From 32% to 44%
Science Option	From 48% to 54%	From 4% to 10%	From 38% to 44%

Each examination is divided into three parts. Table 2 gives a breakdown of the types of tasks involved, the focuses of evaluation and the number of marks allotted.

TABLE 2 – BREAKDOWN OF THE TYPES OF TASKS, FOCUSES OF EVALUATION AND MARKS ALLOTTED

Exam Part	Type of Task	Focus of Evaluation	Number of Tasks	Total Marks
A	Multiple-choice questions	Knowledge of and ability to apply mathematical concepts and processes	6	24
B	Short-answer questions		4	16
C	Situations involving applications	Mathematical reasoning and the ability to organize and apply mathematical concepts and processes	6	60

Part C consists of two types of situations involving applications:

- Category I: The candidate must choose and carry out a set or series of operations to meet the requirements of the task by using the appropriate mathematical concepts and processes as well as appropriate strategies.
- Category II: The candidate must draw on different aspects of reasoning to convince using mathematical arguments, to recognize a model and apply it, to prove a statement or property, to disprove a statement using a counterexample or to formulate a conjecture.

Table 3 presents the breakdown, by category, of the six situations involving applications in Part C of the examinations for the three options.

TABLE 3 – BREAKDOWN OF THE SITUATIONS INVOLVING APPLICATIONS IN PART C

Option	Category I	Category II
Cultural, Social and Technical Option	5	1
Technical and Scientific Option	4	2
Science Option	4	2

AUTHORIZED AND UNAUTHORIZED MATERIALS

Authorized materials

Candidates may bring and use the following materials:

- calculator (that complies with the rules described below)
- ruler
- compass
- set square
- protractor
- graph paper
- memory aid prepared beforehand by the candidate in accordance with the requirements outlined on page 6

For the June examination, candidates must bring an **HB pencil**.

Rules for using calculators

Calculators with or without a graphic display may be used during the ministerial examinations for Secondary IV mathematics.

Calculators with a computer algebra system (CAS) are permitted only if this system is disabled for the entire examination.

In the interest of fairness regarding applications on a computer, tablet or calculator, certain functions must be disabled or monitored. The use of these applications must be planned in conjunction with the educational institution responsible for administering the examination, either at the start of the school year or, in the case of homeschooling, when the learning project is implemented.

The data and programs stored in the calculator's memory must be deleted before the examination begins. Candidates must therefore have been given the opportunity beforehand to learn how to reset their calculator's memory. In addition, it is forbidden to store programs in the calculator's memory during the examination.

User guides, memory expansion features or any other calculator accessories or peripherals are not allowed during the examination. Communication between calculators is also not permitted during the examination.

If, during the examination, a candidate is caught in possession of a calculator whose memory contains data or programs, this will be considered a form of cheating, and the examination may be declared invalid by the Ministère.

Candidates may not lend their calculator to other candidates or borrow one from them.

Unauthorized materials

No other materials are permitted.

Candidates are also strictly forbidden to have **in their possession** any personal mobile device (smartphone, wireless headphones or earbuds, smartwatch, etc.).

SECTION 3 STEPS IN THE EXAMINATION FOR MATHEMATICS

PREPARING THE MEMORY AID

The week before the examination, each candidate is asked to prepare a memory aid on one letter-sized sheet of paper (8½ in x 11 in). Using both sides of the sheet, the candidate can record, for example, mathematical formulas that may be useful for the examination. This memory aid must be handwritten. Mechanical reproduction of the memory aid is forbidden. The candidate's name and the examination code must be indicated on the memory aid.

- *Cultural, Social and Technical* Option 563-420
- *Technical and Scientific* Option 564-420
- *Science* Option 565-420

WRITING THE EXAMINATION

Upon arrival in the examination room, each candidate receives a copy of the Student Booklet, which contains all the tasks in the examination. For the June examination, each candidate also receives a scannable answer sheet. Candidates have 3 consecutive hours to read through the instructions in this booklet and complete all the tasks on their own.

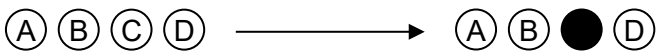
The examination consists of 16 tasks divided into 3 parts. The candidate can complete the tasks in any order.

Part A

Part A consists of 6 multiple-choice questions.

For the June exam, candidates indicate their answers on a sheet that will be marked by a scanner, which can only read answers indicated with an **HB pencil**.

For each question, candidates must fill in the circle that corresponds to their answer, as shown in the example below.



For the January and August examinations, candidates indicate their answers in the Student Booklet by circling the letter that corresponds to their answer for each question.

An example of a question in Part A is presented on page 8.

Part B

Part B consists of 4 short-answer questions.

For each question, candidates write their answers in the Student Booklet in the spaces provided for this purpose.

The length of line segment KT is 384 m.

An example of a question in Part B is presented on page 9.

Part C

Part C consists of 6 situations involving applications.

In the Student Booklet, candidates must show clear, organized work that indicates the reasoning they used for each of these situations. Note that candidates cannot list calculator applications to support any result or mathematical statement they indicate in their exam booklet.

Examples of situations involving applications are presented on pages 10 to 12.

If after 3 hours a candidate has not finished writing the examination, 15 more minutes may be allotted, as specified in the Administrative Guide for the Certification of Studies and Management of Ministerial Examinations.

At the end of the examination, candidates must hand in to the examiner their graph paper, their memory aid and all other exam documents before leaving the examination room.

No candidates may leave the examination room before at least half the time allotted for the exam has elapsed. Any candidate who has a good reason to leave the examination room must be accompanied by an authorized person designated by the educational institution.

MARKING

The corrector will mark the examination using the answer key and the rubric provided by the Ministère. The rubric used to grade the situations involving applications is provided in the appendix.

SECTION 4 EXCERPTS FROM MINISTERIAL EXAMINATIONS FOR MATHEMATICS

EXAMPLE OF A QUESTION IN PART A FOR ALL THREE MATHEMATICS OPTIONS

This example deals with a concept related to statistics that is covered in all three mathematics options.

The table below shows the linear correlation coefficient between the two variables of three different statistical distributions.

DISTRIBUTION	LINEAR CORRELATION COEFFICIENT
1	−0.87
2	−0.45
3	0.72

Which of the following presents these distributions, in order, from the weakest to the strongest linear correlation?

A) 1, 2, 3

B) 1, 3, 2

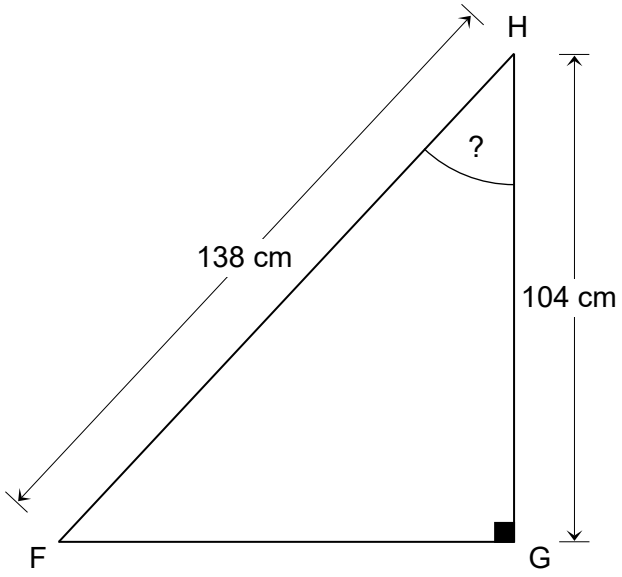
C) 2, 3, 1

D) 3, 2, 1

EXAMPLE OF A QUESTION IN PART B FOR ALL THREE MATHEMATICS OPTIONS

This example deals with a geometry concept that is covered in all three mathematics options.

Consider right triangle HGF represented below.



To the nearest degree, what is the measure of angle FHG?

ANSWER:

To the nearest degree, the measure of angle FHG is _____°.

EXAMPLES OF SITUATIONS INVOLVING APPLICATIONS IN PART C

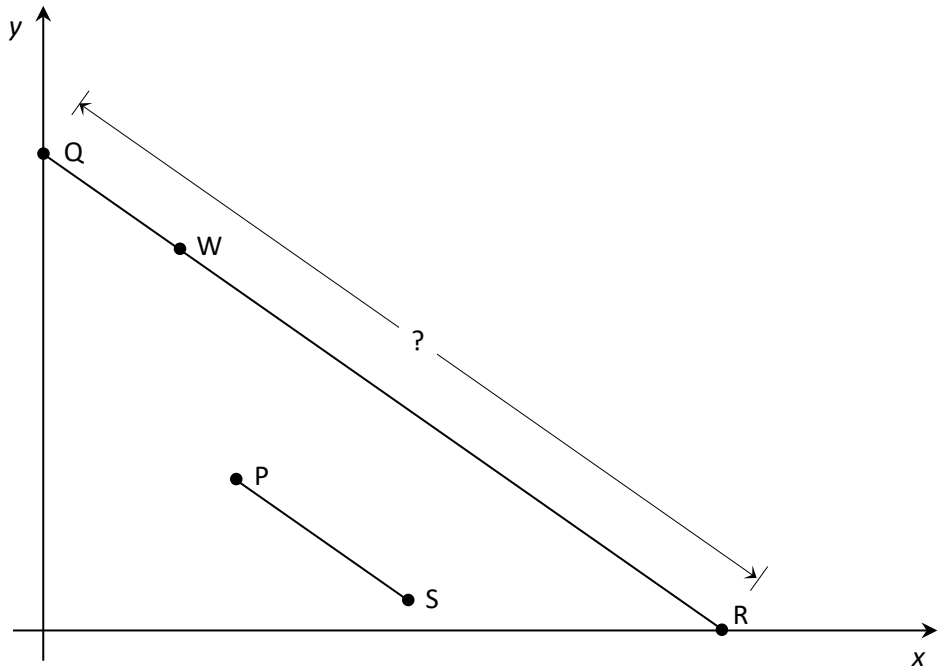
Category I – *For all three mathematics options*

This example deals with analytic geometry concepts that are covered in all three mathematics options.

TWO LINE SEGMENTS

In the Cartesian plane represented below,

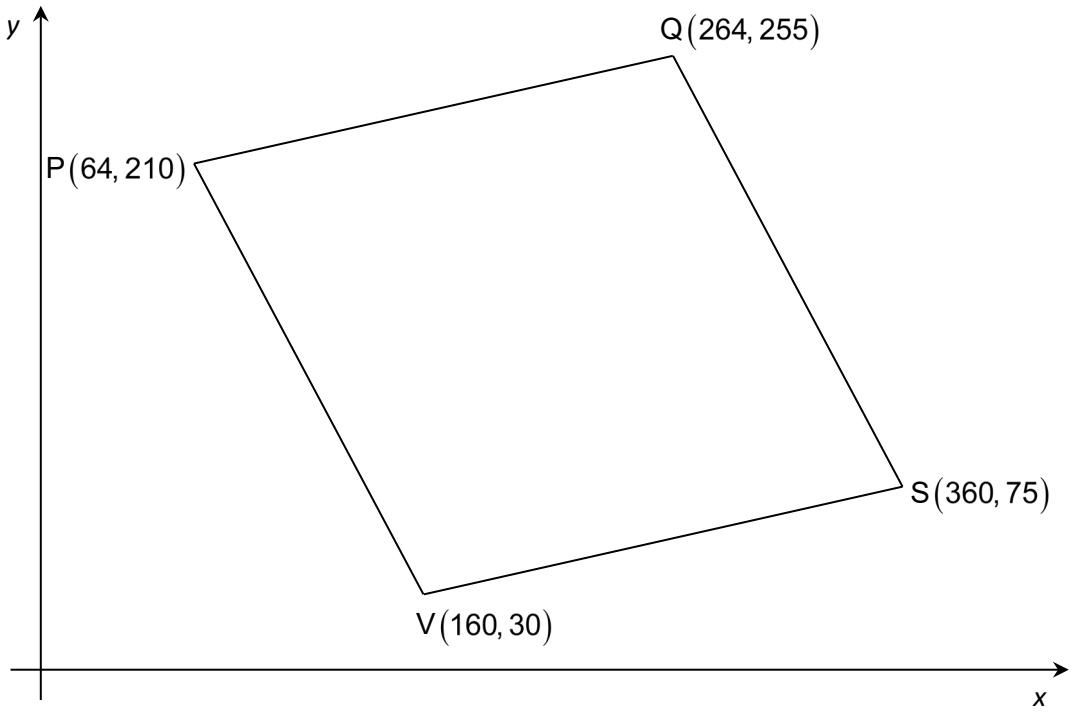
- $\overline{PS} \,//\, \overline{QR}$
- point R is a point on the *x*-axis
- point Q is a point on the *y*-axis
- point $W(50, 140)$ is on line segment QR
- the equation associated with line segment PS is $y = -\frac{7}{10}x + 105$



To the nearest tenth, what is the length of line segment QR?

A PARALLELOGRAM, BUT NOT A RHOMBUS

Consider quadrilateral PQSV represented below in the Cartesian plane.



Show that quadrilateral PQSV is a parallelogram, but that it is not a rhombus.

A SERIES OF ALGEBRAIC EXPRESSIONS

The table below shows a series of algebraic expressions. The numerators and denominators of these expressions are not equal to zero.

1st expression	$\frac{4xy - 6x + 10y - 15}{2y - 3}$
2nd expression	$\frac{4x^2 + 17x + 15}{x + 3}$
3rd expression	$\frac{6x^2 - x - 5}{9x + 1} \div \frac{x - 1}{9x + 1}$
. . .	. . .
6th expression	$\frac{144x^2 - 25}{?}$

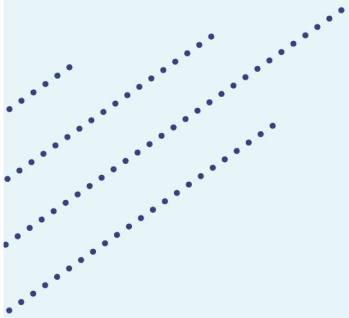
What is the denominator of the 6th expression in this series?

APPENDIX RUBRIC FOR THE SITUATIONS INVOLVING APPLICATIONS

		OBSERVABLE INDICATORS				
		LEVEL A	**LEVEL B**	**LEVEL C**	**LEVEL D**	**LEVEL E**
EVALUATION CRITERIA	**Cr. 3** **Proper implementation of mathematical reasoning suited to the situation**	*The student . . .* • chooses appropriate concepts and processes and uses actions, strategies, hypotheses, assumptions, etc. that make it possible to meet the requirements of the situation	*The student . . .* • chooses appropriate concepts and processes and uses actions, strategies, hypotheses, assumptions, etc. that make it possible to meet most of the requirements of the situation	*The student . . .* • chooses appropriate concepts and processes and uses actions, strategies, hypotheses, assumptions, etc. that make it possible to meet some of the requirements of the situation	*The student . . .* • chooses appropriate concepts and processes and uses actions, strategies, hypotheses, assumptions, etc. that make it possible to: – meet few of the requirements of the situation OR – partially meet some of the requirements of the situation	*The student . . .* • chooses concepts and processes and uses actions, strategies, hypotheses, assumptions, etc. that make it possible to partially meet one of the requirements of the situation
	Cr. 2* **Correct use of appropriate mathematical concepts and processes**	• applies the required concepts and processes appropriately to meet the requirements of the situation	• applies the required concepts and processes appropriately to: – meet the requirements of the situation, but makes one or more minor mistakes OR – meet most of the requirements of the situation, and may or may not make minor mistakes	• applies some of the required concepts and processes appropriately to meet the requirements of the situation, and may or may not make minor mistakes	• applies few of the required concepts and processes appropriately to meet the requirements of the situation, and may or may not make minor mistakes	• does not apply any of the required concepts and processes appropriately to meet the requirements of the situation
	Cr. 4 **Proper organization of the steps in an appropriate procedure**	• shows clear and organized work that is in keeping with the rules and conventions of mathematical language	• shows clear work, although some elements are implicit, and makes few or no mistakes regarding the rules and conventions of mathematical language	• shows work that lacks clarity because it is incomplete or includes several mistakes regarding the rules and conventions of mathematical language	• shows work that consists of confusing or isolated elements that may include mistakes regarding the rules and conventions of mathematical language	• shows little work
	Cr. 5 **Correct justification of the steps in an appropriate procedure**	• uses appropriate arguments to justify or support the statements, conclusions or results that need to be justified or supported	• uses appropriate arguments to justify or support most of the statements, conclusions or results that need to be justified or supported	• uses appropriate arguments to justify or support some of the statements, conclusions or results that need to be justified or supported	• uses appropriate arguments to justify or support few of the statements, conclusions or results that need to be justified or supported	• does not justify or support the statements, conclusions or results with appropriate arguments
	Cr. 1** **Formulation of a conjecture suited to the situation**	• formulates one or more appropriate conjectures that account for every aspect of the situation	• formulates one or more appropriate conjectures that account for most of the aspects of the situation	• formulates one or more partially appropriate conjectures that account for certain aspects of the situation	• formulates one or more largely inappropriate conjectures that account for few aspects of the situation	• formulates one or more inappropriate conjectures

* – To apply a concept or process appropriately means that the student must apply it without making a conceptual or procedural error.
– The student may fail to apply a concept or process that is required to carry out all the steps in a line of reasoning and that was not part of the learning prescribed for an academic level lower than the level for which the examination is designed. In such cases, the student is considered to have made a conceptual or procedural error.
– The student is considered to have made a minor mistake if there is an error in the application of a concept or process that was part of the learning prescribed for an academic level lower than the level for which the examination is designed.

** – The student may be required to make conjectures (hypotheses, assumptions, etc.) at different stages in their line of mathematical reasoning. Criterion 3 will be used to evaluate these conjectures, but the written work involved in making these conjectures may not always be fully shown.



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