SCHOOL ACHIEVEMENT INDICATORS PROGRAM
OF THE COUNCIL OF MINISTERS OF EDUCATION, CANADA

Québec Results
in the 2001 Mathematics Assessment

Québec

SCHOOL ACHIEVEMENT INDICATORS PROGRAM OF THE COUNCIL OF MINISTERS OF EDUCATION, CANADA

Québec Results
in the 2001 Mathematics Assessment

Ministère de l'Éducation
April 2002

Ministère de l'Éducation
ISBN : 2-550-39295-7
Legal Deposit — Bibliothèque nationale du Québec, 2002

Table of Contents

1 INTRODUCTION

1.1 Context of the Study

The provinces of Canada have given the Council of Ministers of Education Canada (CMEC) the mandate to implement the School Achievement Indicators Program (SAIP) to assess students' performance in mathematics, reading and writing, and science. In April and May 2001, the mathematics achievement of students from all the provinces and territories of Canada was evaluated.

1.2 Target Groups

The mathematics assessments were administered to students who were 13 years old on August 31, 2001. In most of the provinces' education systems, these students were registered in the first year of secondary school, which is the transition year between elementary and secondary school.

1.3 Sampling Procedure

The samples of students were selected using a two-stage procedure.

The CMEC was responsible for managing the first stage, the aim of which was to select schools. The provinces and territories were asked to provide the CMEC with a list of all schools with 13 year-old students, indicating for each school the number of 13-year-olds (students born between September 1, 1986 and August 31, 1987). Schools under federal jurisdiction and those with fewer than five students were excluded. The schools were then selected using a procedure that took into account their size.

Each province and territory was responsible for the second stage, the aim of which was to select students, using a uniform procedure that obliged the coordinators for the provinces or territories to give equal probability of selection to all 13-year-olds. This procedure did not allow for any exclusion at this stage of the process.

1.4 Description of the Samples of Québec Students

As in the other studies in which Québec has participated, different samples were constituted for anglophone and francophone students. Thus it is possible to analyze the data for each of the two language groups. Table 1 shows the size of the Québec samples in the study. More than 4 000 13-year-olds took part.

The samples for the two components of the assessment are representative of the student population of Québec because they consist of students from both the public and private systems as well as both language groups (i.e. francophones and anglophones).

Table 1

NUMBER OF SCHOOLS AND STUDENTS INCLUDED IN THE SAMPLES

Samples	**Francophones**		**Anglophones**		**Total number of students**
	Schools	**Students**	**Schools**	**Students**	
13-year-olds					
Mathematics content assessment	95	885	98	863	**1 748**
Problem-solving assessment	95	601	98	773	**1 374**
Total number of students		**1 486**		**1 636**	**3 122**

1.5 Development of the Assessment Instruments

1993 Assessment

The development of the 1993 SAIP mathematics assessment began in 1991, and was led by a consortium of representatives from Alberta, Québec and Ontario who worked in cooperation with representatives of other departments and ministries of education. These specialists developed the mathematics materials needed for describing and assessing the achievement of 13-year-old Canadian students. They established criteria for five performance levels and designed two types of instruments: one for mathematical content and the other for problem solving. Because these instruments were thoroughly field-tested, the resulting comments from teaching personnel and

students as well as the detailed statistical analyses helped to determine the selection of test items for the final version of the test booklets.

1997 Assessment

The 1997 SAIP instruments for the mathematics assessment were essentially the same as those created for the 1993 assessment. The consortium in charge of the SAIP mathematics assessment in 1997 included representatives from British Columbia, Ontario, Québec and New Brunswick (francophone). The consortium's task was to update the assessment materials by taking into account the data and comments gathered when the 1993 assessment was administered, while making sure the modified materials would measure the same concepts and skills in the same manner as in 1993.

The same criteria were used for mathematical content. However, four multiple-choice items were replaced following the 1993 data analysis. Approximately 20 other items were slightly modified, in most cases, to make questions clearer linguistically. Although the items were essentially the same as in 1993, the test booklets were packaged in a different manner: the background questionnaire, the placement test and the 125 questions were all included in the same booklet. As a result of these changes, all the instruments were field-tested in the fall of 1996.

2001 Assessment

In preparing the assessment, a consortium made up of representatives from Saskatchewan, Ontario, and Newfoundland and Labrador reviewed the conceptual framework and criteria, the assessment instruments and the administrative procedures. In addition, the consortium ensured that the 2001 SAIP assessment would be updated on the basis of research findings, the policies pertaining to the development of programs and ongoing teaching practices.

After appealing to the provinces and territories, CMEC personnel and other assessment specialists for their participation and contribution, the consortium made several changes to different elements of the 2001 assessment. All these changes were fully examined and verified during pilot studies and comprehensive field-testing.

- Conceptual Framework and Criteria

Although the conceptual framework (areas) remains unchanged, adjustments were made to the criteria describing the level of performance for each area, so that the allocation of the students' performance levels is more uniform and more precise. To this end, criteria were added to the area covering data management and statistics.

Table 2

CHANGES MADE TO THE DEFINITION OF AREAS FOR MATHEMATICS CONTENT ASSESSMENT

Areas	% of students by performance level									
	1		2		3		4		5	
	1993	***2000***	1993	***2000***	1993	***2000***	1993	***2000***	1993	***2000***
NUMBERS AND OPERATIONS	11 [1] 44[2]	***7*** ***28***	11 44	***6*** ***24***	9 36	***7*** ***28***	5 20	***6*** ***24***	3 12	***6*** ***24***
ALGEBRA AND FUNCTIONS	3 12	***6*** ***24***	3 12	***6*** ***24***	5 20	***6*** ***24***	9 36	***6*** ***24***	12 48	***7*** ***28***
MEASUREMENT AND GEOMETRY	8 32	***6*** ***24***	8 32	***6*** ***24***	8 32	***6*** ***24***	7 28	***7*** ***28***	6 24	***6*** ***24***
DATA MANAGEMENT AND STATISTICS	3 12	***6*** ***24***	3 12	***7*** ***28***	3 12	***6*** ***24***	4 16	***6*** ***24***	4 16	***6*** ***24***

[1]Number of items per level

[2]Percentage of items per level

- Anchor Questions

For the mathematics content assessment, among the 125 test questions ranging from level one to five, certain questions remained unchanged during the three assessments (1993, 1997 and 2001). These "anchor questions" provide a good comparison of the students' performance from one assessment to the next. When a new cycle begins, some of the other questions are replaced or modified as the analyzed results show that it is necessary to ask questions that provide a better measure of the students' performance. Thus, in 2001, 30 or so questions were replaced.

- Problem-Solving Assessment

  Out of the six problems assigned to students, four were the same as in previous assessments and two were replaced. Once again, these new questions were examined in pilot studies and were rigorously field-tested.

The assessment focused on mathematical knowledge and problem-solving skills. Each student in the sample took part in only one of the two components of the assessment, focusing on *a*) knowledge and understanding of mathematical concepts, knowledge of mathematical processes and their ability to use them as well as the ability to link concepts and mathematical processes to solve problems in applied mathematics (mathematics content assessment) or *b*) the development of problem-solving skills (problem-solving assessment).

1.6 Description of the Levels of Performance

The students' performance in mathematics was evaluated on the basis of five levels of performance. The presentation of the results in the form of percentages representing the proportion of students at each of the five levels does not allow for the calculation of averages in the usual manner. Level 1 corresponds to the learning expected of students in elementary school, whereas level 5 describes the performance expected of students who have completed an advanced course in mathematics. Thus, it was expected that most students in the target groups for the assessment would easily attain performance level 1 and that very few 13-year-olds would meet the criteria for level 5.

2 QUÉBEC RESULTS

2.1 Mathematics Content Assessment

Students were classified according to five levels of performance based on their test scores, which measured their knowledge in the following areas:

- numbers and operations
- algebra and functions
- measurement and geometry
- data management and statistics

Approximately 40 per cent of the questions assessed the students' understanding of major mathematical concepts, approximately 30 per cent assessed their knowledge of major mathematical procedures, and approximately 30 per cent assessed their ability to solve problems requiring the use of major mathematical concepts and processes. A description of the five levels of performance for this assessment is provided in Appendix A.

Table 3 (p. 12) shows the percentages of students attaining each level of performance in mathematics content. The results for 13-year-olds are provided for each language group.

- **Level 1** is attained by more than nine out of ten students.
- **Level 2** is attained by nearly three quarters of the students.
- **Level 3** is attained by nearly four out of ten students.
- **Level 4** is attained by just over 1 per cent of the students.
- **Level 5** is attained by only a few students.

Table 3

DISTRIBUTION OF QUÉBEC STUDENTS BY PERFORMANCE LEVEL (MATHEMATICS CONTENT ASSESSMENT)

Populations	% of students by performance level				
	1	**2**	**3**	**4**	**5**
13-year-olds					
anglophones	**88.2**	**66.6**	**35.1**	**1.6**	**0.1**
girls	86.1	62.9	30.6	1.4	0.2
boys	91.1	71.1	40.0	1.9	0.0
francophones	**89.7**	**74.9**	**39.2**	**1.1**	**0.0**
girls	90.5	77.2	39.5	1.1	0.0
boys	88.9	72.3	39.0	1.2	0.0
QUÉBEC	**89.6**	**74.1**	**38.8**	**1.1**	**0.0**

Note: The comments preceding the tables take into account the confidence intervals presented in the tables in Appendix C.

2.2 Problem-Solving Assessment

Students were classified according to five levels of performance based on their test scores, which measured their knowledge in the following areas:

- application of problem-solving strategies
- construction of mathematical models corresponding to statements
- calculation of exact and approximate solutions to problems
- testing of the validity of certain solutions
- communication of solutions and problem-solving methods

The students had to solve six problems, providing detailed answers. A description of the five levels of performance for this assessment is provided in Appendix B.

Table 4 (p. 13) shows the percentages of Québec students attaining each level of performance in problem solving. The results for 13-year-olds are provided for each language group.

- **Level 1** is attained by nearly nine out of ten students.
- **Level 2** is attained by more than seven out of ten students.
- **Level 3** is attained by nearly three out of ten students.
- **Level 4** is attained by nearly 5 per cent of the students.
- **Level 5** is attained by nearly 1 per cent of the students.

Table 4

DISTRIBUTION OF QUÉBEC STUDENTS BY PERFORMANCE LEVEL (PROBLEM-SOLVING ASSESSMENT)

Populations	% of students by performance level				
	1	**2**	**3**	**4**	**5**
13-year-olds					
anglophones	**90.4**	**69.2**	**29.0**	**6.1**	**0.6**
girls	91.9	71.8	33.6	7.6	0.5
boys	88.9	66.4	24.1	4.2	0.8
francophones	**87.7**	**71.0**	**29.0**	**4.7**	**0.8**
girls	89.0	77.4	29.4	4.2	0.3
boys	86.5	64.4	28.7	5.2	1.4
QUÉBEC	**88.0**	**70.8**	**29.0**	**4.8**	**0.8**

Note: The comments preceding the tables take into account the confidence intervals presented in the tables in Appendix C.

2.3 Comments on the Québec Results

Results in the Mathematics Content and Problem-Solving Assessments

As expected, the first level of performance, which corresponds to learning at the elementary level, is attained by about 90 per cent of the students, and the second level of performance, which corresponds to learning in progress, is attained by nearly three quarters of the students.

Attainment of Higher Levels of Performance

It is normal that very few 13-year-olds meet the requirements at performance levels 4 and 5.

Results by Language Group

When the overall achievement of francophones and anglophones is compared, there is a significant difference, in favour of the francophone group, between the results at performance levels 2 and 3 for the mathematics content assessment, whereas there is no significant difference at these levels for the problem-solving assessment.

Results by Gender

Although the percentages shown in Tables 3 and 4 seem to indicate that there is a difference between the results achieved by boys and girls, the confidence intervals presented in the tables in Appendix C (p. 37) should be taken into account before drawing any conclusions. A comparison of the results in the mathematics content assessment and the problem-solving assessment shows that, overall, 13-year-olds of both sexes obtain essentially the same results. Nevertheless, for the anglophone group, boys achieve higher results than girls for the mathematics content assessment, while the opposite is true for the problem-solving assessment. As for the francophone group, girls achieve higher results at performance level 2 for both assessments.

3 COMPARISON OF QUÉBEC AND CANADIAN RESULTS

3.1 Results in the Mathematics Content Assessment by Level of Performance

In Table 5 (p. 16), a comparison of the Québec and Canadian results in the mathematics content assessment shows the following:

- Nearly 90 per cent of Canadian students attain performance **level 1.** Québec francophone and anglophone students show slightly higher results than Canadian students as a whole.

- Nearly 65 per cent of Canadian students attain performance **level 2.** Québec francophone and anglophone students show results superior to those of Canadian students as whole. Québec francophone students rank highest among Canadian students.

- Nearly 30 per cent of Canadian students attain performance **level 3.** Québec francophone and anglophone students show results superior to those of Canadian students as a whole, and rank highest among Canadian students.

- Only 1 per cent of Canadian students meet the criteria for performance **level 4.** Québec anglophone students show results superior to those of Canadian students as a whole, and place third among Canadian students.

- Only a few Canadian students attain performance **level 5.** Québec anglophone students show results similar to those of Canadian students as a whole.

Table 5

PERCENTAGE OF 13-YEAR-OLDS BY PERFORMANCE LEVEL IN THE 2001 MATHEMATICS CONTENT ASSESSMENT

	% of students by performance level				
POPULATIONS	1	2	3	4	5
ALBERTA	90.7	70.6	33.1	2.3	0.3
BRITISH COLUMBIA	86.9	60.7	24.8	1.4	0.1
MANITOBA (ANG.)	83.8	57.2	21.4	0.4	0.0
MANITOBA (FR.)	88.5	59.2	24.1	0.2	0.2
NEW BRUNSWICK (ANG.)	82.3	51.9	18.7	1.1	0.0
NEW BRUNSWICK (FR.)	83.8	57.6	23.4	0.6	0.0
NEWFOUNDLAND AND LABRADOR	81.8	57.1	21.3	2.0	0.3
NORTHWEST TERRITORIES	67.8	40.5	13.9	0.9	0.0
NOVA SCOTIA (ANG.)	81.8	47.7	11.6	0.1	0.0
NOVA SCOTIA (FR.)	90.0	48.5	18.5	0.8	0.0
NUNAVUT	27.8	8.0	3.0	0.0	0.0
ONTARIO (ANG.)	90.3	63.4	25.3	1.5	0.1
ONTARIO (FR.)	84.8	56.3	24.8	1.2	0.0
PRINCE EDWARD ISLAND	80.5	52.7	12.2	0.3	0.2
QUÉBEC (ANG.)	**88.2**	**66.6**	**35.1**	**1.6**	**0.1**
QUÉBEC (FR.)	**89.7**	**74.9**	**39.2**	**1.1**	**0.0**
SASKATCHEWAN	82.7	52.1	17.7	0.2	0.0
YUKON	80.8	52.5	18.2	0.5	0.0
QUÉBEC	**89.6**	**74.1**	**38.8**	**1.1**	**0.0**
ALL OF CANADA	**88.3**	**64.4**	**27.9**	**1.3**	**0.1**

Note: The comments preceding the tables take into account the confidence intervals presented in the tables in Appendix C.

(FR.) – francophone

(ANG.) – anglophone

3.2 Results in the Problem-Solving Assessment by Level of Performance

In Table 6 (p. 18), a comparison of the Québec and Canadian results in the problem-solving assessment shows the following:

- More than 85 per cent of Canadian students attain performance **level 1.** Québec students show results superior to those of Canadian students as a whole. Québec anglophone students rank highest among Canadian students.

- Two thirds of Canadian students attain performance **level 2**. Québec students show results superior to those of Canadian students as a whole.

- A quarter of Canadian students attain performance **level 3**. Québec students show results superior to those of Canadian students as a whole and rank second among Canadian students.

- Only 4 per cent of Canadian students attain performance **level 4.** Québec students show results superior to those of Canadian students as a whole. Québec anglophone students rank second among Canadian students.

- Only a few Canadian 13-year-olds attain performance **level 5**. Québec students show results superior to those of Canadian students as a whole and rank second among Canadian students along with francophone students in Manitoba.

Table 6

PERCENTAGE OF 13-YEAR-OLDS BY PERFORMANCE LEVEL IN THE 2001 PROBLEM-SOLVING ASSESSMENT

	% of students by performance level				
POPULATIONS	1	2	3	4	5
ALBERTA	90.3	76.5	31.9	6.5	1.3
BRITISH COLUMBIA	85.0	63.6	23.1	3.2	0.3
MANITOBA (ANG.)	82.6	60.4	21.9	2.4	0.5
MANITOBA (FR.)	89.0	71.1	28.5	4.6	0.8
NEW BRUNSWICK (ANG.)	82.1	57.9	17.7	1.9	0.2
NEW BRUNSWICK (FR.)	87.4	65.5	26.5	3.7	0.1
NEWFOUNDLAND AND LABRADOR	80.0	58.2	22.1	2.6	0.3
NORTHWEST TERRITORIES	55.8	32.9	8.2	0.9	0.0
NOVA SCOTIA (ANG.)	77.3	50.9	13.7	1.3	0.2
NOVA SCOTIA (FR.)	88.0	57.8	15.7	1.2	0.0
NUNAVUT	9.3	2.3	0.6	0.0	0.0
ONTARIO (ANG.)	88.0	68.7	25.1	3.4	0.1
ONTARIO (FR.)	86.7	68.8	25.6	3.2	0.5
PRINCE EDWARD ISLAND	80.8	51.8	15.7	2.4	0.4
QUÉBEC (ANG.)	**90.4**	**69.2**	**29.0**	**6.1**	**0.6**
QUÉBEC (FR.)	**87.7**	**71.0**	**29.0**	**4.7**	**0.8**
SASKATCHEWAN	83.4	60.8	16.2	1.9	0.1
YUKON	81.5	63.7	15.1	2.1	0.7
QUÉBEC	**88.0**	**70.8**	**29.0**	**4.8**	**0.8**
ALL OF CANADA	**86.7**	**67.6**	**25.4**	**3.8**	**0.5**

Note: The comments preceding the tables take into account the confidence intervals presented in the tables in Appendix C.

(FR.) – francophone
(ANG.) – anglophone

3.3 Comments on the Québec and Canadian Results

Because very few 13-year-olds attained performance levels 4 and 5**,** we will examine the results of the 13-year-olds at levels 2 and 3.

Québec 13-year-olds show results superior to those of students in other provinces or territories at levels 2 and 3 for both the mathematics content and the problem-solving assessments. The results of 13-year-old Québec francophones are superior to those of Canadian students as a whole: they rank first in levels 2 and 3 in the mathematics content assessment and second in the problem-solving assessment. The results of 13-year-old Québec anglophones are superior to those of Canadian students as a whole. These results are shown in the graphs on pages 20 to 23.

The results of Québec students may be explained by the following factors:

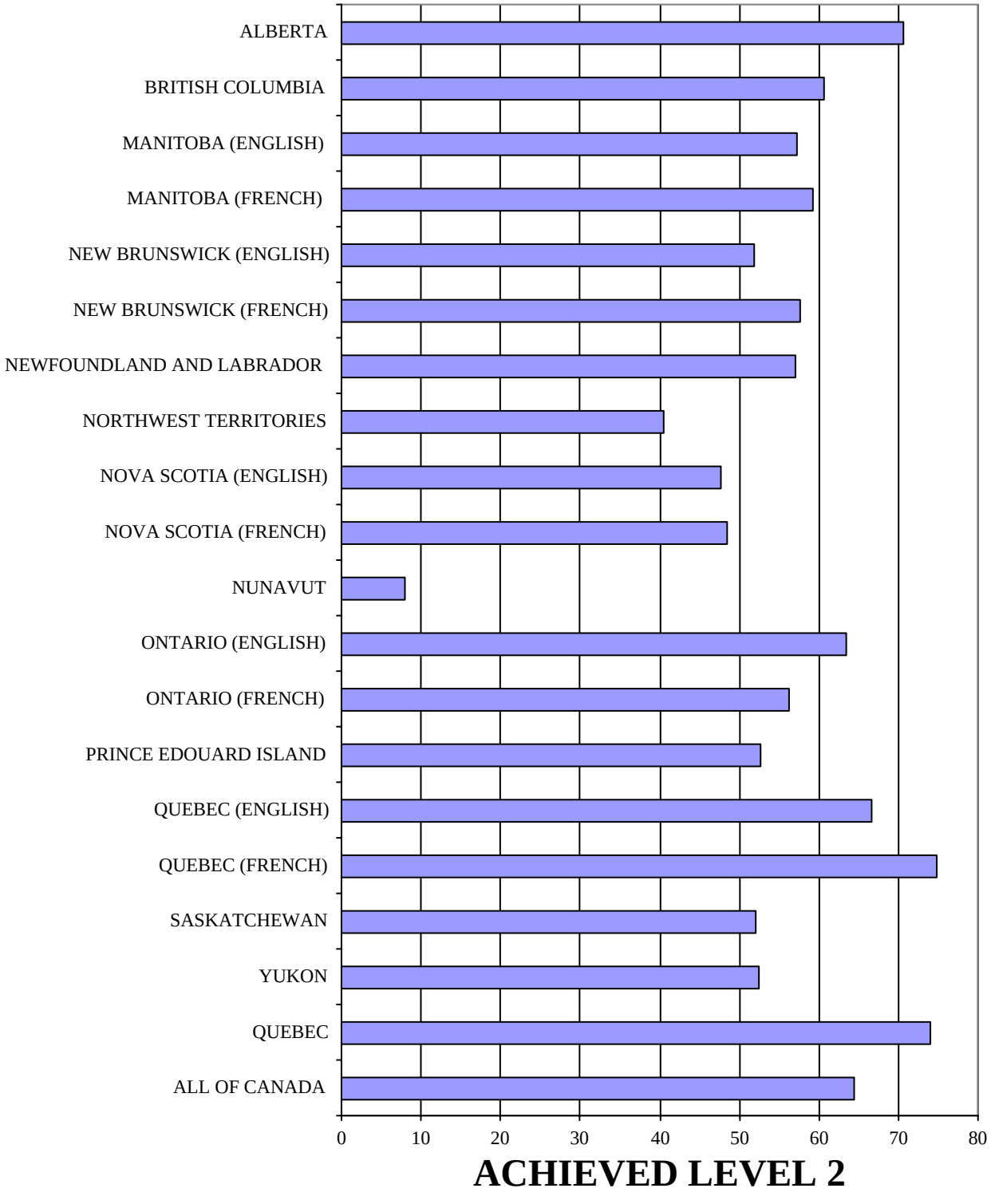
- pedagogical environment: the quality of teaching in elementary and secondary school, and the availability of French and English instructional materials that are consistent with the objectives of the new mathematics program

- pedagogical activities: the organization of professional development sessions by the mathematics teachers' associations, the organization of local professional development days by the school boards, the publication of articles on teaching mathematics in the periodicals of mathematics teachers' associations, and the organization of mathematics contests

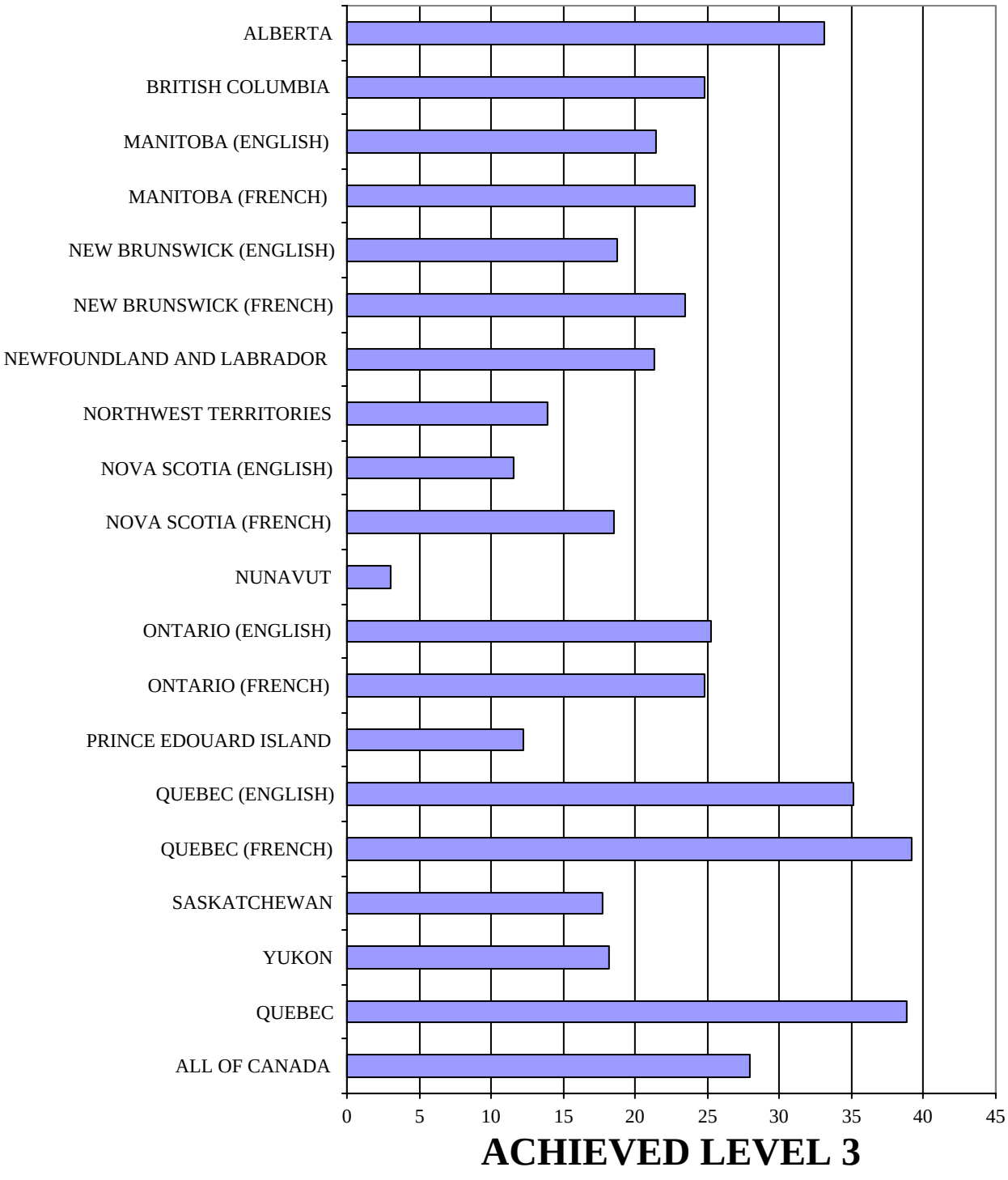
- pedagogical evaluation: the organization of local and provincial professional development sessions on the evaluation of learning by the school boards and mathematics teachers' associations, the preparation of regional examinations by the school boards, the preparation of complementary examinations and uniform examinations by the Ministère de l'Éducation, and the establishment of marking committees by the school boards

As a result of these activities, teachers become familiar and comply with the content and approach recommended in the mathematics programs and use the content and approach recommended in available textbooks more critically.

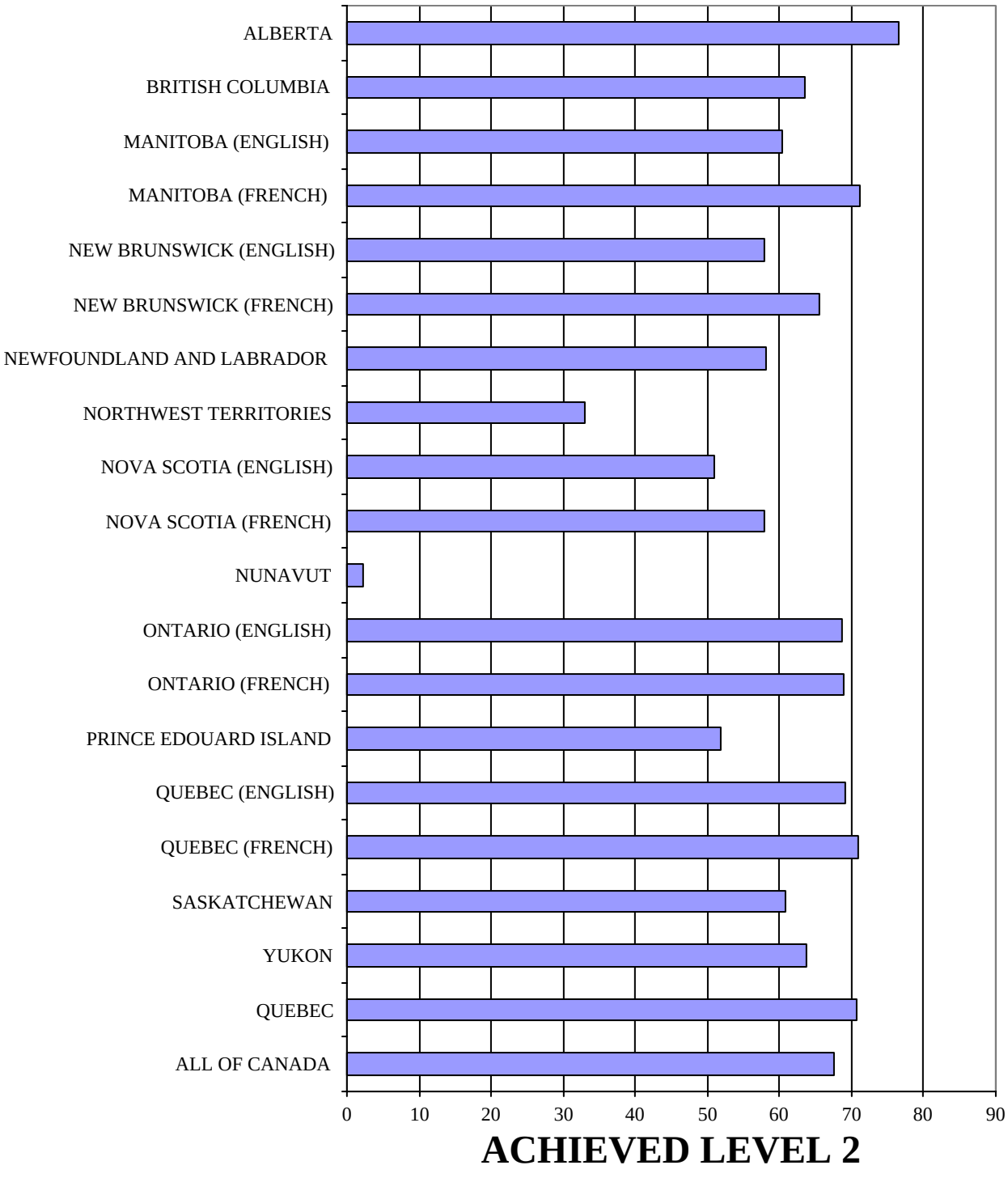
MATHEMATICS CONTENT ASSESSMENT



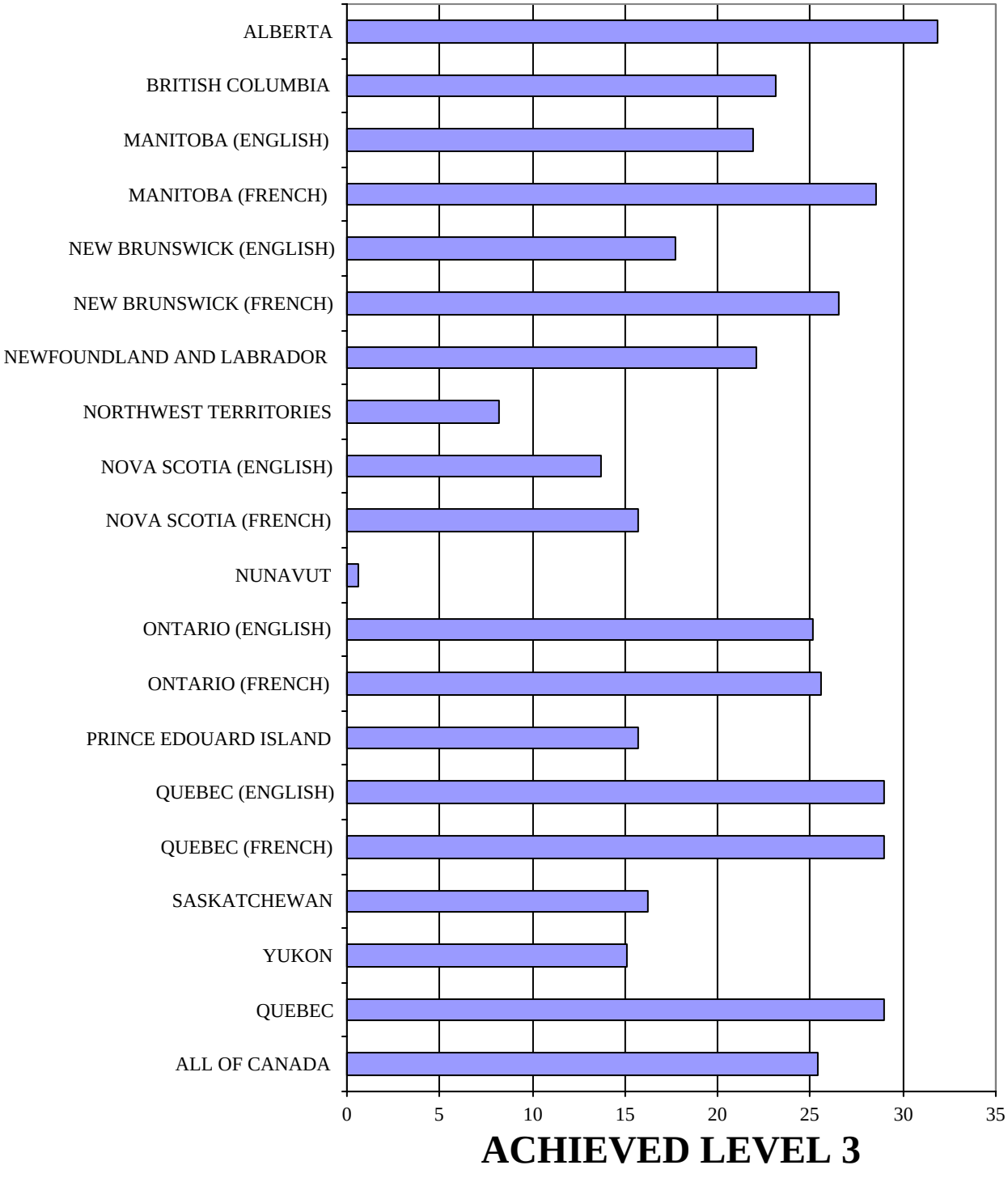
MATHEMATICS CONTENT ASSESSMENT



PROBLEM-SOLVING ASSESSMENT



PROBLEM-SOLVING ASSESSMENT



4 COMPARISON OF 2001 RESULTS WITH THOSE OF 1993 AND 1997

4.1 Mathematics Content Assessment

Caution must be exercised when comparing the results of the 1993 and 1997 mathematics content assessments with those of the 2001 assessment because certain changes were made to the test and the procedure for its administration. In addition, Table 2 (p. 8) shows the changes made to the weighting of results.

In Table 7 (p. 25), a comparison of the 2001 results with those of 1993 and 1997 in the mathematics content assessment shows the following:

For Canada as a whole, there is no significant difference between these results and those of the of the 1993 and 1997 assessments. Furthermore, statistical analyses of the results for the two language groups show that there is no language bias in the items. In 1997 and in 2001, the decision not to exclude certain students before constituting the samples, as the schools had done in 1993, but rather to exclude them at the time of administration, explains the increase in the number of students who do not attain performance level 1 and, later, the decrease in the number of students who attain performance level 1.

For Québec, students' test results for the 2001 mathematics content assessment at performance level 1 are lower compared to 1997, having decreased in the same proportion as the increase in the percentage of students ranking below level 1. At performance level 2, the results of Québec anglophone students are higher, while those of Québec francophone students are lower, whereas for Canadian students as a whole, the results rose by 5 per cent between 1997 and 2001. At performance level 3, the results of 13-year-old Québec francophones are 9.5 per cent lower and those of Québec anglophone students are 6.8 per cent lower, while for Canadian students as a whole, the results are 0.5 per cent lower. In performance level 4, the results of Québec students are lower in the 2001 assessment, while those of Canadian students are higher.

Table 7

MATHEMATICS CONTENT ASSESSMENT
FREQUENCY DISTRIBUTION, BETWEEN 1993 AND 2001

	13-YEAR-OLDS					
POPULATIONS	**Below Level 1**	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
QUÉBEC (ANG. - FR.) 1993	5.3 - 2.5	94.7 - 97.5	**68.0 - 83.4**	36.6 - 45.2	1.5 - 2.4	0.0 - 0.0
ALL OF CANADA 1993	6.4	93.6	**64.4**	29.5	1.2	0.0
QUÉBEC (ANG. - FR.) 1997	9.2 - 7.1	90.8 - 92.9	**65.3 - 78.3**	41.9 - 48.7	2.4 - 2.5	0.0 - 0.1
ALL OF CANADA 1997	10.0	90.0	**59.4**	28.4	1.2	0.0
QUÉBEC (ANG. - FR.) 2001	**11.8 - 10.3**	**88.2 - 89.7**	**66.6 - 74.9**	**35.1 - 39.2**	**1.6 - 1.1**	**0.1 - 0.0**
ALL OF CANADA 2001	**11.7**	**88.3**	**64.4**	**27.9**	**1.3**	**0.1**

4.2 Problem-Solving Assessment

In 1997, certain changes were made to the problem-solving assessment and the procedure for its administration. In 1993, the person in charge of administering the tests chose which of the two versions, each comprising nine problems, the students would write, whereas in 1997 a single test comprising six problems was administered. The first four problems in the 1993 test, which were formulated the same way and in the same position, were part of the 1997 test; two other problems from 1993, with important changes in formulation, presentation and position, were also included in the 1997 test. Because of all the changes in the test on problem-solving, it is much more difficult to compare the 1993 and 1997 versions than it is for the test on mathematics content. However, it is much easier to compare the 1997 and 2001 versions because four out of the six test questions assigned to students in 2001 were the same as those of the previous two tests.

In Table 8 (p. 28), a comparison of the 2001 results with those of 1993 and 1997 in the problem-solving assessment shows the following:

- In 1997, the decision not to exclude certain students before constituting the samples, but rather to exclude them at the time of administration was maintained, which explains the increase in the number of students who do not attain performance level 1. In 2001, for Canada as a whole, the number of students who do not attain performance level 1 declined compared to 1997. This 2.5 per cent decrease corresponds to the 2.5 per cent increase in students who attain performance level 1. Furthermore, in 2001, more students attain the other performance levels, including a 25 per cent increase in the number of students who attain performance level 2 and about a two-thirds increase in those who attain performance level 3.

- Between 1997 and 2001, the decrease in the percentage of Québec students who attain performance level 1 is the same as the increase in the percentage of Québec students who do not attain performance level 1. Furthermore, between 1997 and 2001, the gap between Québec and Canadian students at performance levels 2, 3 and 4 narrowed. At performance level 2, the results of 13-year-old Québec anglophones are 11.2 per cent higher and those of francophones are 4.2 per cent higher, while the results of Canadian students as a whole are 15.4 per cent higher. At performance level 3, the results of 13-year-old Québec anglophones are 11.6 per cent higher and those of francophones are 4.5 per cent higher, while the results of Canadian students as a whole are 10.1 per cent higher.

Table 8

PROBLEM-SOLVING ASSESSMENT
FREQUENCY DISTRIBUTION BETWEEN 1993 AND 2001

	13-YEAR-OLDS					
POPULATIONS	**Below Level 1**	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
QUÉBEC (ANG. - FR.) 1993	5.3 - 3.7	94.7 - 96.3	**68.0 - 69.1**	36.6 - 10.4	1.5 - 0.7	0.0 - 0.0
ALL OF CANADA 1993	7.5	92.5	**57.6**	8.5	0.8	0.0
QUÉBEC (ANG. - FR.) 1997	15.0 - 9.3	85.0 - 90.7	**57.9 - 66.8**	17.4 - 24.5	2.9 - 5.1	0.4 – 0.5
ALL OF CANADA 1997	15.8	84.2	**52.2**	15.3	2.5	0.2
QUÉBEC (ANG. - FR.) 2001	**9.6 - 12.3**	**90.4 - 87.7**	**69.2 - 71.0**	**29.0 - 29.0**	**6.1 - 4.7**	**0.6 -0.8**
ALL OF CANADA 2001	**13.3**	**86.7**	**67.6**	**25.4**	**3.8**	**0.5**

4.3 Comments on the 2001 Results and Those of 1993 and 1997

Although the tests for 2001 were substantially different from those of 1993 and 1997, and the control group for 1993 seemed to show that there was little or no difference between the Canadian results in 1993, 1997 and those in 2001 in the mathematics content assessment, the fact remains that the difference between the results of Québec 13-year-olds and those of Canadian students as a whole in 2001 has decreased. In the problem-solving tests, there is an increase from 1993 to 2001 in the percentages of Canadian students as a whole who succeed beyond level 1, and a decrease in the difference between the results of Québec 13-year-olds and those of Canadian students as a whole.

5 THE PAN-CANADIAN AND OTHER STUDIES

This is the third pan-Canadian assessment of 13-year-olds that the Ministère de l'Éducation du Québec has taken part in.

With respect to this age group, Québec has taken part in several international studies in which other Canadian provinces were included. In 1988, Québec, with three other Canadian provinces and four countries, took part in a mathematics and science study coordinated by the Educational Testing Service in Princeton, U.S.A. In 1991, a second international study was carried out by the same American organization, in which 20 countries and 9 Canadian provinces took part. In 1995, Québec chose to participate in third international mathematics and science study (TIMSS), not as a separate entity but as part of the Canadian sample. In 1999, Québec took part in the fourth international mathematics and science study (TIMSS). These studies are projects carried out by the International Association for the Evaluation of Educational Achievement (IEA). The 1999 TIMSS study brought together 43 countries and provinces. With regards to ratings, Québec is a front runner, following Singapore, Korea, Taiwan, Hong Kong and Japan. Table 9 (p.30) shows the mathematics results of Canadian participants. This table presents the average scores, rather than the percentages of students as in the pan-Canadian assessment.

In the three pan-Canadian tests, 13-year-olds obtained scores comparable to those obtained in the international studies.

Table 9

PARTIAL RESULTS OF THE THIRD INTERNATIONAL MATHEMATICS AND SCIENCE STUDY (TIMSS)

	Secondary II	
Populations	Average %	Standard error
Alberta	53.0	0.42
British Columbia	52.2	0.56
Newfoundland and Labrador	50.4	0.61
Ontario	51.7	0.30
Québec	**56.6**	**0.53**
All of Canada	**53.1**	**0.25**
International	**48.7**	**0.07**

In this study, for Québec students in secondary II, which is one of the levels that include 13-year-olds, the results are superior to those of students in the other participating provinces as well as those of the Canadian sample. These results corroborate those from previous studies in which Québec participated.

6 CONCLUSION

The results of Québec students in the 2001 mathematics assessment confirm those obtained in the mathematics knowledge and skills assessment in the School Achievement Indicators Program (SAIP) in 1993 and 1997. These results are superior to the Canadian average although there is less difference between the Québec and Canadian results in 2001, in both mathematics assessments (mathematics content and problem-solving). These results, as well as those obtained by Québec 13-year-olds in the last international mathematics and science study (TIMSS), show that the mathematical knowledge and skills of Québec students compare favourably with those of students on the national and international level.

Among the elements that contribute to the excellence of the results of Québec students are the following:

- the Québec mathematics programs that take into account both North American and international currents of thought
- the teaching provided by elementary and secondary school teachers who are aware of the importance of the knowledge, abilities and skills transmitted through mathematics teaching and who give the students what they need to live in a world where technology plays a dominant role
- the support given to mathematics teaching by the Ministère de l'Éducation, by the school boards, the teacher training programs in Québec universities, by the professional associations in mathematics, and in the instructional materials provided by Québec publishing houses for students at both the elementary and secondary levels
- the preparation of complementary examinations and uniform examinations by the Ministère de l'Éducation and of common examinations by the school boards

This analysis of the results of the pan-Canadian assessment allows us to draw conclusions concerning the general performance of 13-year-olds in mathematics. It also provides mathematics teachers and those in charge of programs and evaluation with information that can help them improve student learning.

7 APPENDIXES

7.1 Appendix A:

Summary of Performance Levels in the Mathematics Content Assessment

The following skills are expected of students at each performance level of the mathematics content assessment.

Level 1

- Add, subtract and multiply, using a limited range of natural numbers.
- Use concrete materials and diagrams to represent simple relations.
- Determine linear dimensions of recognizable simple plane figures.
- Read information from very simple tables.

Level 2

- Use the four basic operations with positive numbers with no more than two digits after the decimal point.
- Use patterns and classifications in real-life situations and plot points on a grid.
- Calculate dimensions and areas of plane figures, classify solid forms and use single geometric transformations.
- Extract and represent data using tables and diagrams.

Level 3

- Use the four basic operations with positive rational numbers written as decimals or fractions.
- Use monomial algebraic expressions and plot points on a Cartesian grid.
- Use length, angle measure, area and volume involving various plane geometric figures and repetitions of the same geometric transformation.
- Use information from various sources and calculate the arithmetic mean and simple probabilities.

Level 4

- Use the four basic operations with the full range of rational numbers.
- Use and graph polynomial algebraic expressions and simple functions.
- Use the characteristics of solid forms, congruence and similarity in polygons, and compositions of plane transformations.
- Organize data, use measures of central tendency and calculate the probability of a single event.

Level 5

- Use the four basic operations with the full range of real numbers.
- Use and graph algebraic expressions with two variables and various functions.
- Use the properties of circles and right-angle triangles.
- Calculate statistical information and the probability of combined events.

7.2 Appendix B: Summary of Performance Levels in the Problem-Solving Assessment

The following skills are expected of students at each performance level of the problem-solving assessment.

Level 1

- Find single solutions to a one-step problem using obvious algorithms and a limited range of whole numbers.
- Use one case to establish a proof.

Level 2

- Make a choice of algorithms to find a solution to:
  a) multi-step problems, using a limited range of whole numbers
  b) one-step problems, using rational numbers.
- Use more than one particular case to establish a proof.
- Use common vocabulary to present solutions.

Level 3

- Choose from two algorithms to find solutions to multi-step problems, using a limited range of rational numbers.
- Use necessary and sufficient cases to establish proof.
- Use mathematical vocabulary, although imprecisely, to present solutions.

Level 4

- Adapt one or more algorithms to find solutions to multi-step problems, using the full range of rational numbers.
- Construct structured proofs that may lack some detail.
- Use mathematical and common vocabulary correctly, although solutions may lack clarity for the external reader.

Level 5

- Create original algorithms to find solutions to multi-step problems, using the full range of real numbers.
- Construct structured proofs that provide full justification of each step.
- Use mathematical and common vocabulary correctly, and provide clear and precise solutions.

7.3 Appendix C: Tables

PERCENTAGE OF 13-YEAR-OLDS BY PERFORMANCE LEVEL IN THE MATHEMATICS CONTENT ASSESSMENT

	% of students by performance level					
POPULATIONS	**Below level 1**	**1**	**2**	**3**	**4**	**5**
ALBERTA	9.3 (1.9)	90.7 (1.9)	70.6 (3.0)	33.1 (3.1)	2.3 (1.0)	0.3 (0.4)
BRITISH COLUMBIA	13.1 (2.0)	86.9 (2.0)	60.7 (2.9)	24.8 (2.5)	1.4 (0.7)	0.1 (0.2)
MANITOBA (ANG.)	16.2 (2.3)	83.8 (2.3)	57.2 (3.0)	21.4 (2.5)	0.4 (0.4)	0.0 (0.0)
MANITOBA (FR.)	11.5 (2.6)	88.5 (2.6)	59.2 (4.0)	24.1 (3.5)	0.2 (0.3)	0.2 (0.3)
NEW BRUNSWICK (ANG.)	17.7 (2.5)	82.3 (2.5)	51.9 (3.2)	18.7 (2.5)	1.1 (0.7)	0.0 (0.0)
NEW BRUNSWICK (FR.)	16.2 (2.5)	83.8 (2.5)	57.6 (3.4)	23.4 (2.9)	0.6 (0.5)	0.0 (0.0)
NEWFOUNDLAND AND LABRADOR	18.2 (2.9)	81.8 (2.9)	57.1 (3.7)	21.3 (3.1)	2.0 (1.1)	0.3 (0.4)
NORTHWEST TERRITORIES	32.2 (4.0)	67.8 (4.0)	40.5 (4.5)	13.9 (2.9)	0.9 (0.8)	0.0 (0.0)
NOVA SCOTIA (ANG.)	18.2 (2.6)	81.8 (2.6)	47.7 (3.3)	11.6 (2.1)	0.1 (0.2)	0.0 (0.0)
NOVA SCOTIA (FR.)	10.0 (5.2)	90.0 (5.2)	48.5 (8.6)	18.5 (6.7)	0.8 (1.5)	0.0 (0.0)
NUNAVUT	72.2 (4.8)	27.8 (4.8)	8.0 (2.9)	3. 0 (1.8)	0.0 (0.0)	0.0 (0.0)
ONTARIO (ANG.)	9.7 (2.0)	90.3 (2.0)	63.4 (3.3)	25.3 (3.0)	1.5 (0.8)	0.1 (0.2)
ONTARIO (FR.)	15.2 (3.1)	84.8 (3.1)	56.3 (4.3)	24.8 (3.8)	1.2 (0.9)	0.0 (0.0)
PRINCE EDWARD ISLAND	19.5 (3.0)	80.5 (3.0)	52.7 (3.8)	12.2 (2.5)	0.3 (0.5)	0.2 (0.3)
QUÉBEC (ANG.)	**11.8 (2.2)**	**88.2 (2.2)**	**66.6 (3.1)**	**35.1 (3.2)**	**1.6 (0.8)**	**0.1 (0.2)**
QUÉBEC (FR.)	**10.3 (2.0)**	**89.7 (2.0)**	**74.9 (2.9)**	**39.2 (3.2)**	**1.1 (0.7)**	**0.0 (0.0)**
SASKATCHEWAN	17.3 (2.4)	82.7 (2.4)	52.1 (3.1)	17.7 (2.4	0.2 (0.3)	0.0 (0.0)
YUKON	19.2 (5.5)	80.8 (5.5)	52.5 (7.0)	18.2 (5.4)	0.5 (1.0)	0.0 (0.0)
QUÉBEC	**10.4 (2.0)**	**89.6 (2.0)**	**74.1 (2.9)**	**38.8 (3.2)**	**1.1 (0.7)**	**0.0 (0.0)**
ALL OF CANADA	**11.7 (0.6)**	**88.3 (0.6)**	**64.4 (0.8)**	**27.9 (0.8)**	**1.3 (0.2)**	**0.1 (0.1)**

PERCENTAGE OF 13-YEAR-OLDS BY PERFORMANCE LEVEL IN THE PROBLEM-SOLVING ASSESSMENT

	% of students by performance level					
POPULATIONS	**Below level 1**	**1**	**2**	**3**	**4**	**5**
ALBERTA	9.7 (2.0)	90.3 (2.0)	76.5 (2.9)	31.9 (3.1)	6.5 (1.7)	1.3 (0.8)
BRITISH COLUMBIA	15. 0 (2.1)	85.0 (2.1)	63.6 (2.9)	23.1 (2.5)	3.2 (1.1)	0.3 (0.3)
MANITOBA (ANG.)	17.4 (2.4)	82.6 (2.4)	60.4 (3.0)	21.9 (2.6)	2.4 (0.9)	0.5 (0.4)
MANITOBA (FR.)	11.0 (2.7)	89.0 (2.7)	71.1 (4.0)	28.5 (3.9)	4.6 (1.0)	0.8 (0.8)
NEW BRUNSWICK (ANG.)	17.9 (2.5)	82.1 (2.5)	57.9 (3.3)	17.7 (2.5)	1.9 (0.9)	0.2 (0.3)
NEW BRUNSWICK (FR.)	12.6 (2.5)	87.4 (2.5)	65.5 (3.6)	26.5 (3.6)	3.7 (1.4)	0.1 (0.3)
NEWFOUNDLAND AND LABRADOR	20.0 (3.1)	80.0 (3.1)	58.2 (3.9)	22.1 (3.1)	2.6 (1.2)	0.3 (0.4)
NORTHWEST TERRITORIES	44.2 (5.4)	55.8 (4.6)	32.9 (5.1)	8.2 (3.0)	0.9 (1.0)	0.0 (0.0)
NOVA SCOTIA (ANG.)	22.7 (2.8)	77.3 (2.8)	50.9 (3.4)	13.7 (2.3)	1.3 (0.8)	0.2 (0.3)
NOVA SCOTIA (FR.)	12.0 (7.0)	88.0 (7.0)	57.8 (10.6)	15.7 (7.8)	1.2 (2.3)	0.0 (0.0)
NUNAVUT	90.7 (4.4)	9.3 (4.3)	2.3 (2.3)	0.6 (1.1)	0.0 (0.0)	0.0 (0.0)
ONTARIO (ANG.)	12.0 (2.3)	88.0 (2.3)	68.7 (3.3)	25.1 (3.1)	3.4 (1.3)	0.1 (0.3)
ONTARIO (FR.)	13.3 (3.3)	86.7 (3.3)	68.8 (4.5)	25.6 (4.2)	3.2 (1.7)	0.5 (0.7)
PRINCE EDWARD ISLAND	19.2 (3.3)	80.8 (-3.3)	51.8 (4.2)	15.7 (3.0)	2.4 (1.3)	0.4 (0.5)
QUÉBEC (ANG.)	**9.6 (2.1)**	**90.4 (2.1)**	**69.2 (3.3)**	**29.0 (3.2)**	**6.1 (1.7)**	**0.6 (0.6)**
QUÉBEC (FR.)	**12.3 (2.6)**	**87.7 (2.6)**	**71.0 (3.6)**	**29.0 (3.6)**	**4.7 (1.7)**	**0.8 (0.7)**
SASKATCHEWAN	16.6 (2.4)	83.4 (2.4)	60.8 (3.2)	16.2 (2.4)	1.9 (0.9)	0.1 (0.2)
YUKON	18.5 (6.3)	81.5 (6.3)	63.7 (7.8)	15.1 (5.8)	2.1 (2.3)	0.7 (1.3)
QUÉBEC	**12.0 (2.6)**	**88.0 (2.6)**	**70.8 (3.6)**	**29.0 (3.6)**	**4.8 (1.7)**	**0.8 (0.7)**
ALL OF CANADA	**13.3 (0.6)**	**86.7 (0.6)**	**67.6 (0.9)**	**25.4 (0.8)**	**3.8 (0.4)**	**0.5 (0.1)**

DISTRIBUTION OF QUÉBEC STUDENTS BY PERFORMANCE LEVEL (MATHEMATICS CONTENT ASSESSMENT)

Populations	% of students by performance level				
	1	2	3	4	5
13-year-olds					
anglophones	**88.2 (2.2)**	**66.6 (3.1)**	**35.1 (3.2)**	**1.6 (0.8)**	**0.1 (0.2)**
girls	86.1 (3.3)	62.9 (4.6)	30.6 (4.4)	1.4 (1.1)	0.2 (0.5)
boys	91.1 (2.7)	71.1 (4.3)	40.0 (4.7)	1.9 (1.3)	0.0 (0.0)
francophones	**89.7 (2.0)**	**74.9 (2.9)**	**39.2 (3.2)**	**1.1 (0.7)**	**0.0 (0.0)**
girls	90.5 (2.7)	77.2 (3.8)	39.5 (4.5)	1.1 (0.9)	0.0 (0.0)
boys	88.9 (3.0)	72.3 (4.3)	39.0 (4.6)	1.2 (1.0)	0.0 (0.0)
QUÉBEC	**89.6 (2.0)**	**74.1 (2.9)**	**38.8 (3.2)**	**1.1 (0.7)**	**0.0 (0.0)**

DISTRIBUTION OF QUÉBEC STUDENTS BY PERFORMANCE LEVEL (PROBLEM-SOLVING ASSESSMENT)

Populations	% of students by performance level				
	1	2	3	4	5
13-year-olds					
anglophones	**90.4 (2.1)**	**69.2 (3.3)**	**29.0 (3.2)**	**6.1 (1.7)**	**0.6 (0.6)**
girls	91.9 (2.7)	71.8 (4.5)	33.6 (4.7)	7.6 (2.6)	0.5 (0.7)
boys	88.9 (3.2)	66.4 (4.8)	24.1 (4.3)	4.2 (2.0)	0.8 (0.9)
francophones	**87.7 (2.6)**	**71.0 (3.6)**	**29.0 (3.6)**	**4.7 (1.7)**	**0.8 (0.7)**
girls	89.0 (3.1)	77.4 (4.7)	29.4 (5.1)	4.2 (2.2)	0.3 (0.6)
boys	86.5 (3.9)	64.4 (5.5)	28.7 (5.2)	5.2 (2.6)	1.4 (1.3)
QUÉBEC	**88.0 (2.6)**	**70.8 (3.6)**	**29.0 (3.6)**	**4.8 (1.7)**	**0.85 (0.7)**