INTRODUCTION

A CONTEXT FOR THIS REPORT

This document is the report to the public on the results of the pan-Canadian assessment of mathematics achievement for 13-year-old and 16-year-old students, administered in the spring of 2001 by the Council of Ministers of Education, Canada (CMEC), as a part of the ongoing School Achievement Indicators Program (SAIP).

SAIP is a cyclical program of pan-Canadian assessments of student achievement in mathematics, reading and writing, and science that has been conducted by CMEC since 1993.

The SAIP Mathematics III Assessment (2001) is the third in the series of mathematics assessments, and the results are related to those of similar assessments conducted in 1993 and 1997.

In addition to the results for Canada and for the individual jurisdictions, this public report outlines the curriculum framework and criteria upon which the test is based and describes briefly the development and modification of the test instruments. A preliminary discussion of the data is included, as are the results of a national expectations-setting process, in which actual student results are compared to expectations set by a pan-Canadian panel.

A more detailed statistical analysis of data and a more detailed discussion of methodology will be found in the technical report for this assessment, which will be released by CMEC later this year.

An important aspect of this assessment is the collection of contextual data on the opportunities students have had to learn mathematics and on their attitudes toward mathematics, as well as other information on their interests and activities. Additional contextual information was gathered from school principals and mathematics teachers. A sampling of this information is included in this report, while more information and a detailed discussion will be found in the report *Mathematics Learning: The Canadian Context, 2001,* to be released shortly.

Box 1

SAIP Reports

Three reports will be released for this assessment.

- This public report, intended to give a summary of results and how they were obtained.
- An additional public report, *Mathematics Learning: The Canadian Context, 2001*, with detailed analysis of the data from student, teacher, and school questionnaires to be released shortly.
- A technical report, which usually follows the public report by several months and contains a more detailed description of development and administration, as well as a more complete and detailed data set. This report is intended for researchers and education officials.

Both public reports will be available on the CMEC Web site at **www.cmec.ca**.

SCHOOL ACHIEVEMENT INDICATORS PROGRAM (SAIP)

Background

Ministers of education have long recognized that achievement in school subjects is generally considered to be one worthwhile indicator of the performance of an education system. Ministries[1] of education therefore have participated in a variety of studies of student achievement over the past two decades. At the international level, through CMEC, as well as individually, Canadian provinces and territories have taken part in various achievement studies such as those of the Organisation for Economic Co-operation and Development (OECD), the International Assessment of Educational Progress

[1] In this report, "ministry" means "department" as well, and "jurisdiction" means both "province" and "territory."

Table 1

Overview of SAIP Mathematics III (2001)

Participating jurisdictions	Canada, including all 10 provinces and 3 territories
Populations sampled	13-year-old students and 16-year-old students, except Quebec 16-year-old students (Note that both populations were administered the same test questions.)
Number of participating students	41,000 students • 24,000 13-year-old students • 17,000 16-year-old students
Languages in which the test was developed and administered	Both official languages • 33,000 anglophone students • 8,000 francophone students*
Framework	• Mathematics content • Problem solving
Assessment administration	• Half of students completed the problem solving component (2.5 h). • Half of students completed the mathematics content component (2.5 h). • All students completed a student questionnaire (30 m). • The teacher and principal each completed a separate questionnaire.
Results	• Reported for Canada • Reported for jurisdictions • Pan-Canadian expectations set by broadly representative panel of Canadians
Scoring	• Five levels of achievement
Reports	• Public report (this report) • *Mathematics Learning: The Canadian Context, 2001* (to be released later) • Technical report (to be released later)

* Quebec 16-year-olds did not participate in this assessment. Provinces with significant populations in both languages reported results for both language groups.

(IAEP), and the International Association for the Evaluation of Educational Achievement (IEA). In addition, in most jurisdictions, ministries undertake measures at the jurisdictional level to assess students at different stages of their schooling.

To study and report on student achievement in a Canadian context, CMEC initiated the School Achievement Indicators Program in 1989. In December 1991, in a memorandum of understanding, the ministers agreed to assess the achievement of 13- and 16-year-olds in reading, writing, and mathematics. In September 1993, the ministers further agreed to include the assessment of science. The information collected through the SAIP assessments would be used by each jurisdiction to set educational priorities and plan program improvements.

Table 2

SAIP Assessment Schedules

Mathematics	*Reading and Writing*	*Science*
1993	1994	1996
1997	1998	1999
2001	2002 (Writing)	2004

Copies of reports for assessments administered since 1996 can be found in both official languages through the CMEC Web site at ***www.cmec.ca*** *by following the link to SAIP. For earlier reports, contact CMEC directly at the address found on the inside cover of this report.*

It was decided to administer the assessments in the spring of each year as shown in Table 2 above.

The first two cycles of assessments took place as scheduled, and a report was published for each assessment (see Table 2). Because this is the third mathematics assessment, two questions are asked. In addition to the initial question: "How well have Canadian 13- and 16-year-old students learned mathematics in 2001?", there is also the question: "Has the achievement of Canadian 13- and 16-year-old students in mathematics changed since the first two assessments?"

FEATURES OF SAIP ASSESSMENTS

Curriculum Frameworks and Criteria

School curricula differ from one part of the country to another, so comparing test data resulting from these diverse curricula is a complex and delicate task. Young Canadians in different jurisdictions, however, do learn many similar skills in reading and writing, mathematics, and science. Throughout the history of SAIP assessments, development teams composed of representatives from various jurisdictions have worked with CMEC staff to consult with all jurisdictions to establish a common framework and set of criteria for each subject area. These were intended to be representative of the commonly accepted knowledge and skills that students should acquire during their elementary and secondary education.

Within each subject area, separate strands (or domains) were developed that provided organizers for the curriculum. Then sets of criteria (and separate assessment tools) were developed to assess both the knowledge and the skill components within the strands of the curriculum. In mathematics, both mathematics content and problem solving assessments were developed; in science, both written and practical task assessments were developed; and both reading and writing assessments were developed to assess language skills.

Assessments Over Time

Another important factor to be considered is the impact of changes in curriculum and in teaching practice over time, as a result of both developments in educational research and changing public understandings of the role of education in society. SAIP assessments in all subject areas therefore have been designed to retain sufficient items from one administration to the next to allow longitudinal comparisons of student achievement, while making enough modifications to reflect changes in educational policies and practices.

Five Levels of Achievement

Achievement criteria[2] were therefore described on a five-level scale, representing a continuum of knowledge and skills acquired by students over the span of their elementary and secondary experience. Level 1 criteria were representative of knowledge and skills typically acquired during early elementary education, while level 5 criteria were typical of those acquired by the most capable students at the end of their secondary school program.

It is important to realize that the same assessment instruments are administered to both age groups (13-year-olds and 16-year-olds) to study the change in student knowledge and skills due to the additional years of instruction. Development teams therefore designed assessments in which most 13-year-olds would be expected to achieve level 2 and most 16-year-olds might achieve level 3. For 16-year-olds in particular, the number of specialized courses completed in the subject area being tested would influence greatly the level of achievement expected. In spite of these potential differences in course selection by individual students, SAIP assessments should still help to determine whether students attain similar levels of performance at about the same age.

[2] See *SAIP Mathematics Assessment Framework and Criteria*, below.

A Program Assessment, Not a Student Assessment

In the SAIP assessments, the achievement of individual students is not identified, and no attempt is made to relate an individual's achievement to that of other students. The SAIP assessments are intended to be used as one tool to help in measuring how well the education system of each jurisdiction is doing in teaching the assessed subjects. They do not replace individual student assessments, which are the responsibility of teachers, school boards and districts, and ministries of education. Similarly, no attempt is made to compare schools or school districts. The results are reported at the Canadian and jurisdictional levels only.

Harmonization of English and French Assessment Materials

From the outset, the content instruments used in all SAIP assessments are developed by anglophone and francophone educators working together for the purpose of minimizing any possible linguistic bias. Whether they wrote in French or in English, the students were asked to respond to the same questions and to solve the same problems. A linguistic analysis of each question and problem was also conducted to make sure French and English items functioned in the same manner. For the marking sessions, francophone and anglophone coders were jointly trained and did the marking together in teams working in the same rooms. Consequently, the statistical results presented for each language group in this report can be compared with reasonable confidence.

Funding for SAIP Assessments

Funding for the SAIP assessments is provided jointly by CMEC, ministries of education, and Human Resources Development Canada.

MATHEMATICS EDUCATION IN CANADA

As acknowledged earlier, mathematics curricula differ from one part of the country to another; however, there is a high degree of congruence in many areas of study. There is a strong network of Canadian mathematics educators who work closely with ministries of education in developing curriculum policy (see Box 2). Many Canadian jurisdictions, both individually and in cooperative groups, have developed provincial curricula based upon widely recognized standards for the teaching, learning, and assessment of mathematics (see Box 3). In the development of the *SAIP Mathematics Assessment Framework and Criteria*, and of the assessment instruments themselves, experts from across Canada were closely consulted to ensure that the assessment would provide an accurate and appropriate picture of student achievement in mathematics across the country.

In addition to the many cooperative and individual curriculum renewal initiatives that have taken place in Canada over the past decade, curriculum development across Canada and in many other countries has been influenced greatly by the standards developed by the National Council of Teachers of Mathematics (NCTM) in the United

Box 2

Mathematics Educators

There is a strong and active network of mathematics educators across Canada and North America. A useful directory of organizations with associated links may be found at **http://mathcentral.uregina.ca/BB/**.

Box 3

Mathematics Curriculum Development

Some important curriculum resources:

- The *Western Canadian Protocol Common Curriculum Framework for Canada Mathematics* (1995)
- *Foundation for the Atlantic Canada Mathematics Curriculum*, (nd), and individual provincial curricula
- National Council of Teachers of Mathematics (NCTM). *Principles and Standards for School Mathematics (2000)*

States. In addition, the American Association for the Advancement of Science (AAAS) as a result of their *Project 2061* has been influential in mathematics curriculum development.

Mathematics Curricula in Canada

Common to all mathematics curricula are a number of general principles:

- The importance of providing an accessible mathematics education for all students
- The concept that students learn best when they are actively involved in the process and can relate their learning to their own experiences
- The importance of teaching and learning problem-solving skills as a central part of the curriculum
- The importance of fostering positive attitudes toward learning about and using mathematics concepts and skills

IMPORTANT ASSUMPTIONS AND LIMITATIONS FOR THIS ASSESSMENT

The primary assumption for this assessment is that the five levels of performance represent the potential progression of all students in the sample. However, not all students continue in formal mathematics programs throughout their secondary school career. Since the sample included 13-year-olds and 16-year-olds, some participants, particularly in the older population, may not have taken mathematics courses for two years or more. The sequence of mathematics courses is also not the same for all students in all jurisdictions. The number of required courses, their degree of specialization in the traditional areas of mathematics, and the stress on particular topics vary from jurisdiction to jurisdiction. For example, some jurisdictions emphasize algebra and functions, while others devote more time to measurement and geometry. In addition, concepts and mathematical procedures are introduced in different grades in the various jurisdictions. For these reasons, the *SAIP Mathematics Assessment Framework and Criteria* was originally drafted to reflect the breadth of what students should know and be able to do in the four areas of the assessment framework.

Although the content of the SAIP Mathematics III Assessment was consistent with that of mathematics programs across Canada, there are some limitations that should be noted. The assessment focuses on knowledge and skills that can be measured by a paper-and-pencil test. The following dimensions of mathematics, which are important elements of some programs, were not assessed: the ability to work with manipulatives to solve problems, group problem-solving skills, and the exploration of complex mathematical issues. These dimensions of mathematics programs often represent important outcomes and also reflect critical processes in the teaching of mathematics. These complex skills and processes are more appropriately measured through a variety of techniques such as interviews, portfolios, and performance-based assessments using manipulatives.

SAIP MATHEMATICS ASSESSMENT FRAMEWORK AND CRITERIA

The framework and criteria for the SAIP Mathematics III Assessment reflect the principles of mathematics education described above.

The framework is defined by a series of *strands*, or curriculum organizers.

The strands chosen to measure students' skills in *mathematics content* are designed to evaluate achievement levels attained on

- Numbers and operations
- Algebra and functions
- Measurement and geometry
- Data management and statistics

The strands chosen to measure students' skills in *problem solving* are designed to evaluate levels of achievement attained on

- A range of problems and solutions
- The use of numbers and symbols
- The ability to reason and to construct proofs
- Providing information and making inferences from databases
- Pursuing evaluation strategies
- Demonstrating communication skills

A detailed description of the assessment domains and the associated criteria for each of the five levels may be found on the CMEC Web site at **www.cmec.ca**.

Summary of Criteria for Mathematics Content

(With exemplars drawn from actual student responses)

Level One

- Adds, subtracts, and multiplies, using a limited range of natural numbers
- Uses concrete materials and diagrams to represent simple relations
- Determines linear dimensions of recognizable simple plane figures
- Reads information from very simple tables

7. The points at a sporting competition are awarded as follows:

First Place:	100 points
Second Place:	10 points
Third Place:	1 points

Juan finished first, second, or third in eight events. His total was 251 points.

How many first place results did Juan win?

*A. 2   B. 8   C. 15   D. 111

19. Akiko has to travel a total of 802 km from Quebec City to Toronto for a business meeting. When she reaches Montreal, Akiko has travelled 256 km.

What further distance must Akiko travel in order to get to Toronto?

Answer = 546 km

Level Two

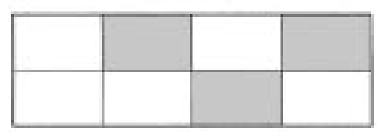
- Uses the four basic operations with natural numbers
- Uses patterns and classifications in real-life situations and plots points on a grid
- Calculates dimensions and areas of plane figures, classifies solid forms, and uses single geometric transformations
- Extracts and represents data using tables and diagrams

13. James wants to run the perimeter of a playing field, the dimensions of which are marked in centimetres and metres.

What distance will James cover by running once around this field?

A. 280 cm   * B. 280 m   C. 18 100 cm   D. 18 100 m

17. Parts of the figure below are shaded.



What fraction of the figure is represented by the shaded parts?

Answer = 3/8

Level Three

- Uses the four basic operations with integers
- Uses monomial algebraic expressions and plots points on a Cartesian grid
- Uses length, angle measure, and area involving various plane geometric figures and repetitions of the same geometric transformation
- Uses information from various sources and calculates arithmetic mean and simple probabilities

4. The weekly salary for a part-time job selling shoes in a shoe store is calculated using the formula

$$\text{Salary} = 5h + \frac{v}{15}$$

where h represents the number of hours worked and v represents the dollar value of the shoes sold in a particular week. A salesperson worked 18 hours and sold \$885 worth of shoes that week.

What was that week's salary for this salesperson?

A. \$65.00 B. \$90.00 * C. \$149.00 D. \$296.20

7. Francis decides to calculate his net worth to see if he can buy rollerblades that cost \$89.95, including tax. Francis has:

- 12 dollars and 3 quarters in his coat
- \$25.75 in his wallet
- a cheque for \$20 from babysitting
- a debt of \$3.25 that he owes to his brother

After paying his debt, how much more money does Francis need to buy the rollerblades?

A. \$28.20 * B. \$34.70 C. \$55.25 D. \$61.75

Level Four

- Uses the four basic operations with the full range of rational numbers
- Uses and graphs polynomial algebraic expressions and simple functions
- Uses the characteristics of solid forms, congruence and similarity in polygons, and compositions of plane transformations
- Organizes data, uses measures of central tendency, and calculates the probability of a single event

2. You are asked to find the numerical value of the following expression:

$$\frac{2x^4z + 4x^3y^2z}{4z}$$

where $x = -2$, $y = \frac{1}{2}$ and $z = -1$

What is the numerical value of this expression?

A. -4   * B. 6   C. 16   D. 28

16. The Drake Auditorium has seating for 2000 people. The tickets for a concert are \$11.50 for adults and \$6.25 for students. All seats in the auditorium are sold for the concert. Three-quarters of the tickets are sold to students and the remaining tickets are sold to adults.

How much money is collected from the sale of tickets for this concert?

answer = \$15 125

Level Five

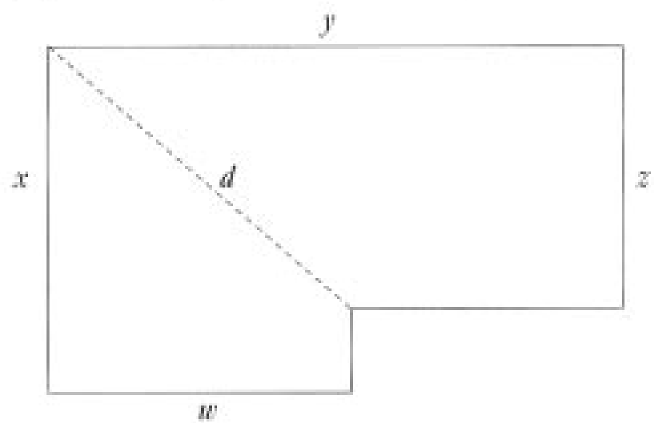
- Uses the four basic operations with the full range of real numbers
- Uses and graphs algebraic expressions with two variables and various functions
- Uses the properties of circles and right-angle triangles
- Calculates statistical information and the probability of combined events

10. A drafting student must construct a symbol. The symbol consists of a circle of radius 30 cm and an inscribed equilateral triangle. A metallic wire is used to outline the perimeter of the triangle.

To the nearest centimetre, what is the length of metallic wire needed?

A. 90 cm   * B. 156 cm   C. 180 cm   D. 188 cm

8. The following diagram is a house plan. All corners are square.



What is the length of a diagonal d in terms of variables given in the diagram?

A. $d = \sqrt{x^2 + y^2}$ * B. $d = \sqrt{w^2 + z^2}$ C. $d = \sqrt{x^2 + w^2}$ D. $d = \sqrt{y^2 + z^2}$

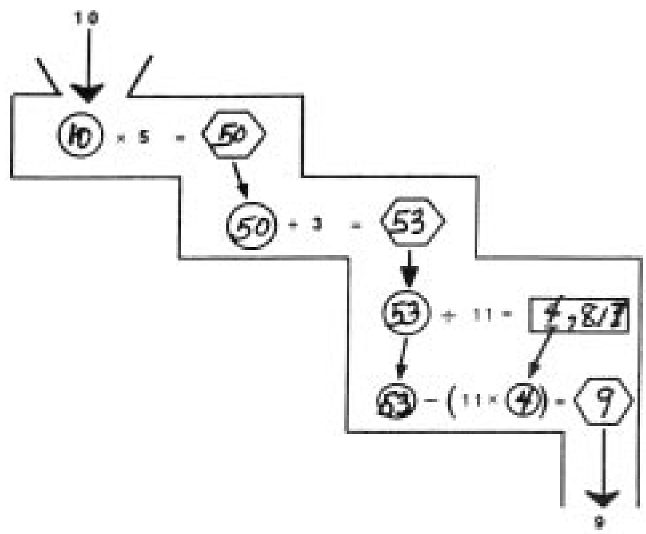
Summary of Criteria for Problem Solving

(With exemplars drawn from actual student responses)

Level One

- Finds single solutions to one-step problems using obvious algorithms and a limited range of whole numbers
- Uses one case to establish a proof

A. A sequence of numbers starting with 8 is generated using a whole number machine. Fill in the blanks to show the effect of the whole number machine on the second term of *10* to produce the *third term*, which is *9*.



The sequence is now: 8, 10, 9, ...

Level Two

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

B. What is the *fourth term* of the sequence produced by this whole number machine?

Show all your work

$9 \times 5 = \boxed{45}$

$45 + 3 = \boxed{48}$

$48 \div 11 = \boxed{4,36\ldots}$

$48 - (11 \times 4) = 4$

The sequence is now: 8, 10, 9, 4,

Level Three

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

C. What are all the *different* numbers that this number machine can produce?

Show all your work

$1 \times 5 = 5$

$5 + 3 = 8$

$8 \div = 0{,}72$

$8 - (11 \cdot 0) = 8$

8, 10, 9, 4, 1

$4 \times 5 = 20$

$20 + 3 = 23$

$23 \div 11 = 2{,}0\overline{9}$

$23 - (11 \times 2) = 1$

rep: 5

The sequence is now: 8, 10 9, 4, 1, 8, 10, 9, ...

Level Four

- Adapts one or more algorithms to find solutions to multi-step problems, using the full range of rational numbers
- Constructs structured proofs that may lack some details
- Uses mathematical and common vocabulary correctly, but solutions may lack clarity for the external reader

D. Explain why the *403rd* term, the *898th* term, and the *2003rd* term have the same value.

Show all your work

because terms repeat after five terms

403 - 3 = 400 is divisible by 5

898 - 3 = 895 is divisible by 5

2003 - 3 = 2000 is divisible by 5

This is the same term

the term is 9

Level Five

- Creates original algorithms to find solutions to multi-step problems, using the full range of real numbers
- Constructs structured proofs that provide full justification of each step
- Uses mathematical and common vocabulary correctly, and provides clear and precise solutions

E. Find a rule which allows you to determine *any term* of the sequence produced by the whole number machine.

Show all your work

x = term

$x - y$ = number divisible by 5

if $y = 1$, the term is 8

$y = 2$, the term is 10

$y = 3$, the term is 9

$y = 4$, the term is 4

$y = 0$, the term is 1.

The 1993 Assessment

The development of the first SAIP Mathematics Assessment (1993) began in 1991 and was led by a consortium of Alberta, Quebec, and Ontario representatives who worked in cooperation with representatives of other ministries of education. These specialists developed mathematics material that would describe and assess the achievement of Canadian 13- and 16-year-olds. Criteria were developed for five performance levels, and two types of instruments were developed, the first for mathematics content instruments, and the second for problem solving instruments. The instruments were extensively field-tested, and comments from teachers and students, as well as detailed statistical analyses, were used in the process of selecting the items that would be included in the final test booklets.

The 1997 Assessment

The SAIP Mathematics II Assessment (1997) materials were essentially those developed for the 1993 assessment. The consortium responsible for the Mathematics II Assessment included representatives from British Columbia, Ontario, Quebec, and New Brunswick (French). Its task was to examine and update the assessment materials and, where necessary, take into account the data and comments from the 1993 administration, while making sure the modified materials would measure the same concepts and skills in the same manner as in 1993.

For mathematics content, criteria remained the same but, following an analysis of the 1993 data, four multiple-choice items were replaced and about 20 other items had very minor changes, mostly aiming at clearer language. Although the items were essentially the same as those used in 1993, the test booklets were packaged in a different manner: the background questionnaire, placement test, and 125 questions were all included in the same booklet. Following these modifications, all the instruments were field-tested in the fall of 1996.

The 2001 Assessment

In preparation for this assessment, a consortium of representatives from Saskatchewan, Ontario, and Newfoundland and Labrador were asked to take a fresh look at the framework and criteria, the assessment instruments, and the administration process, with a view to bringing the SAIP Mathematics III Assessment more in line with current research, developing curriculum policy, and teaching practice.

With the full involvement of, and consultation with, officials in all jurisdictions and with CMEC staff and other assessment experts, the 2001 consortium team made several changes to a number of elements of the assessment. Small changes in the distribution of question types among levels and strands were made to ensure an equal distribution of items. Accommodations were also made to increase the number of questions related to data management and statistics, reflecting current curriculum trends. All of these changes were thoroughly reviewed and tested in both pilot studies and a full-scale field trial.

Framework and Criteria

While the framework (i.e., the strands) remained unchanged, adjustments were made to the criteria that describe levels of achievement within each strand to allow more consistent and accurate assigning of levels to student work. For example, more criteria were added to the data management and statistics strand for this purpose.

Anchor Questions

The mathematics content assessment consists of 125 questions. A certain number of these, known as "anchor questions," have remained unchanged through all three assessments, to permit accurate comparison of student achievement from year to year. In each of the administrations of the assessment (1993, 1997, and 2001), some of the remaining questions were replaced or revised, reflecting the analysis of results that suggested a need for questions that would better indicate student achievement. In 2001, about 30 were thus replaced.

Problem Solving Assessment

Of the six problems presented to the students chosen for this portion of the assessment, four remained unchanged from earlier assessments, and two were replaced. Again, these new questions were rigorously tested through pilot studies and field trials.

A more detailed discussion of the development and verification of the Mathematics III Assessment instruments and administration procedures will be found in the technical report.

Comparability of the 1993, 1997, and 2001 Assessments

While these changes were all made to improve the ability of the SAIP Mathematics Assessment to measure the levels of student achievement, care was taken to try to ensure a valid answer to questions about changes in the mathematics achievement of Canadian 13- and 16-year-old students from 1993 through 1997 and into 2001. Since there were significant changes in the current assessment design, direct statistical comparison with 1993 results is problematic; however, care was taken to ensure that statistically sound comparisons could continue to be made between the 1997 and 2001 results. Not only were assessment design and administration considered, but also the scoring process was carefully designed and managed to ensure that such comparisons could be made.

Careful analysis of data from the 2001 scoring sessions has confirmed that there were few statistical differences in scoring criteria and practices between the 1997 assessment and that of 2001.

ADMINISTRATION OF THE MATHEMATICS III ASSESSMENT (2001)

In April and May 2001, the assessment was administered to a random sample of students drawn from all provinces and territories. Approximately 41,000 students made up the total sample — 24,000 thirteen-year-olds and 17,000 sixteen-year-olds. About 33,000 students completed the assessment in English, and 8,000 in French. In one jurisdiction (Quebec), only 13-year-old students participated.

Participating students were randomly assigned to one of two assessment components — half of the sample to a test of their understanding of mathematics content, the other half to a test of problem-solving skills.

Students assigned to the content assessment were first asked to complete a 15-question placement test, which was scored immediately. The results were then used to direct the individual student to the appropriate set of questions in the test booklet.

Students assigned to the problem solving assessment responded to a series of six problems, selected to assess knowledge and skills over a range of levels of difficulty.

SCORING THE 2001 ASSESSMENT

In all cases, scoring was done by teams of thoroughly trained scorers, who matched student responses with the criteria developed to measure student achievement. Rigorous statistical tests were carried out on a regular basis to ensure both the reliability of individual scorers and the consistency of applying scoring criteria. In addition, sophisticated management techniques have been developed over the history of SAIP assessments to ensure a reliable and efficient process of managing student booklets and the data resulting from the scoring process.

Mathematics Content

Most of the 22,000 mathematics content booklets were scored over a one-week period during June 2001, in Winnipeg, by a group of university students with backgrounds in mathematics and science, who were trained by the consortium members in assigning appropriate codes to student responses. A small team of experienced scorers in Newfoundland subsequently scored a few booklets that arrived after this first session.

Problem Solving

Since this aspect of the assessment required the judgment of experienced mathematics teachers, a team of about 90 teachers was gathered in Halifax during July 2001 to score the booklets. A team of 15 experienced scoring leaders participated in an intensive week-long preparation session. Members of the consortium team trained them on the scoring guide and gave them a large number of sample student responses for practice and subsequent discussion. This process ensured that this team of leaders was well prepared to form the resource team to lead the overall scoring process. During the following two weeks, the full scoring team then completed the scoring of about 19,000 student response booklets, each containing responses to six problems. To further enhance the reliability of the scoring, all scorers worked on the same problem at the same time, and frequent checks were made by scoring team leaders throughout the process.

PAN-CANADIAN EXPECTATIONS FOR PERFORMANCE IN MATHEMATICS

An important question that must be asked for any assessment is one of expectations. "What percentage of Canadian students should achieve at or above each of the five performance levels, as illustrated by the framework and criteria and by the questions asked?" The answer to this question must come not only from educators, but also from the broadest possible spectrum of Canadians.

To assist with the interpretation of SAIP assessments, CMEC regularly convenes pan-Canadian panels of educators and non-educators to examine the framework and criteria and to review the assessment instruments and scoring procedures. For the Mathematics III Assessment, panellists attended one of the three sessions held in Atlantic, Central, and Western Canada during October 2001. This anonymous panel consisted of teachers, students, parents, university academics and curriculum specialists, Aboriginal teacher trainers, business and industry leaders, community leaders, and members of national organizations with an interest in mathematics education. The panel featured representatives from across Canada.

Box 4

How well did Canadian students REALLY do?

To ensure that the design and the results of SAIP assessments are really representative of the expectations that Canadians have for their students and schools, a broadly based panel is gathered from across Canada of both educators and representatives from business and the general public.

In sessions held in three different locations in Canada, members examine all of the testing materials and share their expectations of how well Canadian students should perform.

Results of these sessions are then compared with the actual results and released in the public report.

The 100-member panel reviewed all assessment instruments, both mathematics content and problem solving, scoring procedures, and actual student results to determine the percentage of 13- and 16-year-old students who should achieve each of the five performance levels. Full and open disclosure was provided to panellists of any information pertinent to the assessment, including sampling of students and the varying opportunities that students across the country have in learning mathematics.

A collaborative process was used to define pan-Canadian expectations for student achievement in mathematics. Specifically, participants were asked to answer independently the question "What percentage of Canadian students should achieve at or above each of the five performance levels, as illustrated by the framework and criteria and by the questions asked?"

Panellists' answers to that question were collected to determine the desired Canadian student performance and to help interpret how students should do in comparison with actual results.