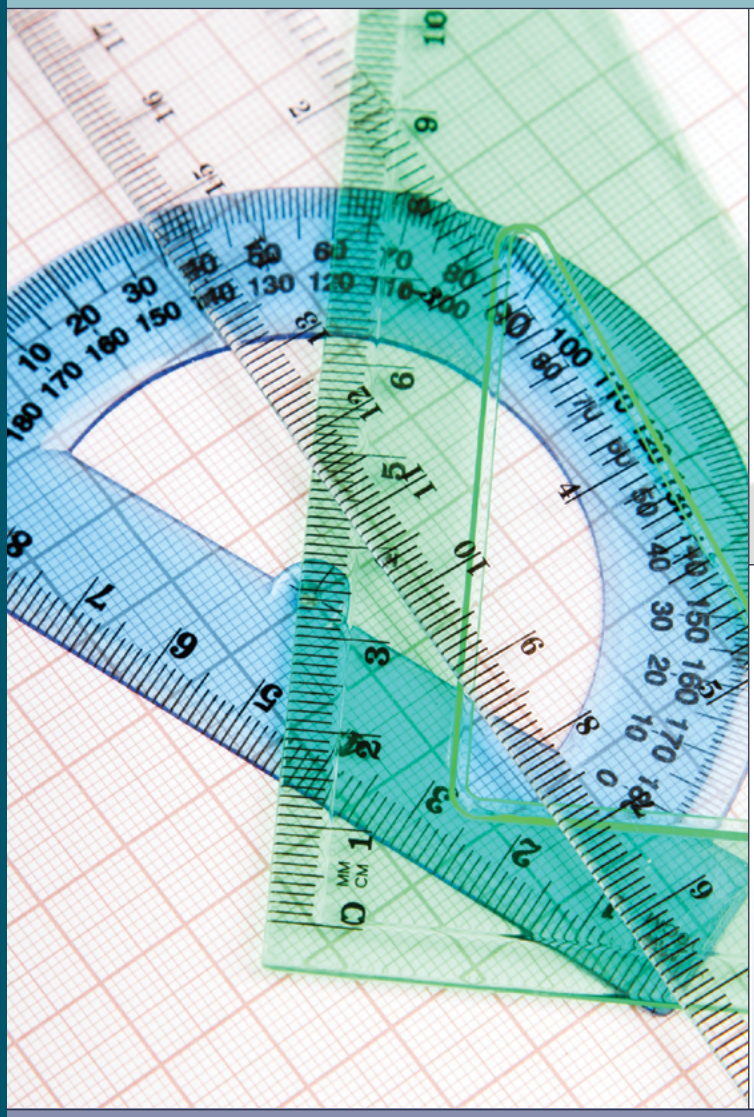
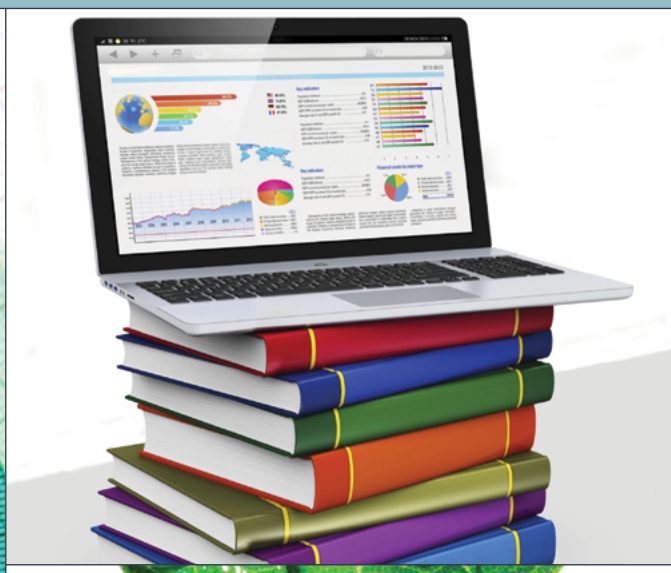
Pan-Canadian Assessment Program

PCAP 2019

Report on the Pan-Canadian Assessment of Mathematics, Reading, and Science





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PCAP 2019

Report on the Pan-Canadian Assessment of Mathematics, Reading, and Science

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The Council of Ministers of Education, Canada (CMEC) was formed in 1967 by the provincial and territorial ministers responsible for education to provide a forum in which they could discuss matters of mutual interest, undertake educational initiatives cooperatively, and represent the interests of the provinces and territories with national educational organizations, the federal government, foreign governments, and international organizations. CMEC is the national voice for education in Canada and, through CMEC, the provinces and territories work collectively on common objectives in a broad range of activities at the elementary, secondary, and postsecondary levels.

Through the CMEC Secretariat, the Council serves as the organization in which ministries and departments of education undertake cooperatively the activities, projects, and initiatives of particular interest to all provinces and territories. One of the activities on which they cooperate is the development and implementation of pan-Canadian testing based on contemporary research and best practices in the assessment of student achievement in core subjects.

Note of appreciation

The Council of Ministers of Education, Canada would like to thank the students, their parents and teachers, and the administrators in schools and ministries/departments of education whose participation in PCAP ensured its success. We are truly grateful for your involvement in this study, which will contribute significantly to a better understanding of educational policies and practices in the fundamental areas of mathematics, reading, and science in the middle years.

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Ce rapport est également disponible en français.

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INTRODUCTION

What is the Pan-Canadian Assessment Program

The Pan-Canadian Assessment Program (PCAP) is a collaborative project that provides data on student achievement in Canadian provinces and territories.[1] It is part of the ongoing commitment of the Council of Ministers of Education, Canada (CMEC) to inform Canadians about how well their education systems are meeting the needs of students and society. Every three years, close to 30,000 Grade 8/Secondary II[2] students from across Canada are assessed with respect to their achievement of the curricular expectations common to all provinces and territories in three core learning domains: reading, mathematics, and science. The information gained from this pan-Canadian assessment provides ministers of education and other stakeholders with a basis for examining their provincial/territorial curriculum and other aspects of their school systems.

School programs and curricula vary from province to province and from territory to territory across the country, so comparing results in these domains is a complex task. However, young Canadians in different provinces and territories learn many similar skills in reading, mathematics, and science. PCAP has been designed to determine whether students across Canada reach similar levels of performance in these core disciplines at about the same age, and to complement existing provincial/territorial assessments with comparative Canada-wide data on the achievement levels attained by Grade 8/Secondary II students.

Goals of PCAP

With the establishment of PCAP in 2003, Canada's ministers of education set out the following goals with respect to pan-Canadian educational assessment:

- to inform educational policies that seek to improve approaches to learning;
- to focus on reading, mathematics, and science, with the possibility of including other domains as the need arises;
- to reduce the testing burden on schools through a streamlined administrative process;
- to provide useful background information through the use of complementary context questionnaires for students, teachers, and school administrators; and

[1] All ten provinces have participated in each PCAP administration. The three territories did not participate in PCAP 2019.
[2] PCAP is administered to students in Secondary II in Quebec and Grade 8 in the rest of Canada.

- to enable provinces and territories to use both national and international results to validate the results of their own assessment programs, and to improve these programs.[3]

Development of the assessment

The PCAP assessment cycle

PCAP assessments are administered every three years to students who are in Grade 8/Secondary II. Each assessment cycle collects achievement data using a cognitive test with a major emphasis on one of the three learning domains — reading, mathematics, or science — and a minor emphasis on the two remaining domains. PCAP also collects a significant range of contextual information (e.g., on demographics, socioeconomic factors, and school teaching and learning conditions) to enhance interpretation of student performance.[4]

Each PCAP assessment includes questions on all three domains, although the focus shifts, as shown in Table I.1. The repetition of the assessments at regular intervals yields timely data that can be compared across provinces and territories, and over time. For the fifth assessment, in 2019, the focus was on mathematics, as it had been in 2010, with reading and science as the minor domains.

Table I.1 PCAP assessment schedule

Domain	Cycle 1			Cycle 2		
	Spring 2007	Spring 2010	Spring 2013	Spring 2016	Spring 2019	Spring 2023[5]
Major	Reading	Mathematics	Science	Reading	Mathematics	Science
Minor	Mathematics	Science	Reading	Mathematics	Science	Reading
Minor	Science	Reading	Mathematics	Science	Reading	Mathematics

Development of PCAP frameworks

While school programs differ from one part of the country to another, PCAP is based on curriculum areas that are common to all provinces and territories at the Grade 8/Secondary II level. This focus on common areas allows comparisons of students at a comparable point in their schooling, across provinces and territories. *PCAP 2019: Assessment Framework* (CMEC, 2020) describes the theoretical

[3] PCAP 2019 results can be compared to three international studies: the Progress in International Reading Literacy Study (PIRLS), the Programme for International Student Assessment (PISA), and the Trends in International Mathematics and Science Study (TIMSS). Unlike PCAP, these studies are not aligned with provincial/territorial programs of study. However, the comparison is useful because the same subjects are assessed, which provides indirect information about the relative progress in performance across grades and ages. PISA is administered in all provinces to the same age cohort of students as PCAP, but two years later. Fewer provinces participate in TIMSS, which assesses Grade 4 and Grade 8/Secondary II students in science and mathematics, and PIRLS, which assesses Grade 4 students in reading.

[4] These contextual data are published in a separate report.

[5] The administration of PCAP 2022 has been delayed until 2023 in response to health concerns related to the global pandemic and to minimize overlap with PISA, which has been delayed one year, from 2021 to 2022.

underpinnings, design principles, and performance descriptors that were used to develop test items in each of the three domains for the second cycle of PCAP (2016–23).

PCAP development began in 2003 with a thorough review of curricula and then-current assessment practices for each of the three target learning domains. All Canadian provinces and territories were consulted, and extensive literature reviews were conducted for each domain. These analyses informed the synthesis of a core of common learning expectations for Canadian Grade 8/Secondary II students. The resulting common curricular framework for each domain reflected a perspective agreed upon by all provinces and territories, and was informed by the latest pedagogical research (CMEC, 2005a). The framework document was reviewed and updated in preparation for the second cycle of PCAP, while the framework for the major domain is reviewed prior to the beginning of the development for each PCAP administration.

For each PCAP assessment, the framework document guides the development of test items. Items are developed in both official languages, cross-translated, and field tested. The 2019 framework document describes the theory guiding the construction of PCAP assessments and provides further detail about the design and field testing of questions used in the assessments (CMEC, 2020).

Assessment design

In measuring any complex and integrated set of skills, it is usually best to include a variety of types of items in the assessment, both to allow all students to respond in the manner that best demonstrates their skill attainment and to measure a wide range of the complex skills involved.

In general, the PCAP assessment is designed with units of questions based on a particular context. Each assessment unit presents a passage or context followed by a series of related items. The contexts chosen for assessment units are intended to capture the interests of Canadian Grade 8/Secondary II students and thereby increase their motivation to write the assessment. Contexts are introduced with an opening situation, which could be in the form of a brief narrative and could include fiction or non-fiction reading passages, tables, charts, graphs, or diagrams. For PCAP 2019, developers of the assessment items and the Advisory Panel on Test Fairness ensured that the contexts were developmentally appropriate, free of bias, and not culturally or geographically dependent. Attention was paid to creating a balance of constructed-response (or open-ended-response) and selected-response items, allowing for an efficient use of student testing time. The ratio of selected-response to constructed-response items was approximately 3:1. In developing assessment items, the choice of item format depended on the process or subdomain being assessed and the format that best enabled students to demonstrate their proficiency.

More details about the domains, subdomains, and assessment design can be found in *PCAP 2019: Assessment Framework* (CMEC, 2020) and the forthcoming *PCAP 2019: Technical Report.*[6]

[6] *PCAP 2019: Technical Report* will be available on the CMEC website in late 2021.

PCAP contextual questionnaires

Students participating in PCAP, and their teachers and school principals, complete questionnaires that are designed to provide all provinces and territories with contextual information to aid in the interpretation of the performance results. Researchers, policy-makers, and practitioners can use the information provided by these questionnaires to help them determine what factors influence learning outcomes. The content of the contextual questionnaires changes, depending on which of the three domains is the primary focus in a PCAP assessment.

Contextual questions accompanying the PCAP 2019 assessment reflect factors that have been found in past studies to correlate with achievement. Some examples of these correlates include:

- student characteristics such as parental level of education, student attitudes, and family demographics;
- teacher characteristics such as teaching and learning strategies, homework expectations, areas of specialization, and years of teaching experience; and
- school characteristics such as instructional climate, time allocation, and availability of resources.

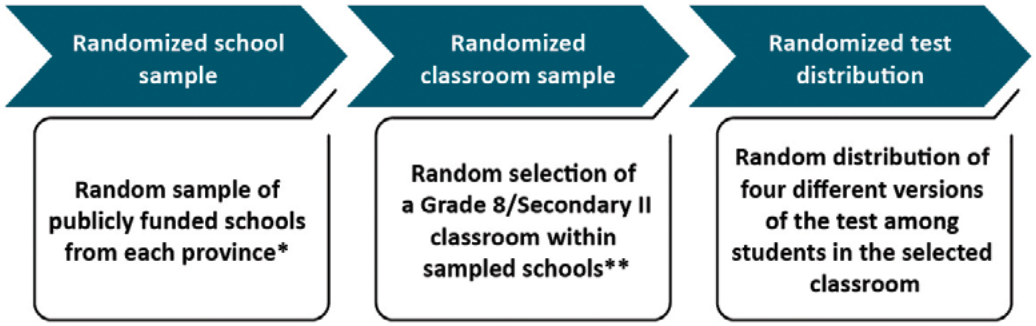
Administering and scoring the assessment

In spring 2019, the PCAP assessment was administered to a random sample of students from across Canada.[7] The selection process occurred in several steps, as shown in Figure I.1. Almost 30,000 students from all ten provinces participated in the 2019 PCAP assessment.[8] All participating students answered questions in all three domains. Approximately 22,000 responded in English, and 7,500 in French. The assessment comprised both selected- and constructed-response items. Students' written responses were scored by subject specialists from across Canada, rigorously trained in PCAP assessment protocols. Multiple checks and balances were built in to the assessment process to ensure the reliability of the data collected. Additional information about the design and scoring of PCAP domains can be found in the PCAP 2019 assessment framework (CMEC, 2020) and forthcoming technical report.

[7] In generating a sample of students to write the assessment, it is necessary to select a large enough number of participants to allow for adequate representation of the population's performance. Here, the word "population" refers to all eligible Grade 8/Secondary II students within a province and/or a linguistic group.

[8] The three Canadian territories did not participate in PCAP 2019.

Figure I.1 Selecting a random sample of Canadian Grade 8/Secondary II students



* Provinces provide lists of publicly funded schools. These schools may be public or private.
** In provinces with small school populations, all schools and/or all Grade 8/Secondary II classes meeting the criteria were selected, in order to obtain a sufficient number of participants for a valid sample.

Transition to PCAP online

For the first time, this cycle of PCAP was administered digitally. To control for mode effects and allow data linking across modes, a mode study was administered to a smaller proportion of students who completed the cognitive test and the questionnaire on paper. The technical advisory group for PCAP reviewed the paper-based and online results and concluded that the results were comparable, both for PCAP 2019 and for comparisons over time. All teacher and school questionnaires were administered online.

Presentation of PCAP results

Every PCAP report provides data for the three learning domains in the form of mean scores. While overall mean scores for participating provinces, and their relative rankings compared to the Canadian mean scores, are useful indicators of the performance of education systems overall, they do not provide much information about student learning.

To provide a detailed understanding of what students know, understand, and can do, PCAP has developed useful benchmarks or performance levels that align a range of scores to levels of knowledge and skills measured by PCAP as an assessment of learning. For the major domain, which was mathematics in 2019, PCAP used four performances levels, which provide an overall picture of students' accumulated proficiency at Grade 8/Secondary II. In this report, performance levels are reported for the overall domain of mathematics as well as for each of its subdomains. A description of the knowledge and skills characteristic of achievement at each performance level in mathematics can be found in Table 1.2 in Chapter 1.

The achievement results in the minor subject domains (reading and science, in 2019) are reported only as overall mean scores. Together, these two minor domains constituted approximately one-third of the assessment. Because students responded to a smaller subset of items for the two minor subject areas, their results by subdomain and performance level are not reported.

PCAP results are weighted based on population size — provinces with a larger population have a greater weight. This weighting has implications for the mean scores: because English-language students from Ontario and French-language students from Quebec contribute the greatest number of test results, their average scores are more likely than those of any other population to be closest to the Canadian English mean and Canadian French mean, respectively. Further analysis of the French-language results in minority settings will be available in the PCAP contextual report.

The actual results from students' assessments are called "raw scores." The raw scores are converted to a scale, which has a range of 0 to 1000. These raw scores are standardized, providing a common measurement so that meaningful comparisons can be made of scores obtained from different populations over time and on different versions of the test.

The standardized scale used for PCAP assessments places scores on a normal distribution with a midpoint or mean of 500 and a standard deviation of 100. The scale midpoint of 500 is equal to the pan-Canadian average for each subject in the baseline year.[9] The majority of students in Canada — about two-thirds — will score between 400 and 600, or within one standard deviation of the mean. This mean can then be used as a reference point that allows the comparison of Canada-wide results.

Reporting by language

The results obtained from students educated in francophone school systems of their respective provinces are reported as "French." The results obtained from students educated in anglophone school systems of their respective provinces are reported as "English." Within anglophone school systems, although students in French immersion programs could, at the discretion of the school, complete the PCAP test in either English or French, their results are reported with those of the English-language cohort. A resource listing common science and mathematics terms in English and French was provided for French immersion students.

Reporting PCAP achievement over time

One of the strengths of PCAP is its measurement of changes over time in student performance. The PCAP achievement scales provide a common metric on which provinces can compare students' progress at the Grade 8/Secondary II level in the three core subjects from one assessment year to another. Items that were administered in the baseline years, known as "anchor items," provide the basis for linking the assessment results. Such links enable provinces to have comparable achievement data from 2007, 2010, 2013, 2016, and 2019, and to analyze changes in performance over time.

Applications of PCAP data

PCAP is designed as a system-level assessment to be used primarily by provincial ministries of education to monitor and assess their respective educational systems. PCAP results are reported only at the pan-Canadian and provincial levels (and, where data are available, by territory), by language of the school

[9] The baseline year is the first year in which the domain was the major domain assessed (2007 for reading, 2010 for mathematics, and 2013 for science).

system, and by gender. They are not included in students' academic records, and no results for individual students, schools, or school boards/districts are reported by CMEC.

The goal of national (and international) large-scale assessments is to provide reliable information about academic achievement and insight into contextual factors influencing it. The data from studies such as PCAP provide policy-makers, administrators, teachers, and researchers with meaningful insights into the functioning of education systems and how they might be improved.

Although public attention is often focused on the results of large-scale, standardized assessments, research suggests that valid and reliable classroom assessments used by teachers in their daily practice also provide powerful tools to improve student achievement (Olson, 2002). Therefore, it is important to recognize the important roles of both classroom assessments (formative and summative) and larger-scale summative assessments such as PCAP in providing valuable information about student learning. Table I.2 summarizes the similarities and differences between large-scale assessments like PCAP and classroom assessments.

Table I.2 Comparison of large-scale and classroom assessments

Large-scale assessment	Classroom assessment
Summative assessment	Program of formative and summative assessments
Standardized procedures, randomly administered	Multiple modes and instances of assessment adapted to student learning needs
Supports analysis of education systems	Supports and assesses the learning of individual students
Fosters system accountability	Provides educators and students with immediate, context-specific feedback on learning
Differentiates by student achievement	Differentiates by student achievement, learning needs, and strengths

UN Sustainable Development Goal on education

In 2015, the United Nations General Assembly adopted a resolution entitled *Transforming Our World: The 2030 Agenda for Sustainable Development* (Agenda 2030), which included 17 Sustainable Development Goals (SDGs). Education is a central theme in *Agenda 2030:* SDG 4 is to "ensure inclusive and equitable education and promote lifelong learning opportunities for all" (UNESCO, 2015). In highlighting the importance of education, UNESCO observes that "increased educational attainment helps transform lives by reducing poverty, improving health outcomes, advancing technology and increasing social cohesion" (UNESCO, 2016b, p. 10).

In addition to the SDGs themselves, the UN has outlined targets and global indicators for monitoring progress toward the goals. The SDGs, targets, and means of implementation are considered to be universal, indivisible, and interlinked (UNESCO, 2016b). Table I.3 lists one of the general targets and indicators for the SDG on education. Some of the other targets for this SDG specifically highlight the importance of skills and knowledge. For example, target 4.7 is as follows:

> By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development. (UNESCO, 2016a, p. 21)

Table I.3 UN Sustainable Development Goal on education (Goal 4)

SDG 4	By 2030, "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."
SDG target 4.1	"By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes."
SDG global indicator 4.1.1	"Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex."

The monitoring of the SDG on education provides challenges. The annual Global Education Monitoring (GEM) Report "has a mandate to help the international community understand whether and how the world is making progress in education and lifelong learning" (UNESCO, 2016b, p. 35). With regard to global indicator 4.1.1 (see Table I.3), international assessments could be used to monitor progress in the proportion of children and young people who, at the end of primary and lower secondary education, have achieved at least minimum proficiency in reading and mathematics (UNESCO, 2017). The UNESCO Institute of Statistics is also working with countries to evaluate how national assessments can be used to monitor progress toward the SDGs. Both national and international studies could be used to measure how close countries are to meeting various targets, particularly those related to equity and education for sustainable development.

Organization of this report

This report provides initial results from the PCAP 2019 assessment for Canada overall and for the ten provinces. It presents the pan-Canadian and provincial results in mathematics, reading, and science, and it also offers comparative results among provinces, and between Canada and individual provinces.

Chapter 1 presents information on mathematics, the primary focus of PCAP 2019. It explains the domain as well as the subdomains that constitute the PCAP assessment of mathematics and describes the four performance levels that broadly classify achievement as expected (Level 2), below expected (Level 1), and above expected (Levels 3 and 4) for students in Grade 8/Secondary II. This chapter presents mathematics achievement by performance level, with comparisons by province, language of the school system, and gender. It also reports on mathematics achievement by overall mean score as well as changes over time compared to the baseline year in 2010, the first year in which mathematics

was the primary focus of the assessment. Again, comparisons by province, language of the school system, and gender are presented.

Chapters 2 and 3 present achievement outcomes in reading and science, the two minor domains assessed in 2019. For minor domains, only mean score data are reported. The chapters present comparisons among provinces as well as changes in achievement over time compared to the respective baseline years. Data are presented by province, language of the school system, and gender.

Chapter 4 presents the 2019 PCAP assessment results for each province. At the opening of each subsection, a "context statement" provides background information on the social and organizational contexts of the province's public education system and an overview of how the province approaches curriculum in the major domain. Provincial results are compared with pan-Canadian averages, with additional breakouts of the data by language of the school system (where appropriate) and by gender. The profile of each province also includes available data for achievement changes over time for all domains.

Major findings are summarized in the Conclusion. Finally, Appendix A includes details on sampling and response rates, while Appendix B comprises tables with detailed data underpinning the findings discussed in this report.

1 MATHEMATICS ASSESSMENT

This chapter delineates the conceptual framework of the mathematics component of PCAP and presents the results of the PCAP 2019 mathematics assessment. The framework is closely aligned with provinces' and territories' curricula, which generally have been guided by National Council of Teachers of Mathematics (NCTM) standards, as articulated in the *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000) and *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence* (NCTM, 2006).

The primary domain: mathematics

For the purpose of the PCAP assessment, mathematics is broadly defined as the study of patterns and relationships and as a discipline involving conceptual understanding, procedural knowledge, and processes. The mathematics domain is divided into four strands or subdomains: numbers and operations; geometry and measurement; patterns and relationships; and data management and probability. Table 1.1 presents the subdomains, related topics, and target percentages of time that the PCAP mathematics assessment dedicated to each subdomain.

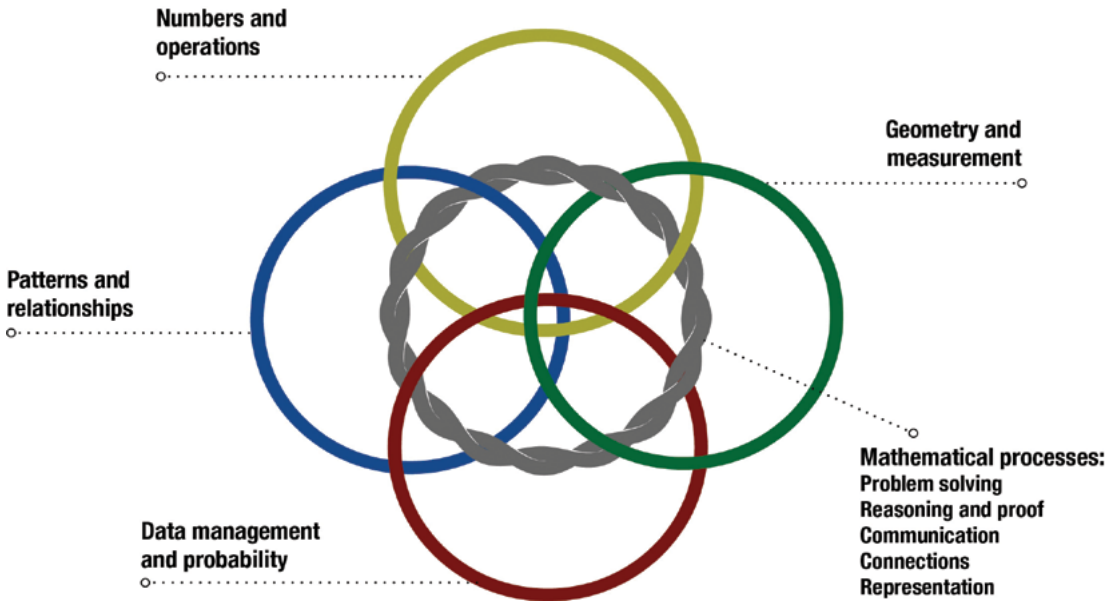
Table 1.1 PCAP mathematics assessment framework

Subdomain	Topic areas	%
Numbers and operations	Properties, equivalent representations, and magnitude	36
Geometry and measurement	Properties of 2-D figures and 3-D shapes, relative position, transformations, and measurement	27
Patterns and relationships	Patterns, algebraic equations and expressions, and linear relations	14
Data management and probability	Data collection and analysis, experimental and theoretical probability	23

In recent years, much attention in the education field has been focused on the development of 21st-century skills. These are usually described as those skills that individuals will have to master to succeed in the 21st century. The four mathematics subdomains incorporate several processes that require 21st-century skills, such as critical thinking and problem solving, creativity and innovation, communication and collaboration, information and communications technology (ICT) literacy, flexibility and adaptability, and initiative and self-direction. The limitations of a large-scale assessment reduce the number of processes or skills that can be reliably assessed. Therefore, only five processes that reflect 21st-century skills have been selected for this assessment: problem solving, reasoning and proof, communication, connections, and representation.

The mathematics subdomains are traditional groupings of conceptual and procedural knowledge, outlined in *PCAP 2019: Assessment Framework* (CMEC, 2020), and the processes are present in all subdomains. As illustrated in Figure 1.1, the concepts and procedures of the subdomains intersect, while the processes are interwoven through all subdomains.

Figure 1.1 PCAP mathematics assessment framework



Results in mathematics

This report presents the results of student performance in the PCAP 2019 mathematics assessment in two ways: as the percentage of students attaining each of the four performance levels and as overall mean scores. This chapter presents results for Canada overall and by province, both for mathematics overall and for each of its subdomains. Student achievement is also broken down by language of the school system for all provinces except Prince Edward Island and Newfoundland and Labrador, where reliable results for francophone school systems are not available because students were not oversampled by language. Results are also compared by gender. Given that the 2019 assessment marks the second time that PCAP assessed mathematics as a major domain (the first time was in 2010), this chapter also discusses changes in mathematics performance over time.

Results in mathematics by performance level

In reporting levels of performance in mathematics, PCAP provides an overall picture of students' accumulated understanding in this domain by the end of Grade 8/Secondary II. The assessment categorizes results according to four levels of performance. Table 1.2 provides a description of all four performance levels, which includes knowledge and skills associated with all the subdomains of mathematics.[10] Students classified at a given performance level are assumed to be able to perform most of the tasks at that level as well as those at the lower levels, if any. Based on pan-Canadian curriculum expectations in mathematics, the expected level of performance of Grade 8/Secondary II students is Level 2.

[10] The performance levels were established using the Bookmark standard-setting method (see Lewis, Mitzel, Mercado, & Schultz, 2012).

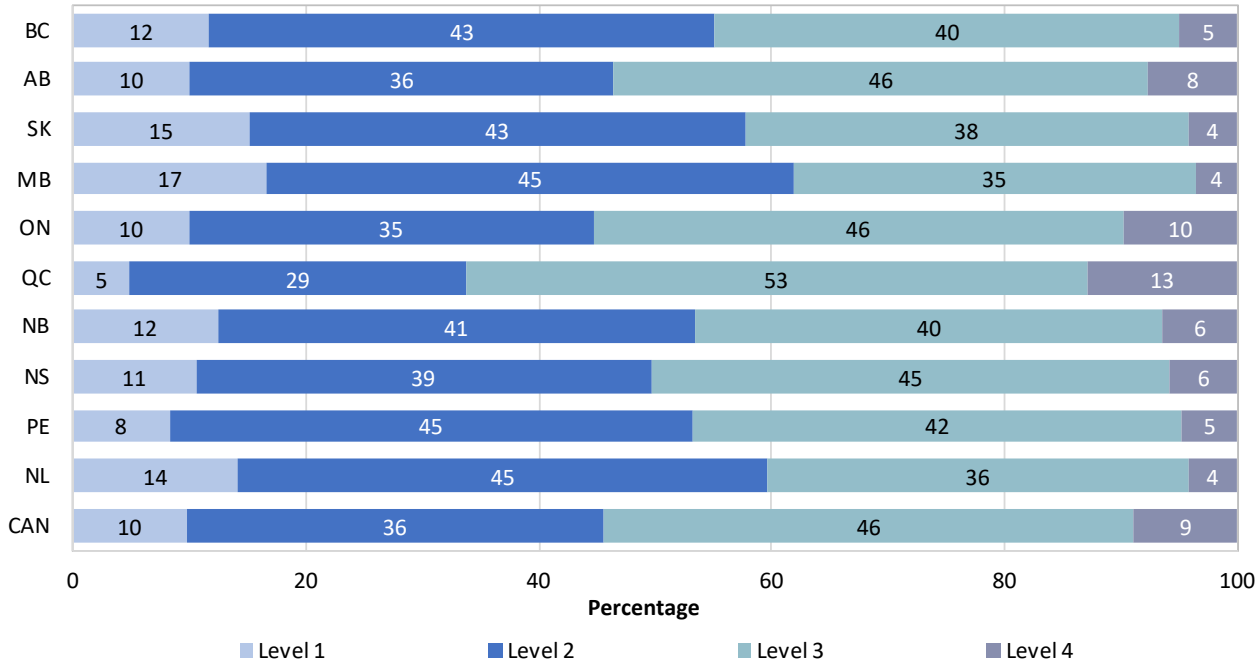
Table 1.2 PCAP 2019 mathematics performance levels — summary description

Performance-level descriptors
Level 4 - Scores of 645 and above
Students at Level 4 were able to: • solve problems that require complex reasoning at the analysis and synthesis levels • use appropriate and efficient strategies to solve problems • generalize patterns and write an algebraic rule • communicate mathematics clearly by explaining and justifying complete solutions • combine information from different mathematical domains to solve a problem (e.g., solve a problem requiring both algebraic reasoning and spatial sense) • make connections between a variety of representations in order to solve a problem
Level 3 - Scores between 498 and 644
Students at Level 3 were able to: • apply mathematical concepts to non-routine or unfamiliar situations • interpret information from tables, diagrams, or graphs • generate the algebraic expression or equation for a given context • solve problems requiring algebraic and spatial reasoning (e.g., carry out multiple transformations, manipulate variable equations) • solve problems using relevant information and/or hidden assumptions • select appropriate strategies to solve a problem • make use of logic to support solutions • describe the relationship between quantities
Level 2 - Scores between 386 and 497
Students at Level 2 were able to: • recall facts, definitions, or terms (e.g., parallel, perpendicular, range) • carry out calculations involving one or more operations, including operations of different types • use provided formulae • compare and order numbers, including fractional representations • identify the algebraic expression or equation for a given context • solve problems involving probability • solve problems that require proportional reasoning, including ratios • calculate straightforward perimeter and area in a non-problem-solving context • evaluate a variable expression • retrieve information from tables, diagrams, or graphs, and apply it to solve a problem • solve problems that are clearly defined as to what is required
Level 1 - Scores of 385 and below
Students at Level 1 were able to: • recognize previously learned information (e.g., geometric shapes) • retrieve information from graphs, tables, or diagrams • calculate percentages and translate between percentage and decimal notation • compare and order numbers, including decimal representations • solve previously learned routine problems with explicit instructions in the stem • solve problems with one-step calculation, including problems with several one-step calculations • identify single transformations (e.g., reflections)

Examples of PCAP mathematics items showing sample results at all four performance levels can be found in the PCAP 2010 public report (CMEC, 2011, pp. 13–17). Sample questions accompanied by student responses show the types of knowledge and skills demonstrated by students at different levels of performance. A more comprehensive set of sample items will be available in a forthcoming issue of *Assessment Matters!* [11]

In 2019, 90 percent of Grade 8/Secondary II students in Canada performed at or above Level 2 in mathematics. Across provinces, the results ranged from 83 percent in Manitoba to 95 percent in Quebec (Figure 1.2, Appendix B.1.1). In Canada as a whole, 10 percent of students did not reach the baseline level in mathematics. In Alberta, Ontario, and Nova Scotia, the proportion of low achievers (below Level 2) was similar to the Canadian average. Quebec and Prince Edward Island had the lowest proportion of students achieving below the baseline level (5 percent and 8 percent, respectively), while Saskatchewan, Manitoba, New Brunswick, and Newfoundland and Labrador had a higher proportion of students achieving at Level 1 compared to Canada overall. At the higher end of the PCAP scale, 9 percent of Canadian students performed at Level 4. At the provincial level, the proportion of students achieving at the highest level was greater than the Canadian average in Quebec and similar to the Canadian average in Alberta and Ontario.

Figure 1.2 Percentage of students at each performance level in mathematics



Multiple comparisons of mathematics achievement among provinces by students meeting or exceeding the expected level of performance at the Grade 8/Secondary II level can be found in Table 1.3.

[11] *Assessment Matters!* is a series of articles and research notes available on the CMEC website, at **https://cmec.ca/459/Overview.html**

Table 1.3 Comparison of Canadian and provincial results in mathematics by percentage of students achieving Level 2 or above

	%	Standard error	Provinces where the percentage of students achieving Level 2 or above is not significantly different from the comparison province or from Canada
Quebec	95	0.6	
Prince Edward Island	92	0.0	Ontario, Alberta
Canada	**90**	**0.4**	Ontario, Alberta, Nova Scotia, British Columbia
Ontario	90	0.8	Prince Edward Island, **Canada**, Alberta, Nova Scotia, British Columbia
Alberta	90	1.1	Prince Edward Island, **Canada**, Ontario, Nova Scotia, British Columbia, New Brunswick
Nova Scotia	89	0.4	**Canada**, Ontario, Alberta, British Columbia
British Columbia	88	0.7	**Canada**, Ontario, Alberta, Nova Scotia, New Brunswick
New Brunswick	88	0.0	Alberta, British Columbia, Saskatchewan
Newfoundland and Labrador	86	0.5	Saskatchewan, Manitoba
Saskatchewan	85	1.0	New Brunswick, Newfoundland and Labrador, Manitoba
Manitoba	83	0.9	Newfoundland and Labrador, Saskatchewan

Overall, the distribution of mathematics proficiency by performance level follows patterns similar to those observed in mathematics among Canadian students in the TIMSS 2019 and PISA 2018 assessments. TIMSS uses four international benchmarks to show the range of students' performance. The low international benchmark, which can be considered the level of minimum proficiency internationally, was reached by 92 percent of Canadian students, while 32 percent of Canadian students reached the high international benchmark (O'Grady, Monk, Rostamian, Scerbina, Tao, & Elez, 2021). Although PISA uses a more complex model of performance than PCAP or TIMSS, with six levels, Level 2 in both PCAP and PISA assessment is considered "baseline proficiency," or the level that is required to participate fully in modern society (OECD, 2019). In PISA 2018, 84 percent of Canadian students reached the baseline level, while 15 percent achieved the highest levels of proficiency (Levels 5 and 6) (O'Grady, Deussing, Scerbina, Tao, Fung, Elez, & Monk, 2019).

Results in mathematics by average score

PCAP 2019 mean scores in mathematics are reported on the PCAP scale, which has a range of 0 to 1000. In the baseline year for mathematics (2010), the Canadian mean was set at 500, with a standard

deviation of 100. To facilitate direct comparisons over time, the Canadian mean has not been rescaled to 500 following the baseline year.

Large-scale studies such as PCAP summarize student performance by comparing the relative standing of provinces based on their mean test scores. This approach can be misleading because there is a margin of error associated with each score (see the box below on statistical comparisons). When interpreting mean performance across provinces, only those differences that are statistically significant should be taken into account.

A note on statistical comparisons

The purpose of PCAP is to report results on the knowledge and skills of Grade 8/Secondary II students in Canada. A two-stage sampling procedure was followed, as described in Appendix A. The sample size must be large enough to produce reliable estimates that would be generalizable to Canada and individual provinces. In some provinces, in order for the PCAP results to be representative of the population — whether of a province or a linguistic group — a census of schools and/or of students was used.

The averages (for mean scores and performance-level proportions) were computed from random samples of students and not from the overall population of students. Consequently, it cannot be said with certainty that a sample average has the same value as the population average that would have been obtained had all Grade 8/Secondary II students been assessed. Additionally, a degree of error is associated with the scores describing student performance, as these scores are estimated based on student responses to test items. A statistic, called the Standard error, is used to express the degree of uncertainty associated with sampling error and measurement error.

When comparing scores among provinces or population subgroups, the degree of error in each average should be considered in order to determine whether averages are significantly different from each other. Standard errors and confidence intervals may be used as the basis for performing these comparative statistical tests. Such tests can identify, with a known probability, whether there are actual differences in the populations being compared.

For example, when an observed difference is significant at the .05 level, it implies that the probability is less than .05 that the observed difference could have occurred because of sampling or measurement error. When comparing provinces — or countries, in international assessments — extensive use is made of this type of statistical test in order to reduce the likelihood that differences due to sampling or measurement errors will be interpreted as real.

For comparisons in this report, a test of significance (the t-test, with the use of Bonferroni adjustments for multiple comparisons to reduce the false positive, or Type-I error rate) was conducted in order to determine whether differences were statistically significant.

Unless otherwise stated, only statistically significant differences at the .05 level are noted in this report for proportions of students at proficiency levels and achieving mean scores.

Note: Due to rounding of the scores and percentages presented in this report, scores and differences may not add up precisely, and percentages may not precisely represent the absolute unrounded values and add up to 100.

Comparisons between results for English- and French-language school systems

Caution is advised when comparing achievement results for the two language groups, even though assessment instruments were prepared collaboratively with due regard for equity with respect to students in both groups. Every language has unique features that are not readily comparable. While the cognitive items, performance descriptors, scoring guides, and processes in PCAP 2019 were judged equivalent in English and French, pedagogical, cultural, and geographical differences related to differences in language structure and use render direct comparisons between language groups inherently difficult, and any such comparisons should be made with caution. Within anglophone school systems, results for students in French immersion programs are reported with the English-language cohort.

Mathematics subdomains

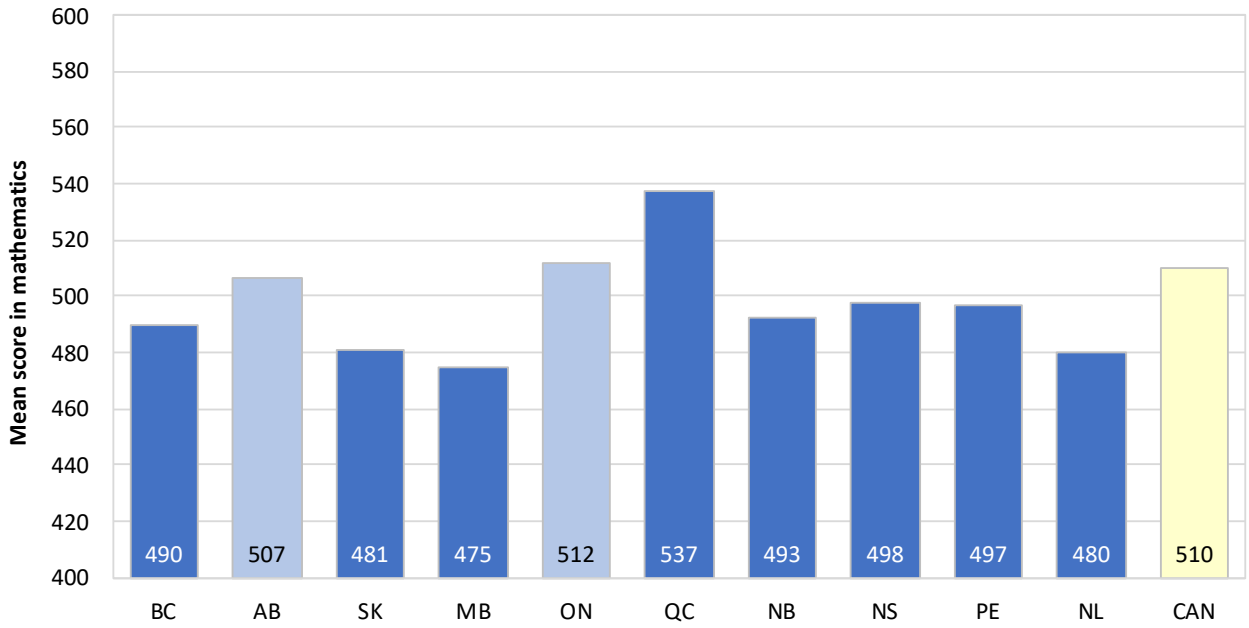
The mean scores for overall mathematics and for the subdomains of mathematics were calculated separately in PCAP, with the Canadian mean set at 500 for each one in the baseline year of 2010. To facilitate direct comparisons over time, the Canadian overall and subdomain means have not been rescaled to 500 following the baseline year.

Interpretation of results for small populations

In PCAP 2019, Statistics Canada was contracted to provide survey weights to ensure that the sampled students represented the number of students in the full PCAP population. Replicate weights were also included to estimate sampling variance, a process that is used in international large-scale assessments. Unlike simple random sampling, replicate weights account for stratification within the random sample. If a census of schools was taken within a province or a linguistic group, the sampling variance is zero, which means the final student weight and the replicate weight are identical, since all schools were selected as part of the first stage of sampling. This results in Standard errors of 0.0 for the following small populations: Prince Edward Island, both language groups in New Brunswick, and the French-language school systems in British Columbia, Saskatchewan, and Manitoba. Despite the lack of sampling variance at the school level for these populations, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student was selected within each school.

Figure 1.3 provides the mean scores in mathematics for all provinces and indicates the extent to which the results differ statistically from the Canadian mean score. Students in Quebec had the highest achievement, with average scores well above the Canadian mean; students in Alberta and Ontario achieved results statistically similar to the Canadian mean; and students in all other provinces achieved scores statistically below the Canadian mean (Appendix B.1.2). Multiple comparisons of mathematics achievement among provinces can be found in Table 1.4.

Figure 1.3 Achievement scores in mathematics



Note: Darker shade denotes significant difference compared to Canada

Table 1.4 Comparison of Canadian and provincial results by mean score in mathematics

	Mean score	Standard error	Provinces whose mean score is not significantly different from the comparison province or from Canada
Quebec	537	3.5	
Ontario	512	3.9	**Canada**, Alberta
Canada	**510**	**1.8**	Ontario, Alberta
Alberta	507	4.0	Ontario, **Canada**, Nova Scotia, Prince Edward Island
Nova Scotia	498	0.5	Alberta, Prince Edward Island
Prince Edward Island	497	0.0	Nova Scotia, British Columbia, Alberta
New Brunswick	493	0.0	British Columbia
British Columbia	490	2.8	Saskatchewan, New Brunswick, Prince Edward Island
Saskatchewan	481	3.0	British Columbia, Manitoba, Newfoundland and Labrador
Newfoundland and Labrador	480	1.2	Saskatchewan, Manitoba
Manitoba	475	2.8	Saskatchewan, Newfoundland and Labrador

Note: Comparisons adjusted using the Bonferroni correction ($p < .005$; t-value = 2.81).

Results in mathematics by subdomain

This section reports Canadian results for the four subdomains of mathematics. As was the case for the overall mathematics score, the mean score for each subdomain was set at 500 in the baseline year in 2010. To facilitate direct comparisons over time, the Canadian mean has not been rescaled to 500 subsequent years.

When analysing results for the subdomains, it should be noted that students' level of mathematical literacy is dependent on skills inherent in various subdomains. A closer analysis of the results of each of the subdomains can help inform policy-level discussion, curricular emphasis, and/or teaching practice. The Canadian means for the four mathematics subdomains are shown in Figure 1.4 (Appendix B.1.3).

Figure 1.4 Achievement scores in mathematics subdomains

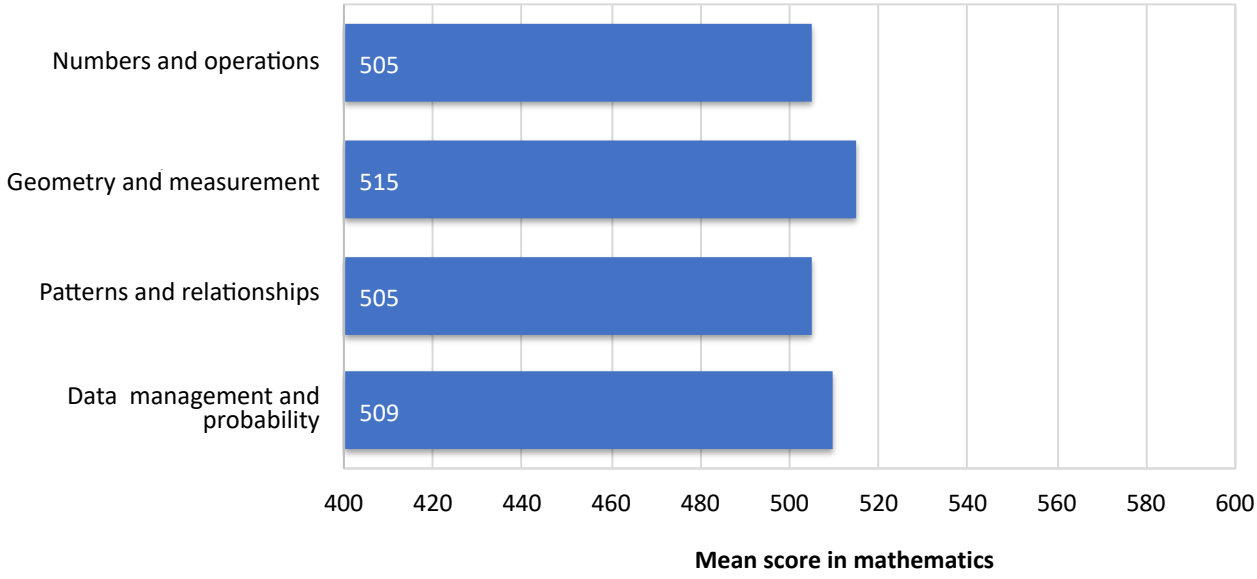


Table 1.5 presents a comparison of provincial results with the Canadian mean scores in the four mathematics subdomains. The achievement of Quebec students was above the Canadian mean for each of the four subdomains. Alberta and Ontario students scored at the Canadian mean in the *numbers and operations* and the *patterns and relationships* subdomains, while Ontario students also achieved at the Canadian mean in *geometry and measurement*. The results in the remaining provinces were below the Canadian mean in each subdomain (Appendix B.1.3).

Table 1.5 Comparison of provincial results to Canadian mean scores in mathematics subdomains

Above* the Canadian mean	At the Canadian mean	Below* the Canadian mean
Numbers and operations		
Quebec	Alberta, Ontario	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Geometry and measurement		
Quebec	Ontario	British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Patterns and relationships		
Quebec	Alberta, Ontario	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Data management and probability		
Quebec		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

* Denotes significant difference

Results in mathematics by language of the school system

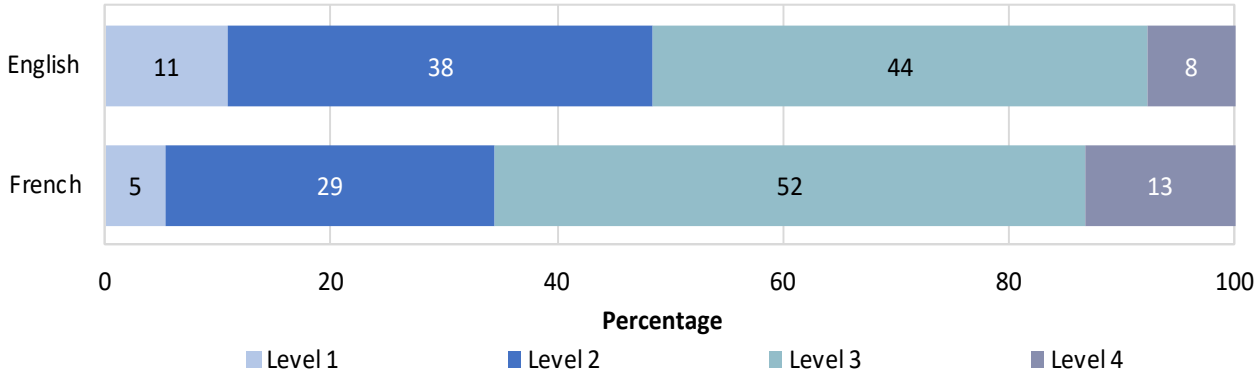
PCAP samples are representative of both majority and minority official language groups[12] in the eight provinces that have sufficient numbers for valid statistical comparisons. Only Prince Edward Island and Newfoundland and Labrador did not oversample separately by language in order to examine the difference between the performance of students in English- and French-language school systems; consequently, results for only English-language schools are reported for these two provinces.

Figure 1.5 shows performance levels in mathematics in Canada overall by language of the school system in which students were enrolled.[13] A higher proportion of students in francophone school systems achieved Level 2 or above compared to their anglophone peers (95 and 89 percent, respectively). In comparison to their English-language counterparts, students in French-language school systems had a greater proportion of students attaining the highest level of performance (Level 4) and a smaller proportion of students who did not meet the expected level of performance (i.e., scored at Level 1) (Appendix B.1.4a).

[12] With respect to the two official languages in Canada, English is the majority language outside of Quebec — across the country, 64 percent of Canadians report speaking English most often at home. In Quebec, French is the majority language — 79 percent of people in Quebec report speaking French most often (Statistics Canada, 2017a).

[13] Within anglophone school systems, although students in French immersion programs could, at the discretion of the school, complete the PCAP test in either English or French, their results are reported with the English-language cohort.

Figure 1.5 Percentage of students at each performance level in mathematics by language of the school system



When we compare Canadian and provincial results at Level 2 or higher for English-language schools, we see that a higher proportion of students in Quebec and Prince Edward Island performed at or above the expected level in mathematics compared to the pan-Canadian results, while students in British Columbia, Alberta, Ontario, and Nova Scotia achieved these levels at a rate similar to that of students in Canada as a whole. Students in anglophone school systems in all other provinces had a lower percentage of students at Level 2 or above compared to Canada overall. With respect to French-language schools, a higher proportion of students in Quebec performed at or above the expected level of achievement compared to the pan-Canadian results, while students in Alberta achieved Level 2 or above at a rate similar to that of students in Canada as a whole; all other provinces for which data are available had a percentage of students at these levels that was lower than the Canadian average (Table 1.6, Appendix B.1.4a).

Table 1.6 Comparison of Canadian and provincial results for percentage of students achieving at or above Level 2 in mathematics by language of the school system

Anglophone school systems		
Higher* percentage than Canada	**The same percentage as Canada**	**Lower* percentage than Canada**
Quebec, Prince Edward Island	British Columbia, Alberta, Ontario, Nova Scotia	Saskatchewan, Manitoba, New Brunswick, Newfoundland and Labrador
Francophone school systems		
Higher* percentage than Canada	**The same percentage as Canada**	**Lower* percentage than Canada**
Quebec	Alberta	British Columbia, Saskatchewan, Manitoba, Ontario, Nova Scotia, New Brunswick

* Denotes significant difference

Within provinces, no significant difference between the two language systems with respect to students at Level 2 or above was found in Alberta, Ontario, Quebec, and Nova Scotia. In British Columbia, Saskatchewan, Manitoba, and New Brunswick, a higher proportion of francophone students achieved these levels of performance compared to anglophone students (Table 1.7, Appendix B.1.4b).

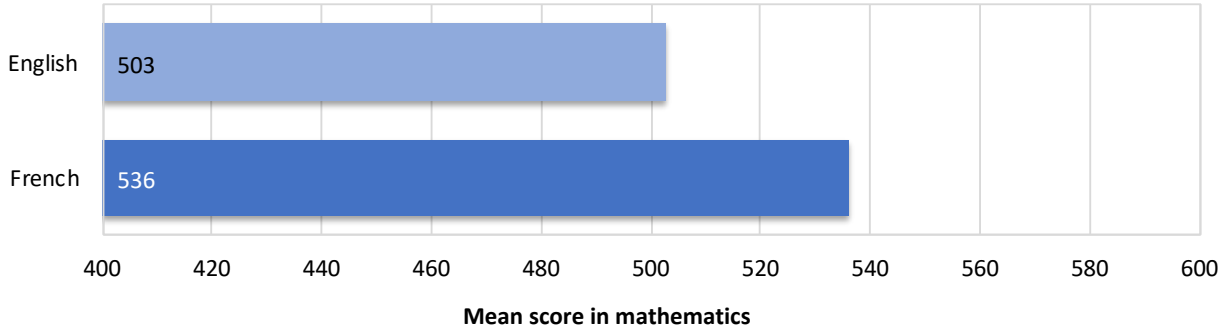
Table 1.7 Comparison of provincial results for percentage of students achieving at or above Level 2 in mathematics by language of the school system

Higher* percentage in anglophone schools	Higher* percentage in francophone schools	No significant difference between school systems
	British Columbia, Saskatchewan, Manitoba, New Brunswick	Alberta, Ontario, Quebec, Nova Scotia

* Denotes significant difference

When results are measured by achievements scores, students in French-language schools achieved higher average scores in mathematics than their peers in English-language schools in Canada overall (Figure 1.6, Appendix B.1.5). This is consistent with results reported for 15-year-olds in the 2018 PISA study (O'Grady, Deussing, et al., 2019) and for Canadian Grade 4 students in the TIMSS 2019 study (O'Grady, Monk, et al., 2021).

Figure 1.6 Achievement scores in mathematics by language of the school system



Note: Variation in shading denotes significant difference between the two groups

Table 1.8 presents a comparison of provincial results with the Canadian means for both English- and French-language school systems. In English-language systems, Ontario and Quebec students scored above the Canadian English mean, while the scores of students in Alberta and Nova Scotia were at the Canadian English mean. In French-language schools, Quebec students scored above the Canadian French mean. The mathematics achievement scores for students in both anglophone and francophone school systems in all remaining provinces for which reliable data are available were below the respective Canadian means (Appendix B.1.5).

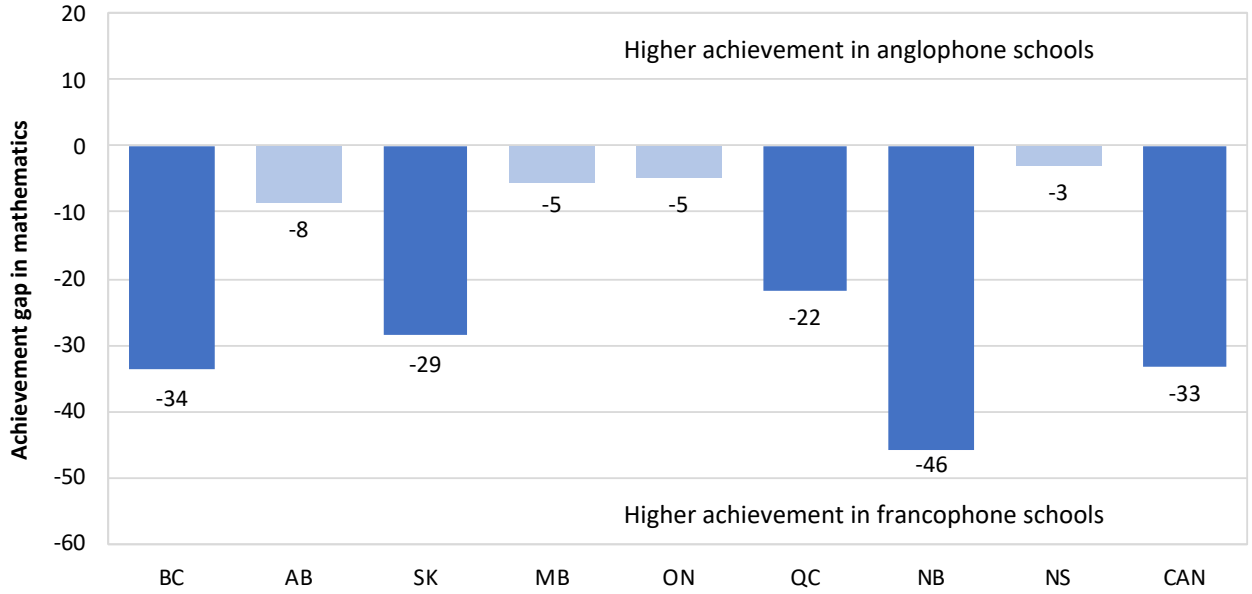
Table 1.8 Comparison of provincial results to Canadian mean scores in mathematics by language of the school system

Anglophone school systems		
Above* the Canadian English mean	**At the Canadian English mean**	**Below* the Canadian English mean**
Ontario, Quebec	Alberta, Nova Scotia	British Columbia, Saskatchewan, Manitoba, New Brunswick, Prince Edward Island, Newfoundland and Labrador
Francophone school systems		
Above* the Canadian French mean	**At the Canadian French mean**	**Below* the Canadian French mean**
Quebec		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia

* Denotes significant difference

Figure 1.7 shows differences in achievement scores in mathematics between anglophone and francophone schools; the bars represent the difference between the average scores of students in francophone systems and the average scores of those in anglophone systems. The achievement gap favours francophone schools in Canada overall. This is consistent with the trend found in PCAP 2016 (O'Grady, Fung, Servage, & Khan, 2018) as well as in TIMSS 2019 with Grade 4 students (O'Grady, Monk, et al., 2021) and in PISA 2018 with 15-years-olds (O'Grady, Deussing, et al., 2019). At the provincial level, francophone schools outperformed anglophone schools in British Columbia, Saskatchewan, Quebec, and New Brunswick, while equity was found between the two language systems in the remaining provinces (Appendix B.1.5). In light of these findings, it would be prudent for policy-makers to further investigate the provincial results, given that differences between the majority- and the minority-language school systems were as much as 46 points on the overall mathematics scale.

Figure 1.7 Achievement gap in mathematics by language of the school system



Note: Numbers are achievement scores in anglophone schools minus those in francophone schools. Darker shade denotes significant difference within Canada or within a province

Differences between anglophone and francophone school systems are evident in each of the mathematics subdomains. At the pan-Canadian level, students in francophone schools performed better than their counterparts in anglophone schools in all four subdomains. The largest gap between the two language systems was found in the *data management and probability* subdomain, while the smallest gap was found in the *patterns and relationships* subdomain (Table 1.9, Appendix B.1.6).

Table 1.9 Mean scores in Canada in mathematics subdomains by language of the school system

Mathematics subdomain	Anglophone school systems		Francophone school systems		Difference (English - French)
	Mean score	Standard error	Mean score	Standard error	
Numbers and operations	497	1.7	534	2.6	-37*
Geometry and measurement	507	1.5	544	2.3	-37*
Patterns and relationships	503	1.4	512	1.9	-9*
Data management and probability	501	0.9	541	1.9	-40*

* Denotes significant difference

At the provincial level, Quebec students performed above the Canadian mean in both language systems in all subdomains except *patterns and relationships*, where they performed at the Canadian mean. Only Alberta, Ontario, and Quebec students scored at or above the Canadian English mean in each of the four subdomains. Students in Ontario scored above the Canadian English mean in the *geometry and measurement* and *patterns and relationships* subdomains; students in Prince Edward Island scored above the Canadian English mean in the *data management and probability* subdomain. In francophone school systems, students scored at the Canadian French mean in British Columbia for *numbers and operations*; in Alberta, Ontario, Quebec, and Nova Scotia for *patterns and relationships*; and in New Brunswick for *data management and probability* (Table 1.10, Appendix B.1.6).

Table 1.10 Comparison of provincial results to Canadian mean scores in mathematics subdomains by language of the school system

Anglophone schools		
Above* the Canadian English mean	**At the Canadian English mean**	**Below* the Canadian English mean**
Numbers and operations		
Quebec	British Columbia, Alberta, Ontario, Nova Scotia, Prince Edward Island	Saskatchewan, Manitoba, New Brunswick, Newfoundland and Labrador
Geometry and measurement		
Ontario, Quebec	Alberta	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Patterns and relationships		
Ontario	Alberta, Quebec, Nova Scotia	British Columbia, Saskatchewan, Manitoba, New Brunswick, Prince Edward Island, Newfoundland and Labrador
Data management and probability		
Quebec, Prince Edward Island	British Columbia, Alberta, Ontario, Nova Scotia	Saskatchewan, Manitoba, New Brunswick, Newfoundland and Labrador
Francophone schools		
Above* the Canadian French mean	**At the Canadian French mean**	**Below* the Canadian French mean**
Numbers and operations		
Quebec	British Columbia	Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia
Geometry and measurement		
Quebec		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia
Patterns and relationships		
	Alberta, Ontario, Quebec, Nova Scotia	British Columbia, Saskatchewan, Manitoba, New Brunswick
Data management and probability		
Quebec	New Brunswick	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia

* Denotes significant difference

Within provinces, francophone students in all eight provinces with sufficient data for valid reporting achieved higher scores than their anglophone peers in two subdomains: *numbers and operations* and *data management and probability.* The results were quite variable within provinces for the other two subdomains (Table 1.11, Appendix B.1.6).

Table 1.11 Summary of differences in provincial achievement scores in mathematics subdomains by language of the school system

Anglophone schools performed significantly better than francophone schools	Francophone schools performed significantly better than anglophone schools	No significant difference between school systems
Numbers and operations		
	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia	
Geometry and measurement		
	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick	Nova Scotia
Patterns and relationships		
	British Columbia, Saskatchewan, New Brunswick	Alberta, Manitoba, Ontario, Quebec, Nova Scotia
Data management and probability		
	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia	

Results in mathematics by gender

Inclusive education is valued in Canadian provinces and territories and has led to the development of policies and resources to support inclusion. One aspect of inclusive education relates to gender identity. In the PCAP questionnaires for students, teachers, and school principals, the question about gender was expanded from the female/male choices of previous assessments to allow two additional choices, as shown in the box below.

How do you identify yourself?
(Please select one response.)
Female
Male
I identify myself in another way.
I prefer not to say.

In Canada overall, 96 percent of students identified themselves as female or male, with similar proportions (48 percent) identifying with each gender. A small proportion of students identified themselves in another way (2 percent) or preferred not to say (2 percent). Similar proportions are observed in all the provinces. The proportion of students who chose to identify themselves in another way or who preferred not to say ranged from 1 to 3 percent (Table 1.12, Appendix B.1.7). Due to the relatively small proportions of students in Canada who did not identify themselves as either female or

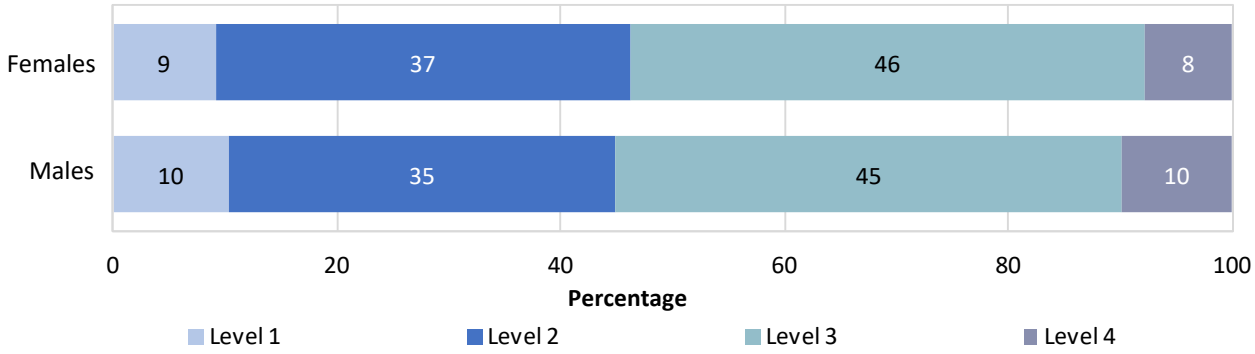
male, and in order to ensure pan-Canadian comparability, this report uses the two standardized gender categories from student administrative data to describe results for Canadian students by gender.

Table 1.12 Percentage of students by gender self-identification

	Female		Male		I identify myself in another way		I prefer not to say	
	%	SE	%	SE	%	SE	%	SE
British Columbia	48	0.7	48	0.7	2	0.2	2	0.3
Alberta	50	0.9	46	0.9	3	0.4	1	0.2
Saskatchewan	50	0.9	47	0.9	2	0.2	1	0.2
Manitoba	49	0.9	47	0.9	2	0.2	2	0.3
Ontario	49	1.0	49	1.0	1	0.3	2	0.3
Quebec	46	1.3	50	1.4	2	0.3	2	0.3
New Brunswick	49	0.0	49	0.0	1	0.0	1	0.0
Nova Scotia	46	0.1	50	0.1	2	0.0	2	0.0
Prince Edward Island	44	0.0	51	0.0	1	0.0	3	0.0
Newfoundland and Labrador	48	0.5	47	0.4	2	0.1	2	0.2
Canada	**48**	**0.5**	**48**	**0.5**	**2**	**0.1**	**2**	**0.1**

In 2019, at the pan-Canadian level, equal proportions of girls and boys wrote the PCAP assessment. The proportions at the provincial level can be found in Table 1.12 and Appendix B.1.7. As was the case in PCAP 2010 (CMEC, 2011), the previous administration in which mathematics was the major domain of the assessment, there was no achievement gap between the proportion of girls and boys achieving at or above Level 2 (91 and 90 percent, respectively). A slightly higher proportion of boys achieved at the highest level of performance compared to girls (10 percent and 8 percent, respectively) (Figure 1.8, Appendix B.1.8a).

Figure 1.8 Percentage of students at each performance level in mathematics by gender



Compared to the respective Canadian averages, a higher proportion of girls and boys in Quebec and girls in Prince Edward Island achieved at or above the expected level of mathematics proficiency (Level 2) for Grade 8/Secondary II students. Compared to the Canadian averages, a similar percentage of both girls and boys in British Columbia, Alberta, Ontario, and Nova Scotia, girls in Newfoundland and Labrador, and boys in Prince Edward Island achieved these levels. The proportion of boys and girls in Saskatchewan, Manitoba, and New Brunswick, and boys in Newfoundland and Labrador, achieving at Level 2 or above was lower than the respective Canadian averages (Table 1.13, Appendix B.1.8a).

Table 1.13 Comparison of Canadian and provincial results for percentage of students achieving at or above Level 2 in mathematics by gender

Girls		
Higher* percentage than Canada	**The same percentage as Canada**	**Lower* percentage than Canada**
Quebec, Prince Edward Island	British Columbia, Alberta, Ontario, Nova Scotia, Newfoundland and Labrador	Saskatchewan, Manitoba, New Brunswick
Boys		
Higher* percentage than Canada	**The same percentage as Canada**	**Lower* percentage than Canada**
Quebec	British Columbia, Alberta, Ontario, Nova Scotia, Prince Edward Island	Saskatchewan, Manitoba, New Brunswick, Newfoundland and Labrador

* Denotes significant difference

Within the provinces, a higher percentage of girls achieved at or above the expected level of proficiency in New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador, while gender equity was found in the remaining provinces (Table 1.14, Appendix B.1.8b).

Table 1.14 Summary of differences in provincial results for percentage of students achieving at or above Level 2 in mathematics by gender

Higher* percentage of girls	Higher* percentage of boys	No significant difference between girls and boys
New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec

* Denotes significant difference

In PCAP 2019, there was no gender difference in mathematics achievement at the pan-Canadian level when the results were examined by mean score (Figure 1.9, Appendix B.1.9). This finding is consistent with the results for Grade 8/Secondary II students in PCAP 2010 (CMEC, 2011), when mathematics was first the major domain. However, these results differ from the most recent international large-scale assessments in which Canada participated. Boys outperformed girls in mathematics at the Grade 4 level in TIMSS 2019 (O'Grady, Monk, et al., 2021), and at age 15 in PISA 2018 (O'Grady, Deussing, et al., 2019). Borgonovi, Choi, and Paccagnella (2018) have explored the evolution of gender gaps

related to numeracy from childhood to adulthood in 23 countries, including Canada. Using data from TIMSS, PISA, and the Programme for International Assessment of Adult Competencies (PIAAC), an international household survey of adults aged 16 to 65, they have suggested that the gender gap favouring men in numeracy is smallest at age 10 and largest at age 27. Results from PIAAC reveal that females report using their numeracy skills less frequently, both at home and at work, compared to males (Arora & Pawlowksi, 2017), and gender differences in the use of numeracy skills at work is found even within the same occupational groups (Lindemann, 2015).

Figure 1.9 Achievement scores in mathematics by gender

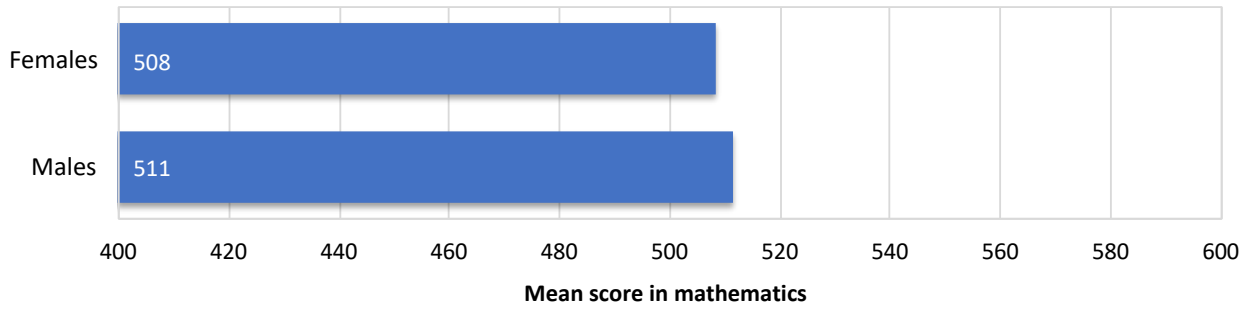


Table 1.15 presents a comparison of provincial and pan-Canadian achievement scores for girls and boys. Both female and male students in Quebec scored above the respective Canadian means in mathematics, while those in Alberta and Ontario achieved scores similar to the respective Canadian means. In all other provinces, both genders scored below the respective Canadian means (Appendix B.1.9).

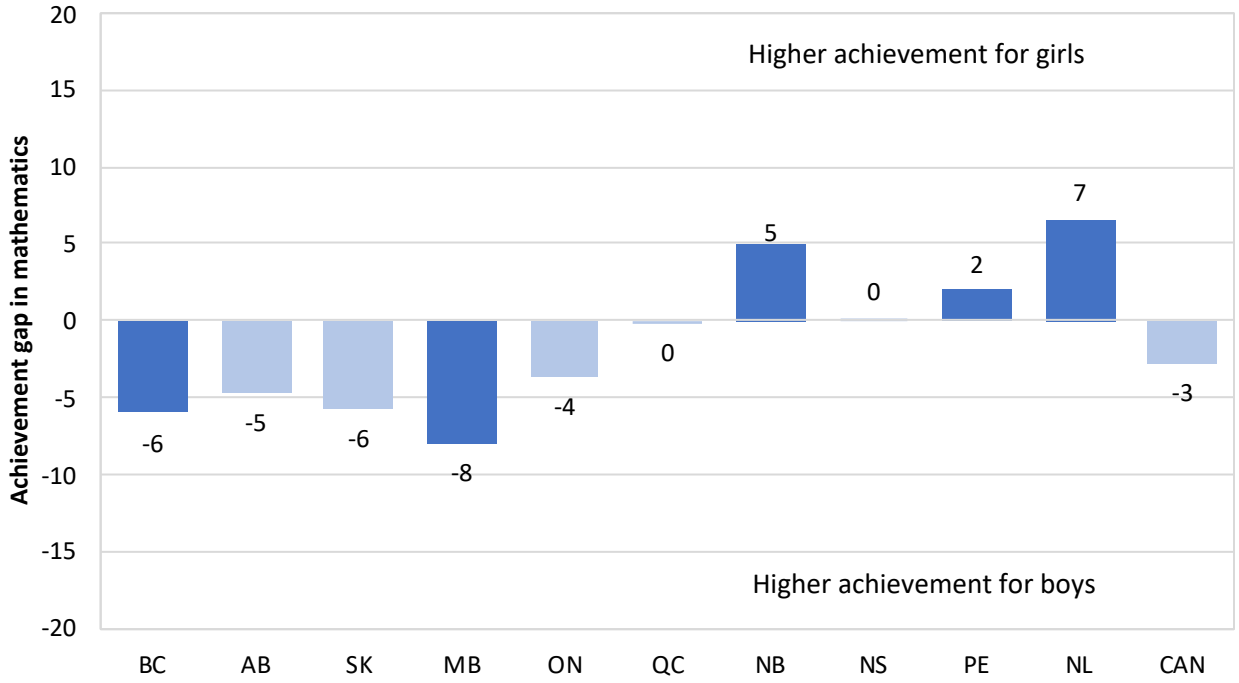
Table 1.15 Comparison of provincial results to Canadian mean scores in mathematics by gender

Girls		
Above* the Canadian mean for girls	**At the Canadian mean for girls**	**Below* the Canadian mean for girls**
Quebec	Alberta, Ontario	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Boys		
Above* the Canadian mean for boys	**At the Canadian mean for boys**	**Below* the Canadian mean for boys**
Quebec	Alberta, Ontario	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador

* Denotes significant difference

Significant differences in mean scores were found within some provinces: boys outperformed girls in British Columbia and Manitoba, while girls outperformed boys in New Brunswick, Prince Edward Island, and Newfoundland and Labrador. No gender gap was found for mathematics in the remaining provinces (Figure 1.10, Appendix B.1.9).

Figure 1.10 Achievement gap in mathematics by gender



Note: Numbers are achievement scores of girls minus those of boys. Darker shade denotes significant difference within a province

For Canada overall, there was no difference in performance between girls and boys in three of the mathematics subdomains; boys outperformed girls in the *numbers and operations* subdomain (Table 1.16, Appendix B.1.10).

Table 1.16 Mean scores in Canada in mathematics subdomains by gender

Mathematics subdomain	Girls		Boys		Difference (girls - boys)
	Mean score	Standard error	Mean score	Standard error	
Numbers and operations	504	1.7	507	1.6	-3*
Geometry and measurement	514	1.5	516	1.5	-1
Patterns and relationships	504	1.3	506	1.5	-2
Data management and probability	508	1.0	510	1.0	-2

* Denotes significant difference

Only in Quebec did girls achieve scores above the Canadian means in all four subdomains, with boys achieving above the Canadian mean in all the subdomains except *patterns and relationships*, for which scores were similar to the Canadian mean. Both boys and girls in Alberta and Ontario achieved scores similar to the respective Canadian means in *numbers and operations* and *patterns and relationships*, while Ontario boys and girls achieved at the respective Canadian means for *geometry and measurement* as well. Scores similar to the Canadian means were also achieved by girls in Nova Scotia for *patterns and relationships* and in New Brunswick for *data management and probability*. Boys in Alberta and Prince Edward Island achieved scores similar to the Canadian mean for *data management and probability* (Table 1.17, Appendix B.1.10).

Table 1.17 Comparison of provincial results to Canadian mean scores in mathematics subdomains by gender

Girls		
Above* the Canadian mean for girls	**At the Canadian mean for girls**	**Below* the Canadian mean for girls**
Numbers and operations		
Quebec	Alberta, Ontario	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Geometry and measurement		
Quebec	Ontario	British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Patterns and relationships		
Quebec	Alberta, Ontario, Nova Scotia	British Columbia, Saskatchewan, Manitoba, New Brunswick, Prince Edward Island, Newfoundland and Labrador
Data management and probability		
Quebec	New Brunswick	British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Boys		
Above* the Canadian mean for boys	**At the Canadian mean for boys**	**Below* the Canadian mean for boys**
Numbers and operations		
Quebec	Alberta, Ontario	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Geometry and measurement		
Quebec	Ontario	British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Patterns and relationships		
	Alberta, Ontario, Quebec	British Columbia, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador
Data management and probability		
Quebec	Alberta, Prince Edward Island	British Columbia, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, Newfoundland and Labrador

* Denotes significant difference

Within provinces, girls outperformed boys in Newfoundland and Labrador in two subdomains (*numbers and operations* and *geometry and measurement*) and in Nova Scotia in the *patterns and relationships* subdomain. Gender equity was found in all four subdomains in Quebec. The results were more variable for the remaining provinces (Table 1.18, Appendix B.10).

Table 1.18 Summary of provincial results in mathematics subdomains by gender

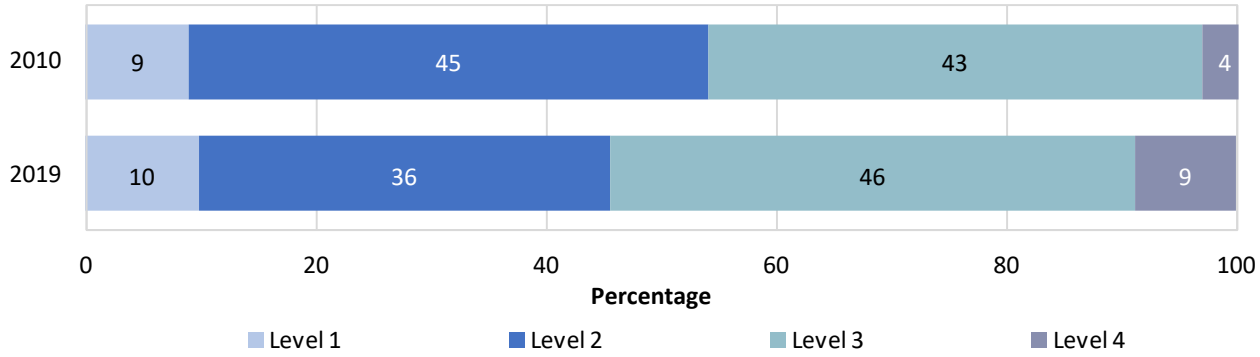
Girls performed significantly better than boys	Boys performed significantly better than girls	No significant difference between girls and boys
Numbers and operations		
New Brunswick, Newfoundland and Labrador	British Columbia, Ontario, Nova Scotia, Prince Edward Island	Alberta, Saskatchewan, Manitoba, Quebec
Geometry and measurement		
New Brunswick, Prince Edward Island, Newfoundland and Labrador	British Columbia, Saskatchewan, Manitoba, Nova Scotia	Alberta, Ontario, Quebec
Patterns and relationships		
New Brunswick, Nova Scotia	British Columbia, Alberta, Prince Edward Island	Saskatchewan, Manitoba, Ontario, Quebec, Newfoundland and Labrador
Data management and probability		
New Brunswick	Saskatchewan, Manitoba, Ontario, Nova Scotia, Prince Edward Island	British Columbia, Alberta, Quebec, Newfoundland and Labrador

Change in mathematics performance over time

PCAP 2019 constitutes the second time that mathematics has been administered as the major domain. Within PCAP, changes over time are typically determined by comparison to the year in which the subject was the major domain, as those assessments involve a larger number of items in that domain and broad coverage of its subdomains.

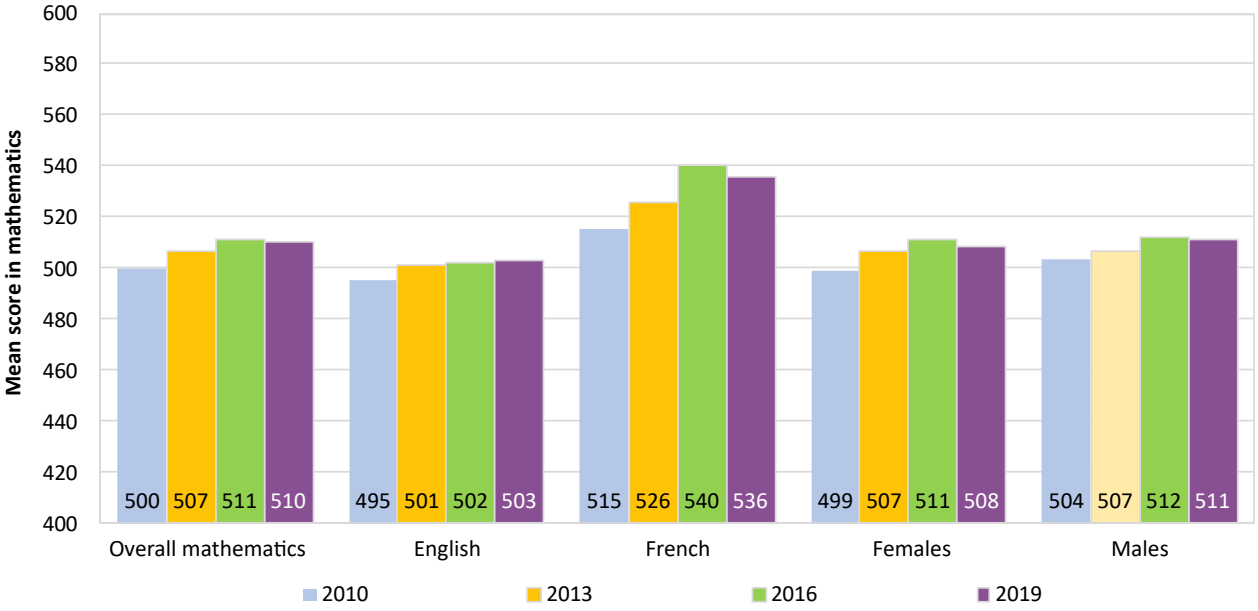
As shown in Figure 1.11, the proportion of students in Canada overall achieving at the level expected for Grade 8/Secondary II in mathematics in 2019 was stable compared to the baseline year of 2010, with 9 in 10 students reaching Level 2 or higher. The proportion of students reaching the highest level of performance (Level 4) increased in 2019 over the baseline year (Appendix B.1.1, CMEC, 2011).

Figure 1.11 Results in mathematics by performance level, 2010 and 2019



The standardized scale score for mathematics and its subdomains was set at 500 in the baseline year of 2010 and was not rescaled in successive administrations, thus allowing the analysis of changes in achievement scores over time. As shown in Figure 1.12 and Table 1.19, results improved at the pan-Canadian level for mathematics overall in 2019 compared to 2010 (Appendix B.1.11).

Figure 1.12 Canadian mean scores in mathematics, 2010–2019



Note: Darker shades denote significant difference compared to the baseline year 2010

A positive change in mathematics achievement is evident in 2019 compared to 2010 in both anglophone and francophone school systems in Canada overall. The change in achievement in French-language schools was 21 points, whereas it was 8 points in English-language schools. The achievement gap between students in anglophone and francophone school systems widened from 20 points in 2010 to 33 points in 2019 (Appendix B.1.12). A positive change in the achievement results for both girls and boys is also evident (Appendix B.1.13). As in 2010, there was no gender gap in mathematics in Canada overall in 2019 (CMEC, 2011, Appendix B.1.9).

Table 1.19 Summary of Canadian achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
Overall mathematics	500	510	10*
Anglophone schools	495	503	8*
Francophone schools	515	536	21*
Achievement gap (A - F)	-20	-33	
Girls	499	508	9*
Boys	504	511	7*
Achievement gap (G - B)	-5	-3	

* Denotes significant difference compared to baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Table 1.20 summarizes changes in provincial scores in mathematics in 2019 compared to the baseline year. Within provinces, the results for mathematics overall were stable in Saskatchewan and Ontario, while improvement was found in the remaining provinces (Appendix B.1.11). The results by language of the school system are variable: in both anglophone and francophone systems, most provinces showed positive change in 2019 compared to 2010, while the remainder showed no change (Appendix B.1.12). Compared to the baseline year, the results in 2019 were stable for both girls and boys in Saskatchewan, Manitoba, and Ontario, and for boys in British Columbia, Alberta, and Newfoundland and Labrador. A positive change was observed for both boys and girls in the other provinces (Appendix B.1.13).

Table 1.20 Summary of changes in provincial achievement scores in mathematics, 2010–2019

Positive change over time*	Negative change over time*	No change over time
Mathematics overall		
British Columbia, Alberta, Manitoba, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador		Saskatchewan, Ontario
Anglophone school systems		
British Columbia, Alberta, Manitoba, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador		Saskatchewan, Ontario
Francophone school systems		
British Columbia, Alberta, Saskatchewan, Quebec, New Brunswick		Manitoba, Ontario, Nova Scotia
Girls		
British Columbia, Alberta, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador		Saskatchewan, Manitoba, Ontario
Boys		
Quebec, New Brunswick, Nova Scotia, Prince Edward Island		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Newfoundland and Labrador

* Denotes significant difference in 2019 compared to baseline year 2010

Because 2019 marks the second time that mathematics was the primary domain of PCAP, changes over time for the subdomains of mathematics can be reported. As shown in Table 1.21, the greatest change was in the *geometry and measurement* subdomain, with achievement scores at the pan-Canadian level 15 points higher in 2019 than in 2010 (Appendix B.1.14).

Table 1.21 Canadian achievement scores in mathematics subdomains, 2010 and 2019

	2010	2019	Change over time
Numbers and operations	500	505	5*
Geometry and measurement	500	515	15*
Patterns and relationships	500	505	5*
Data management and probability	500	509	9*

* Denotes significant difference

Table 1.22 shows the changes in achievement scores over time at the provincial level for the mathematics subdomains. A positive change between the two assessment years is evident in most provinces in each of the subdomains except for *numbers and operations*, in which half of the provinces had stable results (Appendix B.1.14).

Table 1.22 Changes in provincial achievement scores in mathematics subdomains, 2010–2019

	Numbers and operations	Geometry and measurement	Patterns and relationships	Data management and probability
British Columbia	4	19*	6*	10*
Alberta	-1	20*	14*	8*
Saskatchewan	-3	22*	19*	17*
Manitoba	5	23*	11*	16*
Ontario	4	6	-4	0
Quebec	15*	27*	9*	29*
New Brunswick	10*	27*	19*	18*
Nova Scotia	20*	22*	26*	13*
Prince Edward Island	23*	47*	36*	36*
Newfoundland and Labrador	7*	23*	13*	0

* Denotes significant difference (2019 - 2010)

Tables 1.23 and 1.24 show differences between achievement scores in 2019 and those in 2010 at the provincial and pan-Canadian level for the mathematics subdomains by language of the school system and by gender. With the exception of *numbers and operations*, changes were generally positive in each of the subdomains for anglophone and francophone students and for girls and boys (Appendix B.1.15, B.1.16).

Table 1.23 Changes in Canadian and provincial achievement scores in mathematics subdomains, 2010–2019, by language of the school system

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	English	French	English	French	English	French	English	French
British Columbia	4	19*	18*	34*	6*	6*	9*	31*
Alberta	-1	10*	20*	33*	14*	5	8	23*
Saskatchewan	-4	-4	22*	27*	19*	24*	17*	47*
Manitoba	5	12*	23*	20*	11*	4	16*	41*
Ontario	3	10*	6	14*	-4	-5	-2	25*
Quebec	-2	17*	18*	28*	11*	9*	8	32*
New Brunswick	6*	18*	26*	30*	27*	0	14*	28*
Nova Scotia	21*	10*	23*	-9	26*	10*	13*	14*
Prince Edward Island	22*	--	46*	--	36*	--	35*	--
Newfoundland and Labrador	7*	--	23*	--	13*	--	0	--
Canada	**3**	**15***	**13***	**27***	**5***	**8***	**4***	**31***

* Denotes significant difference (2019 - 2010)

Table 1.24 Changes in Canadian and provincial achievement scores in mathematics subdomains, 2010–2019, by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
British Columbia	9*	-3	22*	12*	5	5	14*	3
Alberta	7	-8	20*	18*	12*	15*	4	10*
Saskatchewan	-2	-8*	19*	23*	14*	20*	12*	21*
Manitoba	7	1	17*	26*	5	14*	10*	20*
Ontario	2	3	4	6	-9*	-2	-7	4
Quebec	22*	5	29*	22*	8*	6	28*	26*
New Brunswick	8*	10*	24*	27*	10*	26*	12*	22*
Nova Scotia	18*	20*	18*	24*	21*	28*	2	21*
Prince Edward Island	33*	14*	57*	38*	35*	34*	38*	35*
Newfoundland and Labrador	11*	3	26*	19*	7	16*	-9	5
Canada	**8***	**0**	**15***	**13***	**2**	**5***	**6***	**10***

* Denotes significant difference (2019 - 2010)

Summary

This chapter has presented the performance of Canadian students in the PCAP 2019 mathematics assessment. The assessment focused on curricular outcomes that are common to provinces and territories at the Grade 8/Secondary II level. In 2019, 90 percent of students in Canada overall reached or exceeded the expected level of performance (Level 2) for this grade level, while close to 10 percent reached the highest level of performance (Level 4). The proportion of students reaching the expected level of performance in 2019 was similar to that in the baseline year of 2010; however, a higher proportion of students attained Level 4 in 2019. With respect to achievement scores, the Canadian average for mathematics overall was 510, with provincial scores ranging from a low of 475 to a high of 537. The achievement score in Canada overall was 10 points higher in 2019 than in 2010. Eight provinces also showed improvement in mean scores in 2019 compared to the baseline year, while the results for Saskatchewan and Ontario were stable. Given that PCAP 2019 marks the second time that mathematics has been the primary domain, changes over time for the subdomains of mathematics were reported. Although the results show generally positive changes, there was much variability among the provinces.

This chapter has presented results by language of the school system for eight provinces. A greater proportion of francophone students reached or exceeded the expected level of performance compared to their anglophone counterparts in Canada overall, as well as in British Columbia, Saskatchewan, Manitoba, and New Brunswick. In the remaining provinces, similar proportions of students from both language systems reached or exceeded this level of achievement. When results are examined by mean score, students in francophone schools outperformed their peers in anglophone schools in Canada and in British Columbia, Saskatchewan, Quebec, and New Brunswick. At the pan-Canadian level, there was a positive change in mathematics achievement in 2019 compared to the baseline year of 2010; however, this change was greater in francophone school systems (21 points) than in anglophone school systems (8 points). In most provinces, a positive change in mathematics achievement was found in both anglophone and francophone school systems.

There was no gender gap in mathematics at the Grade 8/Secondary II level in Canada overall; this is consistent with the results from PCAP 2010. In terms of achievement scores, boys outperformed girls in British Columbia and Manitoba, while girls outperformed boys in New Brunswick, Prince Edward Island, and Newfoundland and Labrador. No gender gap was found in the remaining provinces. Compared to the baseline year of 2010, mathematics scores in 2019 improved for both girls and boys in Quebec, New Brunswick, Nova Scotia, and Prince Edward Island, as well as for girls in British Columbia, Alberta, and Newfoundland and Labrador. Mathematics achievement was stable in the remaining provinces.

2 READING ASSESSMENT

Reading was a minor domain in PCAP 2019, and so there were fewer assessment items compared to the major domain of mathematics. As a result, PCAP 2019 allows for an update only on overall performance in reading and not on its subdomains. This chapter reports on the performance of Grade 8/Secondary II students in reading overall, as well as by language of the school system and gender, and on changes in reading performance over time.

Defining reading

In Canada, all curricula seek to develop student literacy in the broadest sense of the word, including the ability to understand, critically analyze, and create a variety of forms of communication (i.e., oral, written, visual, digital, and multimedia). These curricula recognize that reading is a cross-curricular skill necessary in all school subjects, as well as a life skill with applications beyond the classroom. The conceptual framework for the reading component of PCAP was shaped by careful attention to Canadian curriculum guidelines for those classes that serve Grade 8/Secondary II students, and it reflects provincial and territorial language arts curricula, of which literacy is an integral component.

The reading framework for PCAP 2019 has not been altered from that used to define reading performance in the 2016 assessment, in which reading was the major domain for the second time. This continuity enables comparisons over time between the cohorts.

While earlier PCAP assessments focused solely on the process of reading, PCAP 2016 and 2019 combined two terms: reading and literacy. Adding the term "literacy" broadens the meaning of the ability to read to include skills that will be relevant throughout life for attaining individual and societal goals (Mullis, Martin, Kennedy, Trong, & Sainsbury, 2009; Organisation for Economic Co-operation and Development, 2013; Smith, Mikulecky, Kibby, & Dreher, 2000).

In PCAP, "reading literacy" is defined as the ability to construct meaning from texts through understanding, interpreting, and responding personally and critically to text content in order to make sense of the world and participate in society. It also includes metacognitive competencies that allow for awareness and application of different reading strategies appropriate to a given context.

The reader

In order to make meaning of a text, readers must make a connection between what is in the text and what they know or bring to the text. Readers' personal experiences, real or vicarious, allow greater or lesser access to the content and forms of what they read. As readers, students have varying degrees of knowledge of and about language and texts, facility with language strategies, and knowledge of the way language works in print and in the digital world.

The text

Definitions of "text" have evolved over time in parallel with changes in technological culture and society. In the modern world, the notion of "text" has expanded and is now used to describe *any language event* (see, for instance, the *Foundation for the Atlantic Canada English Language Arts Curriculum, K–12*[14]). In this context, communication that uses words, graphics, sounds, and/or images in print, oral, visual, or digital form to present information and ideas can be considered a text. This expanded concept of "text" takes into account the diverse range of language forms with which people interact and from which they construct meaning.

Students must engage with a variety of print and digital texts, such as those generally considered fiction, non-fiction, or a combination of the two. Examples could include short stories, poetry, novels, plays, video clips, pamphlets, labels, instructions, magazine articles, editorials, websites, or online exchanges. Within that range, texts have different degrees of complexity in terms of structure, vocabulary, syntax, organization, ideas, rhetorical devices, and subject matter. The form or type of a particular text plays a part in determining students' success in accessing it.

The reader's purpose

The purpose of a reading activity affects the reader's construction of meaning. Students read texts for a variety of purposes, ranging from the pleasure they get from the text's content and style to the practical information they acquire or point of view to which they are exposed when engaging with it. The student's purpose for reading a particular text also influences the strategies and stance they take toward the text. Texts of any type may be read for many different purposes. Although particular forms or types of text are often considered aesthetic or pragmatic in intention, the reader's purpose may differ from that intent. For example, social studies students may be required to read a novel or access a website to develop knowledge of a particular culture, era, or event.

The context

Context is important in any reading act because it affects the stance the reader takes toward the text. "Context" refers specifically to the physical, emotional, social, and institutional environment at the time of reading. It includes where, when, and why the student is reading. One of the challenges of large-scale assessment is that it is inescapably a testing situation, which, in turn, influences the state of mind the student brings to the reading act. Pre-reading prompts in the PCAP reading assessment offers some sense of context beyond the testing situation.

"Context" also refers more broadly to the worldview of the reader. Any meaning constructed by a reader is a reflection of the social and cultural environment in which the reader lives and reads (Bruffée, 1986; Emerson, 1983; Gee, 1996; Heath, 1983; UNESCO, 2011). Peers, family, and community values affect the stance readers take as they engage with text. This interrelationship is described for print media by Johnston and Costello (2005):

[14] Available at **https://www.gov.nl.ca/education/files/k12_curriculum_documents_english_english.pdf**

> Although we often think of literacy as a set of all-purpose skills and strategies to be learned, it is more complex, more local, more personal, and more social than that. Becoming literate involves developing identities, relationships, dispositions, and values as much as acquiring strategies for working with print. (p. 256)

The interaction

Contemporary concepts of reading recognize that the process of reading involves the *interaction* of reader, text, purpose, and context before, during, and after reading. The interaction is critical for print media (Binkley & Linnakylä, 1997; Bruner, 1990) and even more important for digital media, where the sociocultural contexts are more complex (Legros & Crinon, 2002). There is also recognition that reading does not involve a finite set of discrete skills, knowledge, and concepts. Rather, it is a process of continuous growth in which readers constantly expand the boundaries of their understanding and interpretation of and response to texts. In doing so, they refine the fluency of their integrated reading processes (Paris, 2005).

The subdomains of reading

In light of the interactive process involving reader, text, purpose, and context, the PCAP assessment of reading literacy considers both readers' engagement with text and their response to it. Curricula across Canada identify the following major aspects, or subdomains, of reading literacy:

- understanding texts
- interpreting texts
- responding personally and critically to texts

These three subdomains are parallel to Gray's (1960) distinction between "reading the lines," "reading between the lines," and "reading beyond the lines" — terms commonly used by Canadian teachers. A more detailed description of the reading domain and subdomains is provided in Chapter 4 of *PCAP 2019: Assessment Framework* (CMEC, 2020).

Results in reading

The PCAP 2019 mean scores in reading are reported on the PCAP scale, which has a range of 0 to 1000. In PCAP 2007, when reading was the major domain for the first time, the Canadian mean was set at 500, with a standard deviation of 100. PCAP assessed 13-year-olds in 2007, but, in order to minimize the disruption to classrooms and schools, PCAP 2010 switched to sampling Grade 8/Secondary II classes. To accommodate this change in the target population and to enhance the validity of comparisons over time, analysts isolated the data on Grade 8/Secondary II students from the 2007 sample, so that only these data would be used for comparisons.[15] The baseline for reading was

[15] More detailed information on the process used to ensure a valid comparison can be found in *PCAP 2013: Technical Report* (O'Grady & Houme, 2015b).

changed to PCAP 2010, and the scale was reset to 500 in that year. Within PCAP, changes over time are typically determined by comparison to the year in which the subject was first the major domain, as those assessments involve a larger number of items and broad coverage of the subdomains. Because reading was a minor domain in the adjusted baseline year of 2010, it is necessary to exercise caution when interpreting results for reading trends over time.

To facilitate direct comparisons over time, the Canadian mean of 500, established in the adjusted baseline year of 2010, has not been rescaled to 500 in subsequent years. Thus, in PCAP 2019, the Canadian mean for reading is 505, with a Standard error of 1.4. The box on statistical comparison in Chapter 1 provides additional information on interpreting results.

Results in reading by average score

Figure 2.1 provides the mean scores in the PCAP 2019 reading assessment of Grade 8/Secondary II students for all the provinces and indicates how they compare to the mean score for Canada overall. Students in Ontario achieved results higher than the mean score for Canada overall. Students in British Columbia, Alberta, and Prince Edward Island achieved results that are statistically similar to the Canadian mean, while students in Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, and Newfoundland and Labrador achieved results below the Canadian mean (Appendix B.2.1). Multiple comparisons of reading achievement among provinces can be found in Table 2.1.

Figure 2.1 Achievement scores in reading

Note: Darker shade denotes significant difference compared to Canada

Table 2.1 Comparison of Canadian and provincial results by mean score in reading

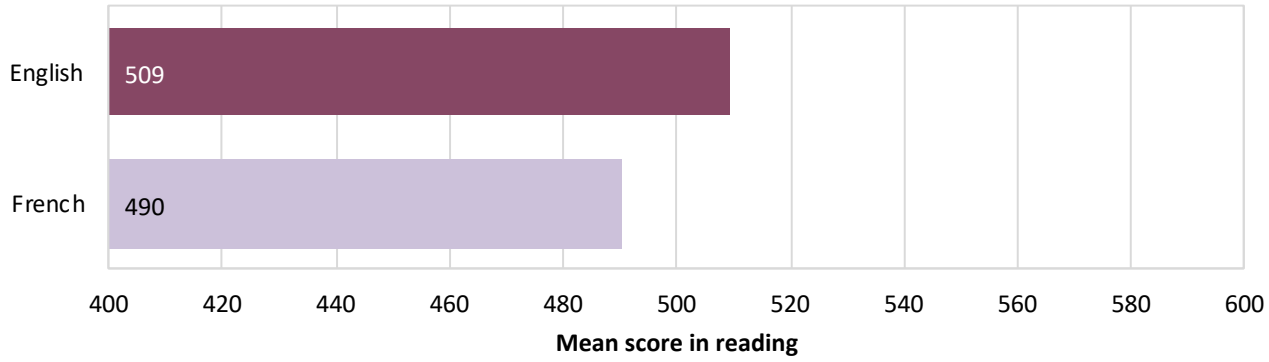
	Mean score	Standard error	Provinces whose mean score is not significantly different from the comparison province or from Canada
Ontario	517	3.0	Alberta
Alberta	506	3.3	Ontario, **Canada**, Prince Edward Island, Nova Scotia, Newfoundland and Labrador, British Columbia, Saskatchewan, Quebec
Canada	**505**	**1.4**	Alberta, Prince Edward Island, British Columbia
Prince Edward Island	505	0.0	Alberta, **Canada**, British Columbia
Nova Scotia	500	0.4	Alberta, Newfoundland and Labrador, British Columbia, Saskatchewan, Quebec
Newfoundland and Labrador	500	1.2	Alberta, Nova Scotia, British Columbia, Saskatchewan, Quebec
British Columbia	499	2.3	Alberta, **Canada**, Prince Edward Island, Nova Scotia, Newfoundland and Labrador, Saskatchewan, Quebec
Saskatchewan	495	2.6	Alberta, Nova Scotia, Newfoundland and Labrador, British Columbia, Quebec
Quebec	494	2.9	Alberta, Nova Scotia, Newfoundland and Labrador, British Columbia, Saskatchewan
New Brunswick	486	0.0	Manitoba
Manitoba	481	2.7	New Brunswick

Note: Comparisons adjusted using the Bonferroni correction ($p < .005$; t-value = 2.81)

Results in reading by language of the school system

In Canada overall, students in English-language schools scored 19 points higher than their peers in French-language schools in reading (Figure 2.2, Appendix B.2.2). This result is consistent with the results reported for Grade 8/Secondary II students in PCAP 2016 (O'Grady, Fung, et al., 2018) and for Canadian 15-year-olds in the 2018 PISA assessment (O'Grady, Deussing, et al., 2019). However, this finding differs from the results reported for the 2016 PIRLS study, which found no significant difference between the two language systems in reading at the Grade 4 level (Brochu, O'Grady, Scerbina, & Tao, 2018).

Figure 2.2 Achievement scores in reading by language of the school system



Note: Variation in shading denotes significant difference between the two groups

Provincially, reading scores across the provinces in the minority-language systems (anglophone school systems in Quebec; francophone school systems in the other provinces) ranged from 449 in Nova Scotia to 493 in Quebec. In the majority-language systems, scores ranged from 482 in Manitoba to 519 in Ontario (Appendix B.2.2).

Table 2.2 presents a comparison of provincial achievement scores in reading with the Canadian means for both English- and French-language school systems. In English-language systems, Ontario students scored above the Canadian English average, while the scores of students in Alberta and Prince Edward Island were at the Canadian English average. In French-language schools, Quebec students scored above the Canadian French average. The reading achievement scores for students in all remaining provinces for which reliable data are available were below the respective Canadian averages for anglophone and francophone systems (Appendix B.2.2).

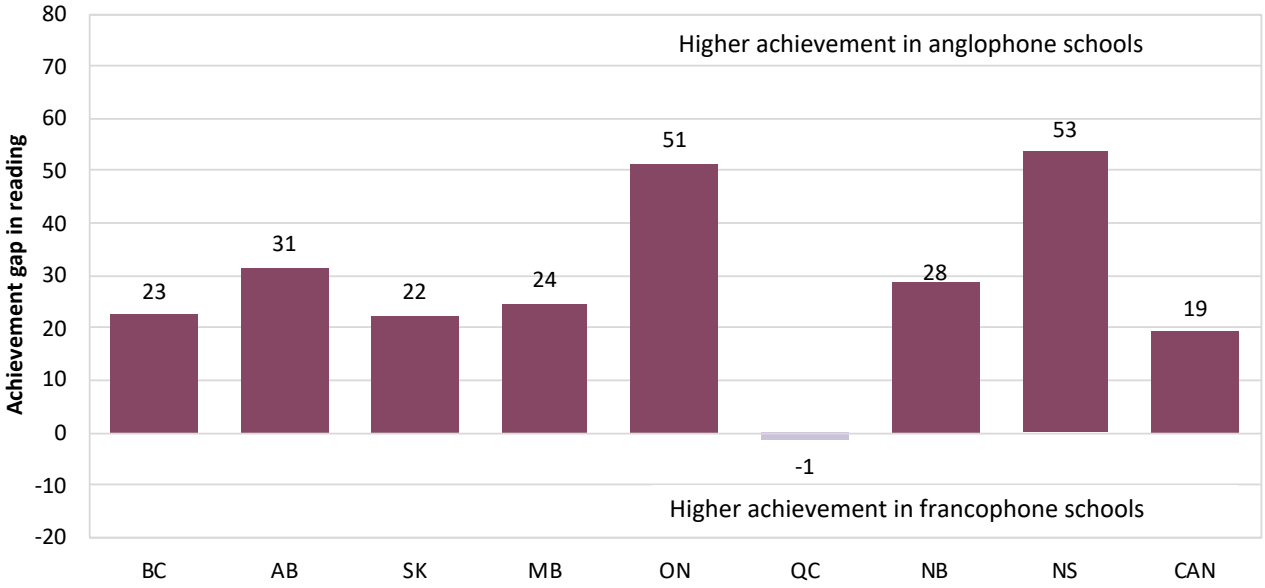
Table 2.2 Comparison of provincial results to Canadian mean scores in reading by language of the school system

Anglophone school systems		
Above* the Canadian English mean	**At the Canadian English mean**	**Below* the Canadian English mean**
Ontario	Alberta, Prince Edward Island	British Columbia, Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, Newfoundland and Labrador
Francophone school systems		
Above* the Canadian French mean	**At the Canadian French mean**	**Below* the Canadian French mean**
Quebec		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia

* Denotes significant difference

Equity in reading scores between the two language systems was achieved only in Quebec. The data reveal significant differences in achievement between anglophone and francophone school systems within the remaining seven provinces for which data are available: students in English-language systems performed better than their counterparts in French-language systems, with differences ranging from 22 points is Saskatchewan to 53 points in Nova Scotia (Figure 2.3, Appendix 2.2).

Figure 2.3 Achievement gap in reading by language of the school system

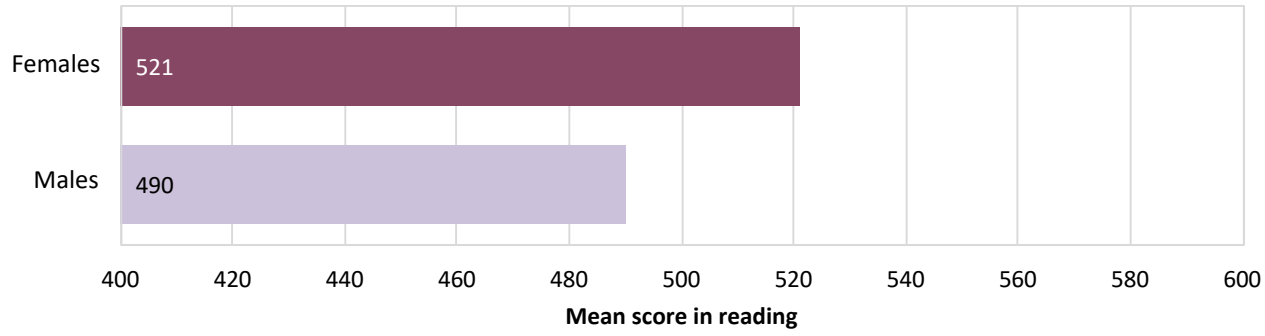


Note: Numbers are achievement scores in anglophone systems minus those in francophone systems. Darker shade denotes significant difference within Canada or within a province

Results in reading by gender

As was the case in PCAP 2016, girls performed significantly better than boys on the reading assessment in PCAP 2019 in Canada overall and in all provinces. On average across Canada, girls outperformed boys in reading by 31 points (Figure 2.4, Appendix B.2.3).

Figure 2.4 Achievement scores in reading by gender



Note: Variation in shading denotes significant difference between the two groups

Table 2.3 presents a comparison of provincial results with the Canadian means for girls and boys in reading. The achievement of girls and boys in Ontario was higher than the respective Canadian mean scores. Results similar to the Canadian means were found for both girls and boys in British Columbia, Alberta, and Prince Edward Island, and for girls in Newfoundland and Labrador; all other provinces were below the respective Canadian mean scores.

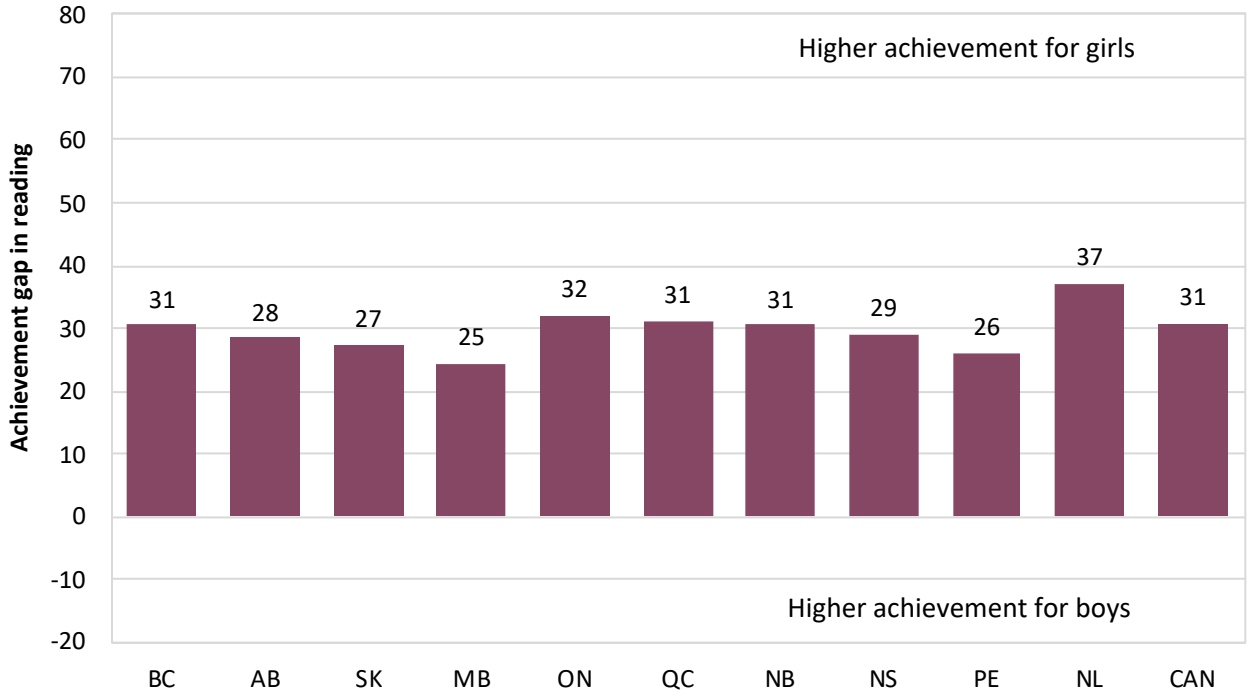
Table 2.3 Comparison of provincial results to Canadian mean scores in reading by gender

Girls		
Above* the Canadian mean for girls	**At the Canadian mean for girls**	**Below* the Canadian mean for girls**
Ontario	British Columbia, Alberta, Prince Edward Island, Newfoundland and Labrador	Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia
Boys		
Above* the Canadian mean for boys	**At the Canadian mean for boys**	**Below* the Canadian mean for boys**
Ontario	British Columbia, Alberta, Prince Edward Island	Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, Newfoundland and Labrador

* Denotes significant difference

At the provincial level, the gender gap favouring girls is evident in all provinces, ranging from 25 points in Manitoba to 37 points in Newfoundland and Labrador (Figure 2.5, Appendix B.2.3).

Figure 2.5 Achievement gap in reading by gender

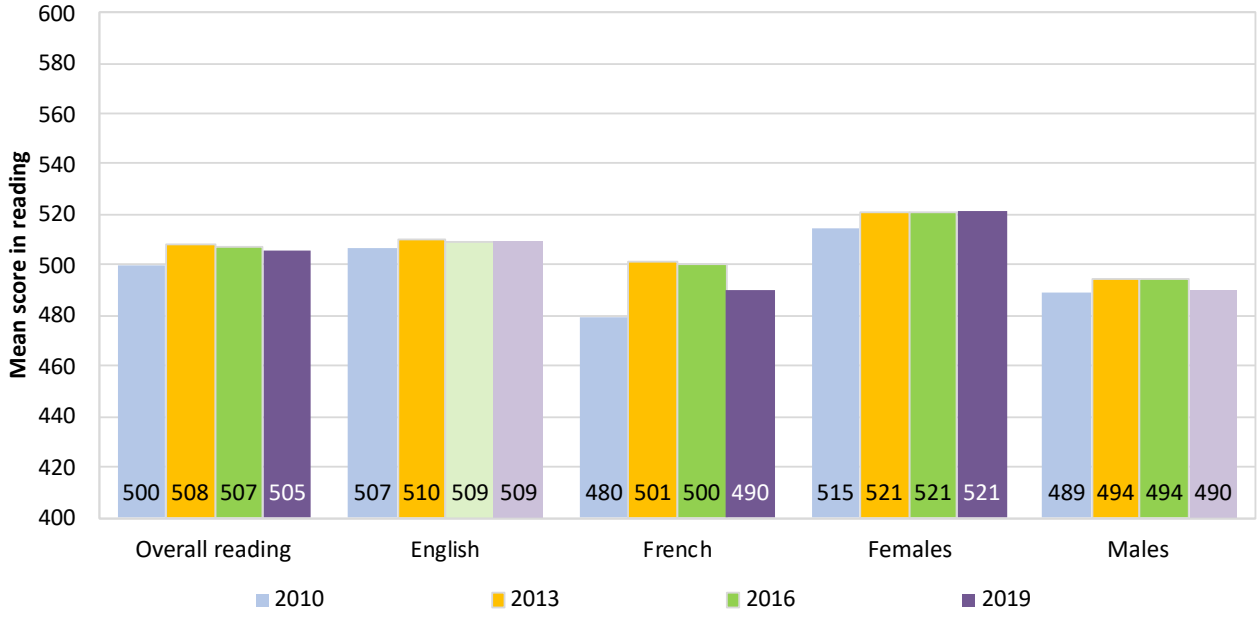


Note: Numbers are achievement scores of girls minus those of boys. Differences within Canada and all provinces are significant.

Change in reading performance over time

Although reading was the major domain in PCAP 2007, changes in sampling and scales, discussed above, render comparisons between that year and the 2019 assessment problematic, and so PCAP 2010 is used as the basis for comparison with PCAP 2019. Changes over time in reading at the pan-Canadian level are shown in Figure 2.6 and in Table 2.4.

Figure 2.6 Canadian mean scores in reading, 2010–2019



Note: Darker shades denote significant difference compared to adjusted baseline year 2010

For overall reading in Canada, there was a five-point gain in achievement in 2019 over 2010. Provincially, a positive change in reading overall was found in Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador; results in the remaining provinces were stable (Table 2.5, Appendix B.2.4).

When reading results were examined by the language of the school system for Canada overall, a positive change was found in francophone schools in 2019 compared to 2010, while results were stable in anglophone schools. While a considerable achievement gap favouring anglophone schools persisted between the two systems over time, the gap narrowed from 27 points in 2010 to 19 points in 2019 (Table 2.4).

As shown in Table 2.5, in anglophone school systems, 2019 saw a positive change in reading achievement compared to 2010 in four provinces (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador), while the remaining provinces had stable results. In francophone schools, an improvement in reading achievement was found in Quebec, while achievement declined in Alberta, Manitoba, Ontario, and Nova Scotia. Results were stable in the remaining two provinces for which data are available (Appendix B.2.5).

With respect to gender, girls' results for 2019 showed positive change over 2010 in Canada overall, while results were stable for boys. The gender gap favoured girls in both 2010 and 2019 and has become wider over time (Table 2.4). Provincially, positive changes were achieved by both girls and boys in Prince Edward Island and Newfoundland and Labrador, by girls in Quebec and Nova Scotia, and by boys in New Brunswick. The results for girls and boys in the remaining provinces were stable (Table 2.5, Appendix B.2.6).

Table 2.4 Summary of Canadian achievement scores in reading, 2010 and 2019

	2010	2019	Change over time
Overall reading	500	505	5*
Anglophone schools	507	509	3
Francophone schools	480	490	11*
Achievement gap (A - F)	27	19	
Girls	515	521	6*
Boys	489	490	1
Achievement gap (G - B)	26	31	

* Denotes significant difference compared to adjusted baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Table 2.5 Summary of changes in provincial achievement scores in reading, 2010–2019

Positive change over time*	Negative change over time*	No change over time
Reading overall		
Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario
Anglophone school systems		
New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec
Francophone school systems		
Quebec	Alberta, Manitoba, Ontario, Nova Scotia	British Columbia, Saskatchewan, New Brunswick
Girls		
Quebec, Nova Scotia, Prince Edward Island, Newfoundland and Labrador		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick
Boys		
New Brunswick, Prince Edward Island, Newfoundland and Labrador		British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Nova Scotia

* Denotes significant difference in 2019 compared to adjusted baseline year 2010

Summary

This chapter summarizes the performance of Canadian students on the PCAP reading assessment. Reading is a minor domain in PCAP 2019, so the reading assessment comprised a smaller number of items than the mathematics assessment. Consequently, in contrast to PCAP 2007 and 2016, when reading was the primary focus of the assessment, this chapter provides results on overall performance in reading and not on subdomains.

For reading overall, Ontario students had the highest achievement, with average scores significantly above the Canadian mean. Students in British Columbia, Alberta, and Prince Edward Island achieved results that are statistically similar to the Canadian mean, while students in Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, and Newfoundland and Labrador achieved results below the Canadian mean score.

Compared to the adjusted baseline year of 2010, reading achievement in PCAP 2019 increased by 5 points in Canada overall. Provincially, a positive change was found in Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Reading results were stable in the remaining provinces.

In PCAP 2019, English-language school systems significantly outperformed French-language school systems in Canada in reading, as was also the case in the adjusted baseline year of 2010. For English schools, the highest achievement in reading was in Ontario, and for French schools, the highest results were in Quebec; in both cases, scores were above the respective Canadian means.

Significant differences by language of the school system were found in seven of the eight provinces for which data are available. Compared to French-language schools, higher reading achievement was found in English-language schools in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, and Nova Scotia. With respect to changes over time, the greatest improvement in 2019 compared to 2010 was found in English-language schools in Prince Edward Island (25 points), while the greatest negative changes were found in francophone schools in Alberta and Nova Scotia (15 and 25 points, respectively).

A gender difference in reading was evident in PCAP 2019 in Canada and in all provinces; this is consistent with the results from the adjusted baseline year of 2010. This gender gap is also reflected in the international studies in which Canada participates. It is worth noting that this persistent gap in achievement may be influencing the tendency to read later in life. Results from PIAAC suggest that men read less frequently than women, and, even among adults who read most frequently (i.e., daily or at least once a week), there is a significant gender gap that favours women (PIAAC, 2012, unpublished data). PISA 2012 reported that the gender gap is smaller for digital reading than for print reading (Brochu, Deussing, Houme, & Chuy, 2013). At the same time, in PCAP 2016, the majority of students reported a preference for reading on paper, both when reading for themselves and when reading for school (O'Grady, Fung, et al., 2018). Such findings may provide insight into teaching and learning strategies that could lead to improvements in reading achievement.

3 SCIENCE ASSESSMENT

Science was a minor domain in PCAP 2019, and so there were fewer assessment items compared to the major domain of mathematics. As a result, PCAP 2019 allows for an update only on overall performance in science and not on its subdomains. This chapter reports on the performance of Grade 8/Secondary II students across Canada and in the ten provinces in science overall. It then breaks down the findings, reporting on the performance of students enrolled in anglophone and francophone school systems, comparing science performance by gender, and, finally, reporting on changes in science performance over time.

Defining science

Scientific literacy, as outlined in the PCAP 2019 assessment framework (CMEC, 2020), builds on two other CMEC initiatives in Canadian science education: the School Achievement Indicators Program (SAIP) science assessments (CMEC, 1996, 2005b) and the Common Framework of Science Learning Outcomes, K to 12 (CMEC, 1997). The PCAP science assessment is not intended to be a comprehensive assessment of outcomes in the science curricula of specific provinces. Rather, it is based on common elements of science curricula in all Canadian provinces.

Science at the Grade 8/Secondary II level aims to provide all students with the foundations for future study in sciences. Yet, not all students will pursue sciences in postsecondary settings. Therefore, an important and universal goal of Canadian science curricula is to equip students with an understanding of the roles that science and technology play in society. Science curricula in Canadian provinces aim to develop students' competence in problem solving and their ability to apply the principles of scientific inquiry and the skills associated with scientific reasoning to real-world situations and familiar problems.

> "Scientific literacy reflects the emphasis of 'science for all' and is inclusive of both those who choose to pursue further study in science and those who choose other careers and interests that are not specific to science." (CMEC, 2020, p. 28)

For PCAP assessment purposes, the domain of science is divided into three competencies and four subdomains.

The three PCAP science competencies are the following:

- *scientific inquiry*: understanding how inquiries are conducted in science to provide evidence-based explanations of natural phenomena

- *problem solving*: using scientific knowledge and skills to solve problems in social and environmental contexts

- *scientific reasoning*: being able to reason scientifically and make connections by applying scientific knowledge and skills to make decisions and address issues involving science, technology, society, and the environment

The PCAP science subdomains are as follows:

- *nature of science*: understanding the nature of scientific knowledge and the processes by which that knowledge develops

- *life sciences:* understanding the characteristics and needs of living things; cells and cell components; and the processes, functions, and systems responsible for the maintenance of an organism's life

- *physical sciences*: describing the properties and components of matter and explaining interactions between those components

- *Earth sciences*: explaining how water is a resource for society and understanding patterns of change and their effect on water resources on Earth

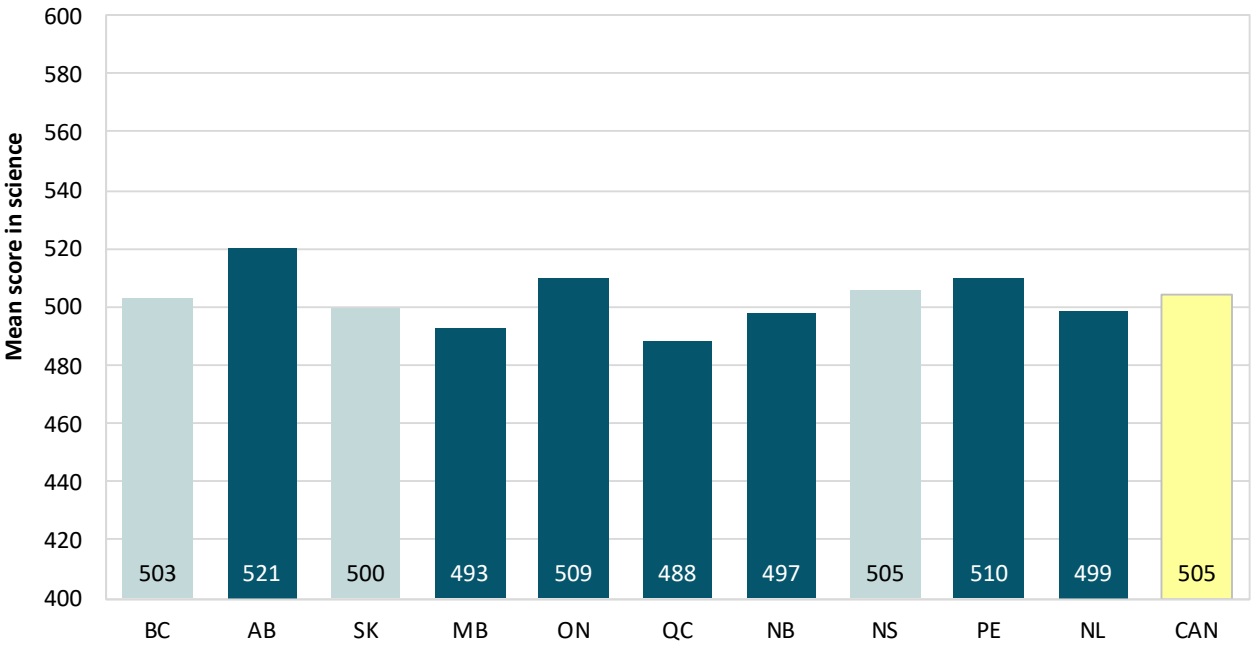
Results in science

PCAP 2019 mean scores in science are reported on the PCAP scale, which has a range of 0 to 1000. In the baseline year for science (2013), the Canadian mean was set at 500, with a standard deviation of 100. To facilitate direct comparisons over time, the Canadian mean has not been rescaled to 500 following the baseline year.

Results in science by average score

Figure 3.1 provides the mean scores in the PCAP 2019 science assessment for all the provinces and indicates how they compare to the mean score for Canada overall. Students in Alberta, Ontario, and Prince Edward Island achieved results higher than the mean score for Canada overall. Students in British Columbia, Saskatchewan, and Nova Scotia achieved results that are statistically similar to the Canadian mean. Students in Manitoba, Quebec, New Brunswick, and Newfoundland and Labrador achieved results below the Canadian mean (Appendix B.3.1). Multiple comparisons of science achievement among the provinces can be found in Table 3.1.

Figure 3.1 Achievement scores in science



Note: Darker shade denotes significant difference compared to Canada

Table 3.1 Comparison of Canadian and provincial results by mean score in science

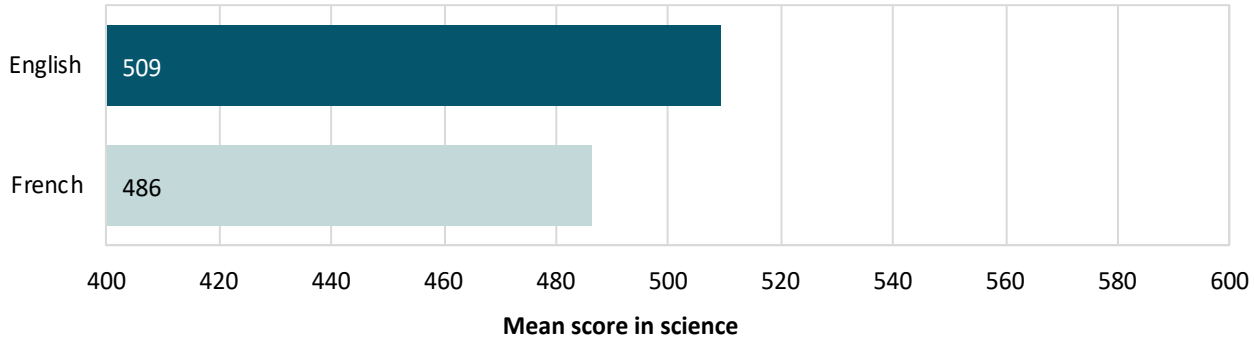
	Mean score	Standard error	Provinces whose mean score is not significantly different from the comparison province or from Canada
Alberta	521	3.2	
Prince Edward Island	510	0.0	Ontario, British Columbia
Ontario	509	2.3	Prince Edward Island, Nova Scotia, British Columbia, Saskatchewan
Nova Scotia	505	0.3	Ontario, **Canada**, British Columbia, Saskatchewan
Canada	505	1.1	Nova Scotia, British Columbia, Saskatchewan
British Columbia	503	2.3	Prince Edward Island, Ontario, Nova Scotia, **Canada**, Saskatchewan, Newfoundland and Labrador, New Brunswick
Saskatchewan	500	2.5	Ontario, Nova Scotia, **Canada**, British Columbia, Newfoundland and Labrador, New Brunswick, Manitoba
Newfoundland and Labrador	499	1.0	British Columbia, Saskatchewan, New Brunswick, Manitoba
New Brunswick	497	0.0	British Columbia, Saskatchewan, Newfoundland and Labrador, Manitoba
Manitoba	493	2.3	Saskatchewan, Newfoundland and Labrador, New Brunswick, Quebec
Quebec	488	2.2	Manitoba

Note: Comparisons adjusted using the Bonferroni correction ($p < .005$; t-value = 2.81).

Results in science by language of the school system

In Canada overall, English-language students outperformed French-language students in science by 23 points (Figure 3.2). This result is consistent with the results reported for Grade 8/Secondary II students in 2013, the baseline year for PCAP science (O'Grady & Houme, 2014), and for Canadian Grade 4 students in the 2019 TIMSS study (O'Grady, Monk, et al., 2021). However, this result differs from the findings for Canadian 15-year-olds in the 2018 PISA study, in which there was no significant difference between the two language systems in science (O'Grady, Fung, Brochu, Servage, & Tao, 2019).

Figure 3.2 Achievement scores in science by language of the school system



Note: Variation in shading denotes significant difference between the two groups

Table 3.2 presents a comparison of provincial results with the Canadian mean in science for each of the two language systems. In English-language school systems, students in Alberta achieved scores significantly higher than the Canadian English mean, while student achievement in British Columbia, Ontario, Nova Scotia, and Prince Edward Island was statistically similar to the Canadian English mean; all other provinces scored below the Canadian English mean. In French-language schools in Quebec, students scored above the Canadian French mean, while students in British Columbia, Alberta, and Saskatchewan achieved scores similar to the Canadian French mean; for all other provinces, the results were significantly below the Canadian French mean (Appendix B.3.2).

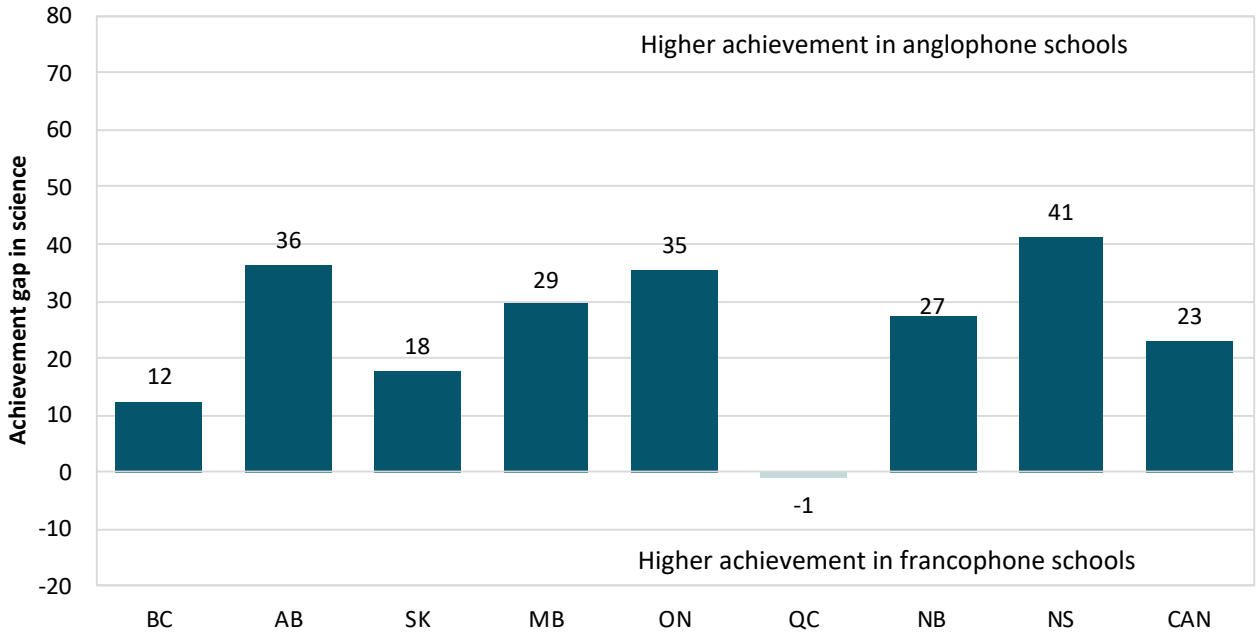
Table 3.2 Comparison of provincial results to Canadian mean scores in science by language of the school system

Anglophone school systems		
Above* the Canadian English mean	**At the Canadian English mean**	**Below* the Canadian English mean**
Alberta	British Columbia, Ontario, Nova Scotia, Prince Edward Island	Saskatchewan, Manitoba, Quebec, New Brunswick, Newfoundland and Labrador
Francophone school systems		
Above* the Canadian French mean	**At the Canadian French mean**	**Below* the Canadian French mean**
Quebec	British Columbia, Alberta, Saskatchewan	Manitoba, Ontario, New Brunswick, Nova Scotia

* Denotes significant difference

Within provinces, there were no differences between the two language systems in science performance in Quebec (Figure 3.3). In all other provinces, students in English-language systems performed better than their counterparts in French-language systems, with differences ranging from 12 points in British Columbia to 41 points in Nova Scotia (Figure 3.3, Appendix B.3.2).

Figure 3.3 Achievement gap in science by language of the school system

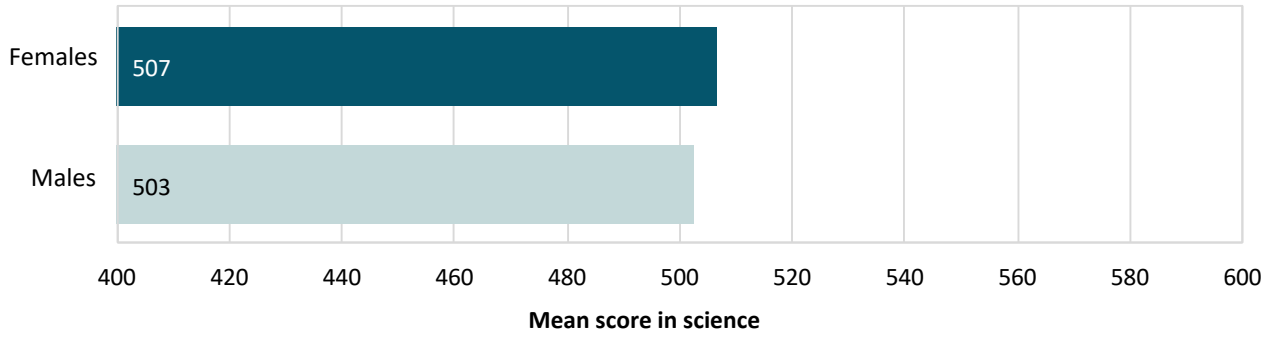


Note: Numbers are achievement scores in anglophone systems minus those in francophone systems. Darker shade denotes significant difference within Canada or a province

Results in science by gender

In PCAP 2019, girls outperformed boys in science (Figure 3.4). This finding in consistent with results reported for students at age 15 in PISA 2018 (O'Grady, Deussing, et al., 2019). In contrast, boys outperformed girls in science at the Grade 4 level in the 2019 TIMSS study (O'Grady, Monk, et al., 2021). No gender gap was found at the Grade 8/Secondary II level in the baseline year for PCAP science (O'Grady & Houme, 2014).

Figure 3.4 Achievement scores in science by gender



Note: Variation in shading denotes significant difference between the two groups

Table 3.3 presents a comparison of provincial results with the Canadian means for science achievement for girls and boys. Both girls and boys in Alberta, girls in Ontario, and boys in Prince Edward Island had higher scores than the respective Canadian means. Both girls and boys in British Columbia, Saskatchewan, and Nova Scotia, as well as girls in Prince Edward Island and Newfoundland and Labrador and boys in Ontario achieved scores similar to the respective Canadian means (Appendix B.3.3).

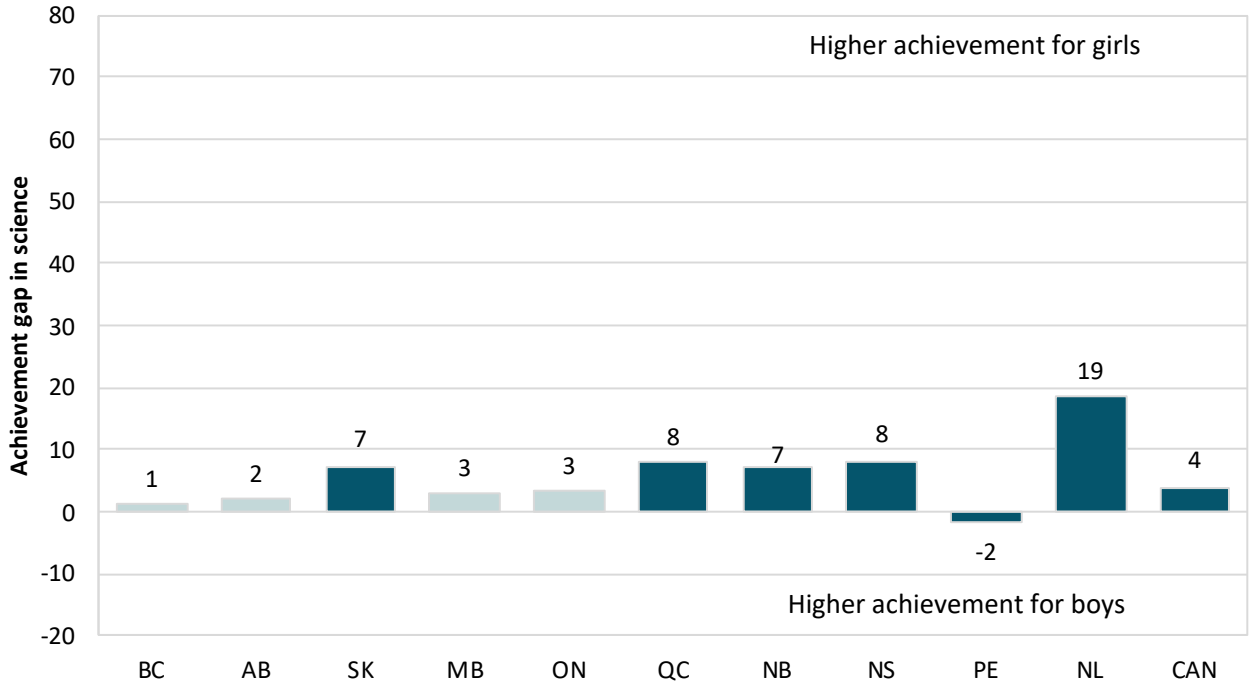
Table 3.3 Comparison of provincial results to Canadian mean scores in science by gender

Girls		
Above* the Canadian mean for girls	**At the Canadian mean for girls**	**Below* the Canadian mean for girls**
Alberta, Ontario	British Columbia, Saskatchewan, Nova Scotia, Prince Edward Island, Newfoundland and Labrador	Manitoba, Quebec, New Brunswick
Boys		
Above* the Canadian mean for boys	**At the Canadian mean for boys**	**Below* the Canadian mean for boys**
Alberta, Prince Edward Island	British Columbia, Saskatchewan, Ontario, Nova Scotia	Manitoba, Quebec, New Brunswick, Newfoundland and Labrador

* Denotes significant difference

Within provinces, no achievement gap in science was found in British Columbia, Alberta, Manitoba, and Ontario. Girls outperformed boys in the remaining provinces except Prince Edward Island, where boys achieved higher scores than girls (Figure 3.5, Appendix B.3.3).

Figure 3.5 Achievement gap in science by gender

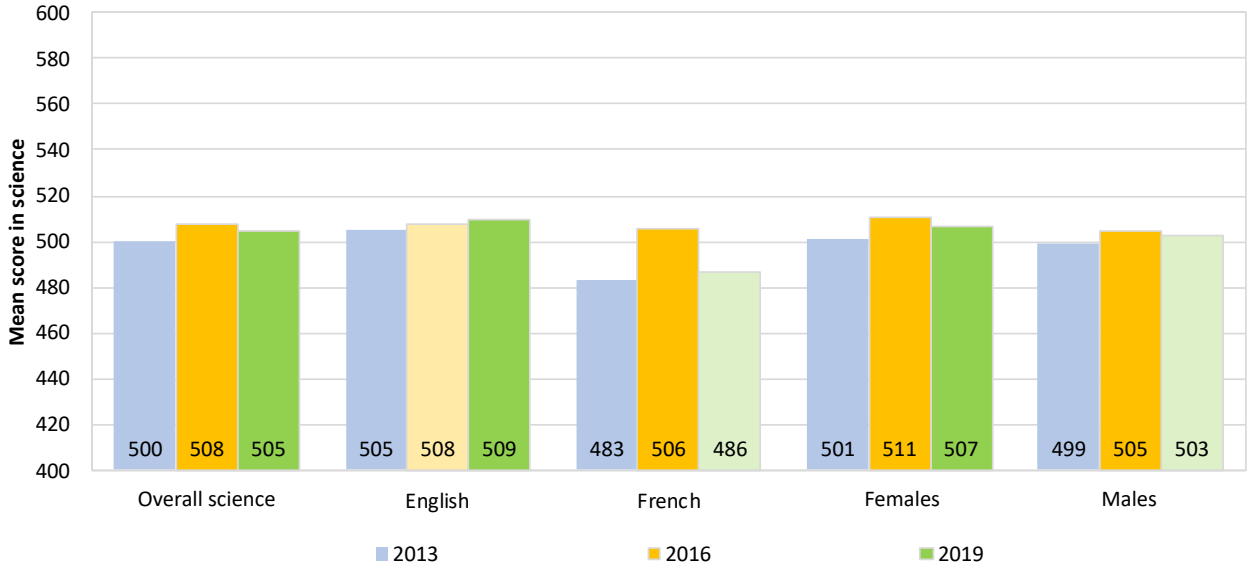


Note: Numbers are achievement scores of girls minus those of boys. Darker shade denotes significant difference within Canada or within a province

Change in science performance over time

Science was the major domain in PCAP in 2013, and that baseline year is used as the basis for comparisons with PCAP 2019. For overall science, the Canadian mean score was four points higher in 2019 than in 2013 (Figure 3.6, Table 3.4).

Figure 3.6 Canadian mean scores in science, 2013–2019



Note: Darker shades denote significant difference compared to the baseline year 2013

At the provincial level, a positive change in science overall was found in Saskatchewan, Manitoba, New Brunswick, Nova Scotia, and Prince Edward Island in 2019 compared to 2013; no significant change was found in the remaining provinces (Table 3.5, Appendix B.3.4).

When science results were examined by the language of the school system, a positive change was found in anglophone schools in 2019 over the results in 2013, while results were stable in francophone schools in Canada as a whole (Table 3.4). An achievement gap favouring anglophone schools in 2013 persisted in 2019 (Appendix B.3.2, O'Grady & Houme, 2014).

As shown in Table 3.5, a positive change in 2019 achievement scores in science was found in both anglophone and francophone systems in Saskatchewan and Manitoba, as well as in English-language schools in New Brunswick, Nova Scotia, and Prince Edward Island and in French-language schools in Ontario. Results by language of the school system were stable in the remaining provinces (Appendix B.3.5).

With respect to gender, girls' science scores in 2019 in Canada overall were 6 points higher than those in 2013, while scores for boys were stable (Table 3.4). A gender gap favouring girls was evident in 2019 (Figure 3.5). This stands in contrast to the 2013 baseline year, when no gender gap was found (O'Grady & Houme, 2014). At the provincial level, positive changes were achieved by both girls and boys in Manitoba, New Brunswick, Nova Scotia, and Prince Edward Island, as well as by girls in Saskatchewan, Quebec, and Newfoundland and Labrador. Boys in Newfoundland and Labrador achieved lower scores in 2019 compared to the baseline year of 2013; the results for girls and boys in the remaining provinces remained stable (Table 3.5, Appendix B.3.6).

Table 3.4 Summary of Canadian achievement scores in science, 2013 and 2019

	2013	2019	Change over time
Overall science	500	505	4*
Anglophone schools	505	509	4*
Francophone schools	483	486	3
Achievement gap (A - F)	22	23	
Girls	501	507	6*
Boys	499	503	4
Achievement gap (G - B)	2	4	

* Denotes significant difference compared to baseline year 2013
Note: Test for significance cannot be calculated for change over time for achievement gaps

Table 3.5 Summary of changes in provincial achievement scores in science, 2013–2019

Positive change over time*	Negative change over time*	No change over time
Overall science		
Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island		British Columbia, Alberta, Ontario, Quebec, Newfoundland and Labrador
Anglophone school systems		
Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island		British Columbia, Alberta, Ontario, Quebec, Newfoundland and Labrador
Francophone school systems		
Saskatchewan, Manitoba, Ontario		British Columbia, Alberta, Quebec, New Brunswick, Nova Scotia
Girls		
Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador		British Columbia, Alberta, Ontario
Boys		
Manitoba, New Brunswick, Nova Scotia, Prince Edward Island	Newfoundland and Labrador	British Columbia, Alberta, Saskatchewan, Ontario, Quebec

* Denotes significant difference in 2019 compared to baseline year 2013

Summary

This chapter summarizes the performance of Canadian students on the PCAP 2019 science assessment. Science was a minor domain in PCAP 2019, so the science assessment comprised a smaller number of items than the mathematics assessment. Consequently, in contrast to PCAP 2013, when science was the primary focus of the assessment, this chapter provides results only on overall performance in science and not on its subdomains.

For science overall, students in Alberta, Ontario, and Prince Edward Island had the highest achievement, with average scores significantly above the Canadian mean, while students in British Columbia, Saskatchewan, and Nova Scotia achieved results that were similar to the Canadian mean. All other provinces had scores below the Canadian mean.

When the science results are analyzed by language of the school system, students in English-language schools in Canada significantly outperformed those in French-language schools in 2019, as was also the case in the PCAP 2013 assessment. For English schools, the highest achievement in science was found in Alberta; for French schools, the highest results were found in British Columbia. Students in English-language systems performed better than their counterparts in French-language systems in all provinces except Quebec, where equity was found between the two language systems. Science scores in Saskatchewan and Manitoba in both language systems were higher in 2019 than in the 2013 baseline. Higher achievement scores over time were also found in anglophone schools in New Brunswick, Nova Scotia, and Prince Edward Island and in francophone schools in Ontario.

In PCAP 2019, girls outperformed boys in science. This was consistent with the findings for students at age 15 in PISA 2018 (O'Grady, Deussing, et al., 2019). However, these findings differ from the results reported for Grade 8/Secondary II students in PCAP 2013, the baseline year for PCAP science, where there was no gender gap (O'Grady & Houme, 2014). As well, boys outperformed girls in science at the Grade 4 level in the 2019 TIMSS study (O'Grady, Monk, et al., 2021).

Achievement scores in science for girls in Canada overall increased in 2019 compared to 2013, while the results for boys were stable. Science results were stable for girls in British Columbia, Alberta, and Ontario, while all other provinces saw an improvement in girls' achievement in 2019 compared to the baseline year. At the same time, the results for boys in British Columbia, Alberta, Saskatchewan, Ontario, and Quebec were stable, while the scores of boys in Newfoundland and Labrador were lower. The achievement of boys in the remaining provinces improved over the 2013 baseline.

BRITISH COLUMBIA

Context statement

Social context

British Columbia has a population of more than five million. Eighty-six percent of the population live in urban areas, the largest portion of which is concentrated in the Greater Vancouver region.[16]

Organization of the school system

Approximately 553,000 students are enrolled in the public school system, 81,000 in independent schools, and over 2,200 in home schools. The province has 60 school districts, including a French-language school board, the *Conseil scolaire francophone de la Colombie-Britannique*.[17]

Mathematics teaching

In recent years, the BC curriculum, including the mathematics curriculum, has been redesigned according to a know-do-understand (KDU) model, which presents a way of conceptualizing the knowledge, competencies, and understandings that students are expected to achieve. Three major core competencies — specifically, communication, thinking, and personal and social competencies — are integrated throughout the new curriculum. The redesigned K–9 curriculum has been fully implemented since the 2016–17 school year, while the Grade 10 curriculum was implemented in the 2018–19 school year, and the Grade 11–12 curriculum in the 2019–20 school year. The curriculum for K–12 mathematics is available in both English and French. For each subject and grade, the curriculum documents provide contextual information and supports, such as instructional samples, and may include suggestions for classroom assessment.

The mathematics curriculum is designed to build on students' mathematics knowledge and to enable them to apply this knowledge to a broad range of situations encountered in everyday life. These goals are facilitated by condensing the learning standards, focusing on flexible teaching and learning within relevant situational contexts, and continuing to develop a strong foundation of mathematical understandings and skills, as just one part of an interdisciplinary set of problem-solving, exploratory, and investigative skills and knowledge. The mathematics curriculum has the same format as the curricula for all other areas of learning. Three curricular elements — big ideas, curricular competencies, and content — link the knowing, doing, and understanding of mathematics learning.

[16] For demographic information, see the government of British Columbia website, at **http://www.gov.bc.ca/.**
[17] For more information on the BC school system, see **https://www2.gov.bc.ca/gov/content/governments/organizational-structure/ministries-organizations/ministries/education.**

Elaborations support each curricular area by providing suggestions, definitions, and clarifications to better support teaching and learning.

The big ideas of the mathematics curriculum highlight the progression of related skills and concepts. For each of the five area of mathematics in Kindergarten through Grade 9 (K–9) — computational fluency, number, patterns and relations, spatial sense, and statistics and probability — important concepts are introduced in Kindergarten, growing with students and expanding in scope and depth of learning as they progress through the grades. For Grades 10–12, students have the opportunity to further explore their passions and interests through diverse mathematics courses. In each of these, specialized learning builds on the K–9 progression of skills and concepts.[18]

Assessment

British Columbia's provincial assessments have been recently revised in order to align with the new curriculum. All students at the beginning of Grades 4 and 7 are assessed annually in reading, writing, and numeracy through the Foundation Skills Assessment (FSA).[19] Secondary school students in Grade 10 are required to write numeracy and literacy assessments, with an additional required literacy assessment in their Grade 12 year. All of these assessments are cross-curricular in nature. The Grade 10 numeracy assessment has been in place since the 2017–18 school year, and the Grade 10 literacy assessment since the 2019–20 school year; the Grade 12 literacy assessment will be in place in the 2020–21 school year. Students also participate in two international assessments — the Progress in International Reading Literacy Study (PIRLS) and the Programme for International Student Assessment (PISA).

The British Columbia Ministry of Education has developed a set of performance standards in reading, writing, numeracy, and social responsibility for voluntary use in schools. Focusing on performance assessment, these standards are a resource to support ongoing instruction and assessment. They exemplify a criterion-referenced approach to student assessment, and they enable teachers, students, and parents to relate student performance to provincial expectations.[20] These performance standards will be reviewed and potentially updated to align with the redesigned provincial curriculum.

Results in mathematics

This section presents PCAP 2019 results in mathematics for British Columbia and in Canada overall by performance levels and mean scores. Student achievement is reported in mathematics overall, by language of the school system, and by gender. This section concludes with a comparison of changes over time in mathematics achievement.

[18] More information on the curriculum model is available at **https://www.curriculum.gov.bc.ca/curriculum/overview.**
[19] For more detail on this assessment, see **https://www2.gov.bc.ca/gov/content/education-training/k-12/administration/program-management/assessment/foundation-skills-assessment.**
[20] For more information on performance standards, see **https://www2.gov.bc.ca/gov/content/education-training/k-12/teach/resources-for-teachers/curriculum/bc-performance-standards.**

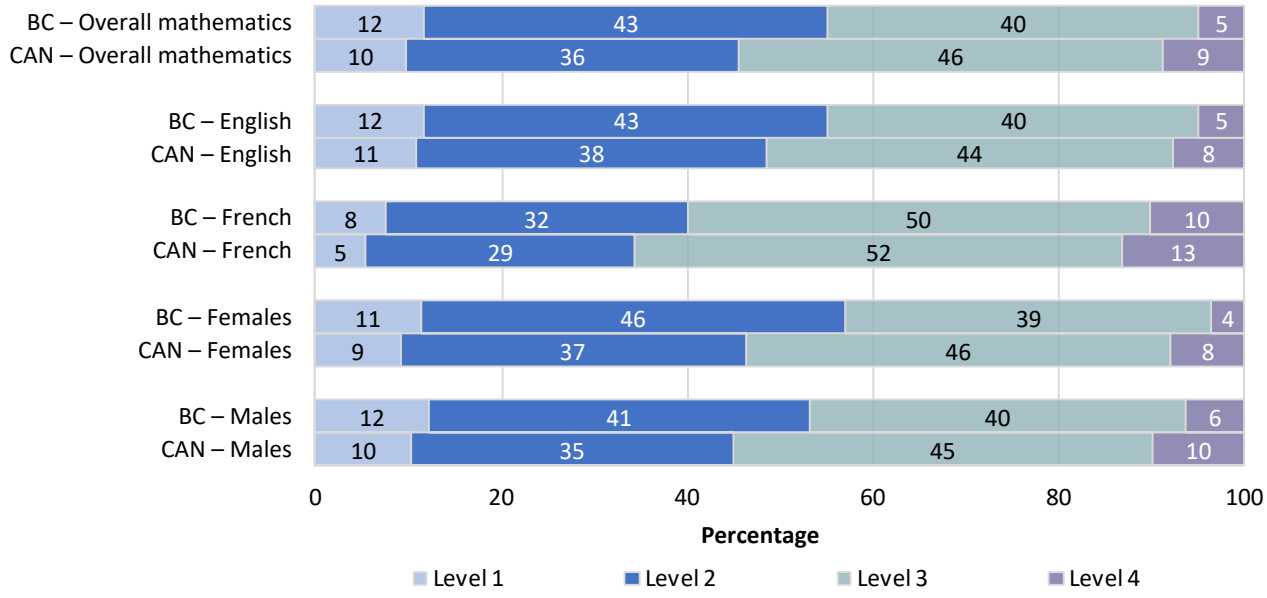
Results in mathematics by performance level

Figure BC.1 presents the results by performance level of students in British Columbia and in Canada overall in the PCAP 2019 mathematics assessment. There was no significant difference between the percentage of students in British Columbia and in Canada overall that performed at or above Level 2 in mathematics (Level 2 is the baseline or expected level of mathematics proficiency for Grade 8 students). Five percent of students in British Columbia achieved the highest level of performance (Level 4), which was lower than the Canadian average (Appendix B.1.1).

Eighty-eight percent of students in the English-language school system in British Columbia achieved Level 2 or higher in mathematics, which was similar to the proportion of students in Canada as a whole. A lower proportion of students in the province's French-language schools achieved at or above Level 2 (92 percent) than was observed at the pan-Canadian level (95 percent). Within British Columbia, a significantly higher proportion of francophone than anglophone students achieved the expected proficiency level (Appendix B.1.4b).

In British Columbia, 89 percent of girls and 88 percent of boys performed at Level 2 or above in mathematics. Although no gender gap was found in the province in the proportion of students achieving Level 2 or above, a higher proportion of boys than girls in British Columbia achieved Level 4 (Appendix B.1.8b).

Figure BC.1 Canada–British Columbia: percentage of students at each performance level in mathematics



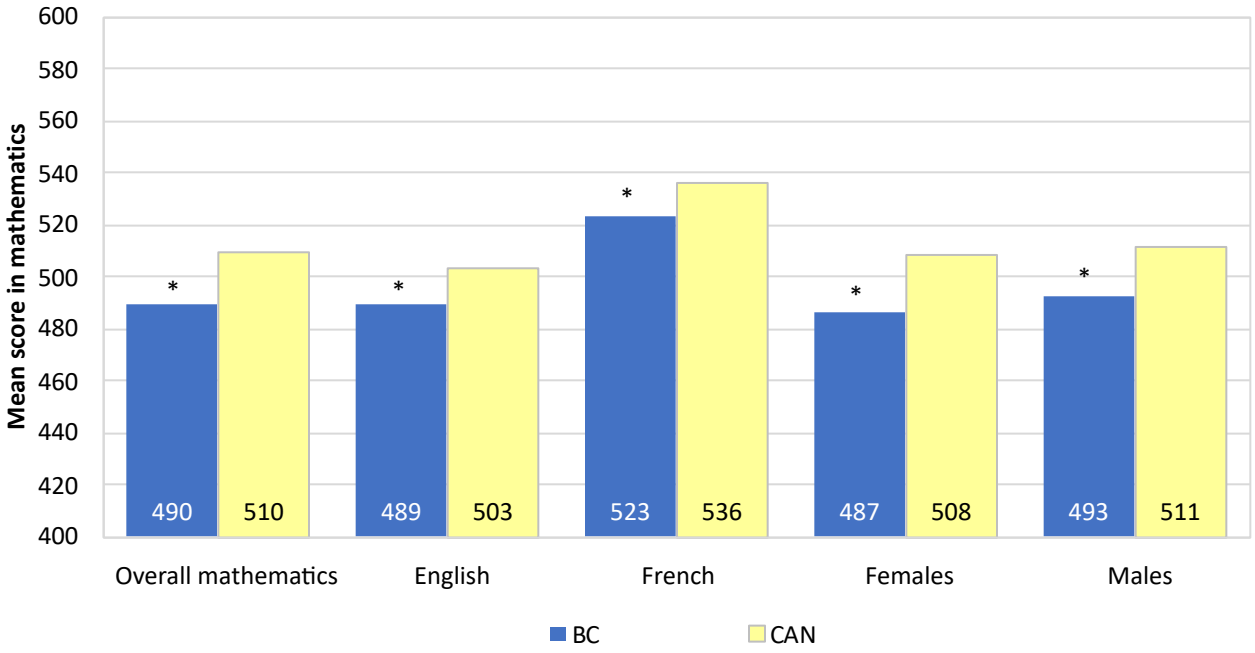
Results in mathematics by mean score

Figure BC.2 summarizes the results by mean score of the PCAP mathematics assessment for students in British Columbia and Canada overall and by language of the school system and gender. British Columbia students achieved below the Canadian mean in mathematics overall (Appendix B.1.2).

Mathematics achievement scores in the province's French- and English-language school systems were lower than the respective Canadian means. Within the province, students enrolled in francophone schools outperformed their anglophone counterparts, which is consistent with the pattern at the pan-Canadian level (Appendix B.1.5).

Girls and boys in British Columbia both scored below the respective Canadian means in mathematics. Within the province, boys significantly outperformed girls in mathematics, whereas no gender gap was found at the pan-Canadian level (Appendix B.1.9).

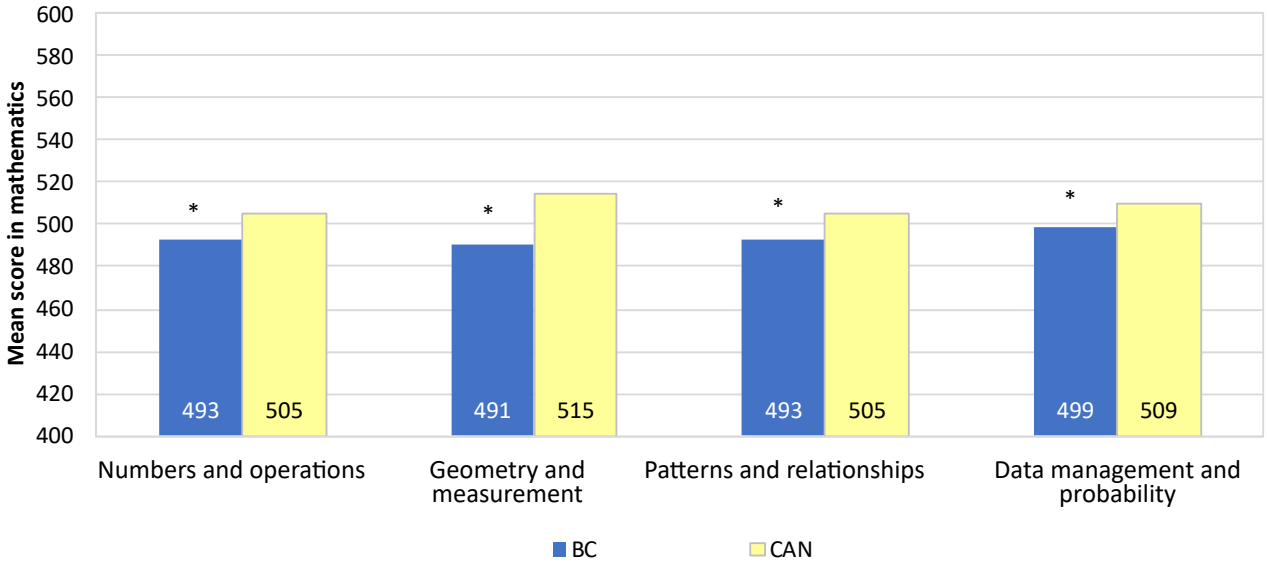
Figure BC.2 Canada–British Columbia: mean scores in mathematics



* Denotes significant difference compared to Canada

Figure BC.3 presents the achievement scores in mathematics by subdomain for British Columbian and Canadian students. Students in the province achieved results below the respective Canadian means in each of the four subdomains in mathematics. Within the province, the strongest results were observed in the *data management and probability* subdomain (Appendix B.1.3).

Figure BC.3 Canada–British Columbia: mean scores in mathematics subdomains



* Denotes significant difference compared to Canada

Table BC.1 compares achievement scores in British Columbia and Canada in each of the mathematics subdomains by language of the school system. Students in English-language schools in British Columbia achieved results in the *geometry and measurement* and *patterns and relationships* subdomains below the respective means of anglophone students in Canada overall, while the results for the other two subdomains were similar to the respective Canadian English means. Students in French-language schools achieved below the respective Canadian French means for all subdomains except *numbers and operations*, in which results were similar to the Canadian French mean. Within the province, students in French-language schools outperformed those in English-language schools in all four subdomains (Appendix B.1.6).

Table BC.1 Canada–British Columbia: mean scores in mathematics subdomains by language of the school system

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN English	497	1.7	507	1.5	503	1.4	501	0.9
BC English	492	2.3	491	2.1	493	1.9	499	1.2
Difference	5		16*		10*		2	
CAN French	534	2.6	544	2.3	512	1.9	541	1.9
BC French	532	0.0	531	0.0	504	0.0	529	0.0
Difference	2		13*		8*		12*	
BC English	492	2.3	491	2.1	493	1.9	499	1.2
BC French	532	0.0	531	0.0	504	0.0	529	0.0
Difference	-40*		-40*		-11*		-30*	

* Denotes significant difference

Table BC.2 compares mathematics achievement scores in British Columbia and Canada in each of the subdomains by gender. It shows that both girls and boys in British Columbia had lower scores than girls and boys in Canada overall in all four subdomains of mathematics. Within the province, no gender gap was found for the *data management and probability* subdomain, whereas boys outperformed girls in the other three subdomains (Appendix B.1.10).

Table BC.2 Canada–British Columbia: mean scores in mathematics subdomains by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN female	504	1.7	514	1.5	504	1.3	508	1.0
BC female	490	2.4	488	2.3	490	2.2	499	1.5
Difference	13*		27*		14*		10*	
CAN male	507	1.6	516	1.5	506	1.5	510	1.0
BC male	495	2.7	494	2.4	496	2.1	499	1.6
Difference	11*		21*		10*		11*	
BC female	490	2.4	488	2.3	490	2.2	499	1.5
BC male	495	2.7	494	2.4	496	2.1	499	1.6
Difference	-5*		-7*		-6*		-1	

* Denotes significant difference

Comparison of results over time

In PCAP, changes over time are determined by comparing the current assessment year to the baseline year — that is, the first year in which the subject was the primary focus of the assessment. For PCAP mathematics, the baseline year was 2010. In the baseline year, a larger number of items are administered in the major domain, which allows broader coverage of the PCAP framework.

Table BC.3 and Figure BC.4 present a summary of the changes over time in mathematics achievement scores in the province. Compared to the baseline year of 2010, overall mathematics achievement improved in British Columbia in 2019 (Appendix B.1.11). Additionally, there was a positive change in all subdomains except for *numbers and operations*, where the results were stable (Appendix B.1.14). At the pan-Canadian level, a positive change in achievement was found in mathematics overall and in each of the subdomains in 2019 compared to 2010 (Appendices B.1.11, B.1.14).

Mathematics results for both English- and French-language schools in British Columbia improved in 2019 compared to 2010. These findings reflect those for both language groups at the pan-Canadian level (Appendix B.1.12).

Mathematics results for girls in British Columbia improved in 2019 compared to 2010, while the results for boys were stable. By contrast, at the pan-Canadian level, change in mathematics scores was positive for both girls and boys (Appendix B.1.13).

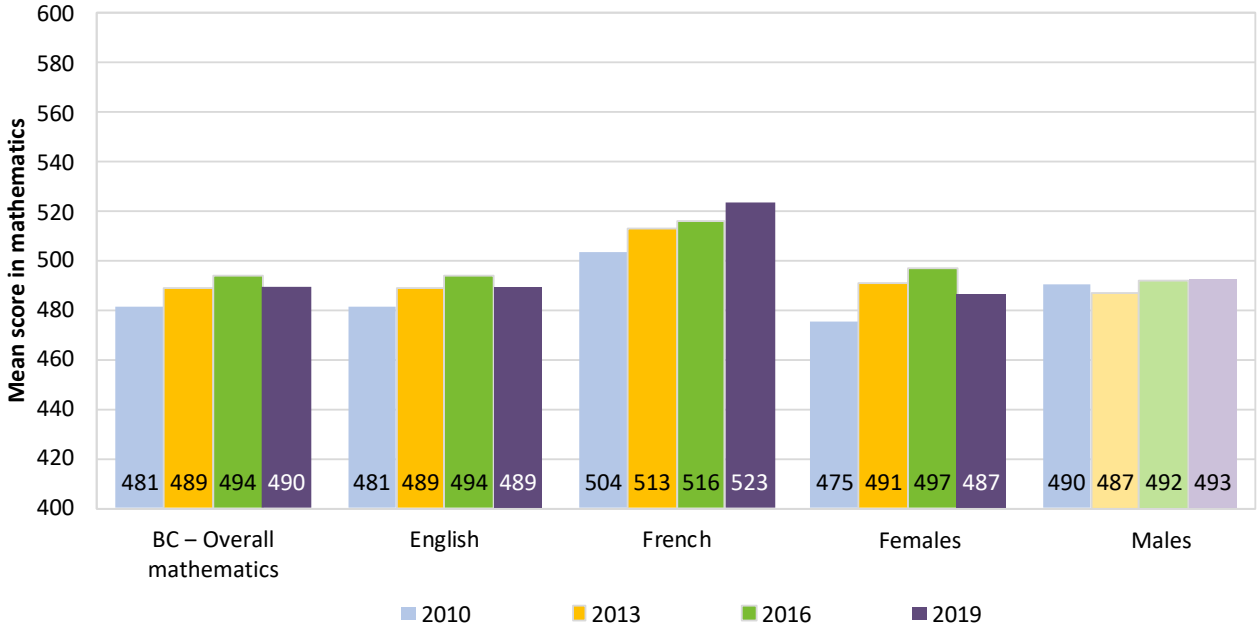
Data tables in Appendix B report results over time for the mathematics subdomains by language of the school system (Appendix B.1.15) and by gender (Appendix B.1.16).

Table BC.3 British Columbia: summary of achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
BC - Overall mathematics	481	490	8*
Numbers and operations	488	493	4
Geometry and measurement	472	491	19*
Patterns and relationships	487	493	6*
Data management and probability	489	499	10*
Anglophone school system	481	489	8*
Francophone school system	504	523	19*
Achievement gap (A - F)	-23	-34	
Females	475	487	11*
Males	490	493	2
Achievement gap (F - M)	-15	-6	

* Denotes significant difference compared to the baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Figure BC.4 British Columbia: mean scores in mathematics, 2010–2019



Note: Darker shades denote significant difference compared to the baseline year 2010

Results in reading and science

As noted in the Introduction, reading and science are both minor domains in PCAP 2019. Results for these domains are reported by mean scores only. This section presents reading and science scores for British Columbia, compares those scores with pan-Canadian results, reports results by language of the school system and by gender, and presents comparisons in achievement over time.

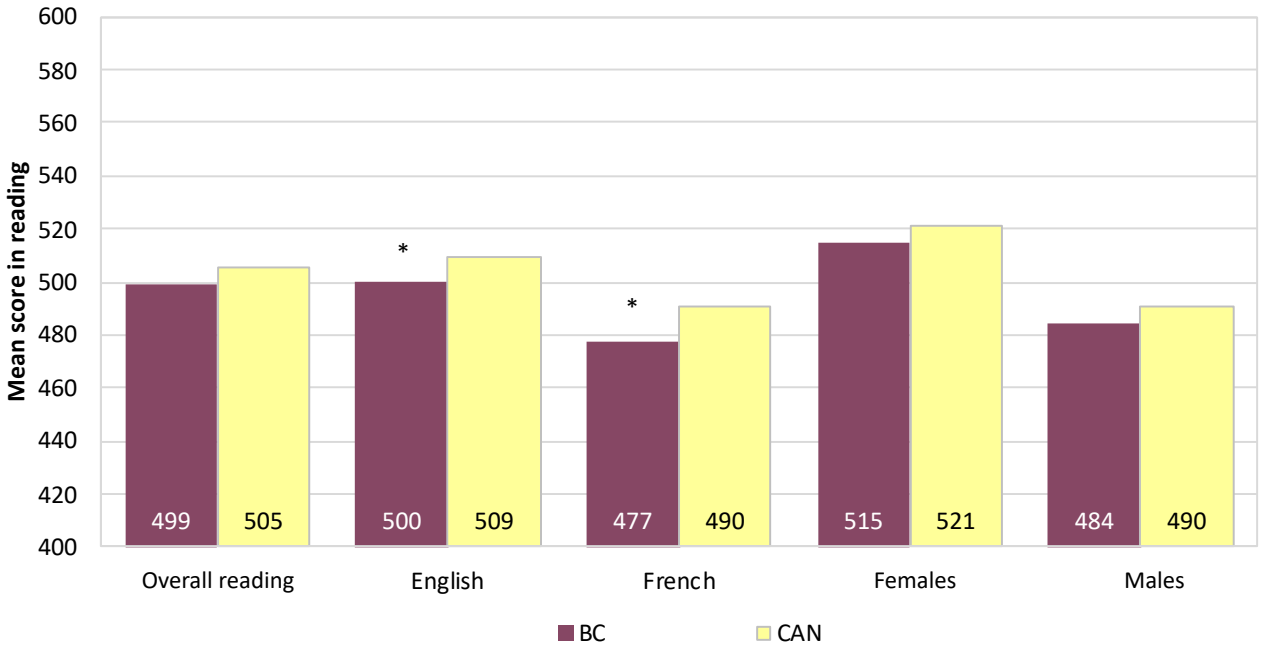
Results in reading

Figure BC.5 displays mean scores in reading overall in British Columbia and Canada, as well as by language of the school system and gender. In PCAP 2019, students in British Columbia achieved results similar to the Canadian mean in reading (Appendix B.2.1).

Students in both language groups in British Columbia achieved scores in reading that were lower than the Canadian mean scores for the respective language groups. Within British Columbia, students in the English-language school system outperformed students in the French-language system, which was consistent with results at the pan-Canadian level (Appendix B.2.2).

Boys and girls in British Columbia achieved scores in reading that were not statistically different from the Canadian means for their respective cohorts. Within the province, girls significantly outperformed boys in reading, which is consistent with the trend at the pan-Canadian level (Appendix B.2.3).

Figure BC.5 Canada–British Columbia: mean scores in reading



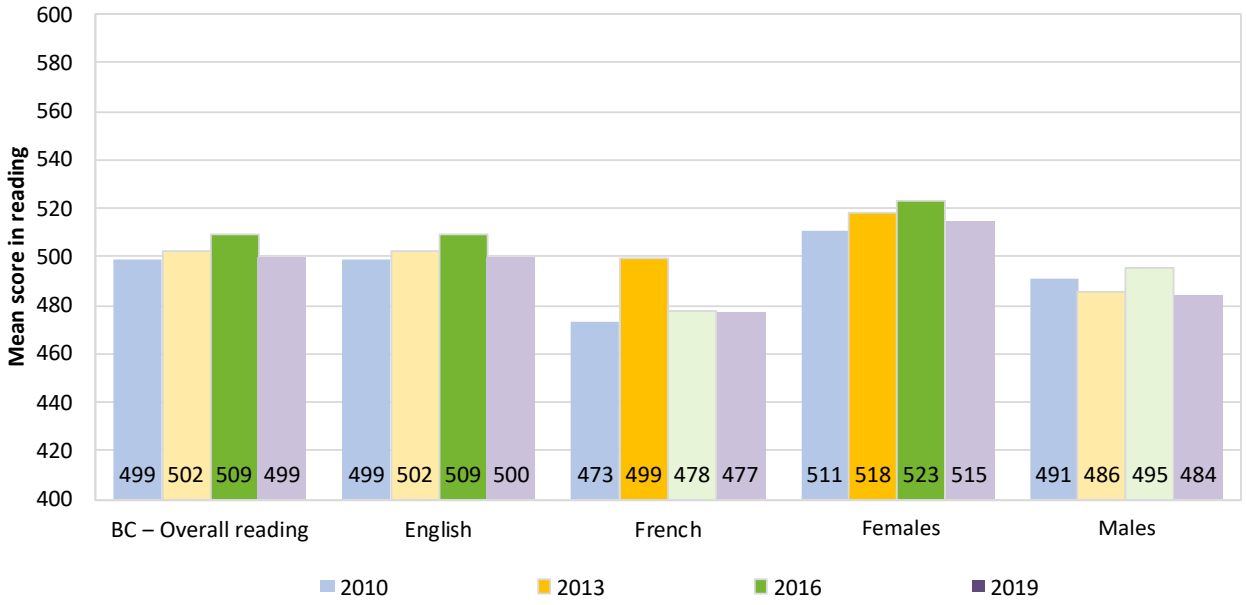
* Denotes significant difference compared to Canada

Figure BC.6 shows PCAP reading achievement over time for students in British Columbia. As explained in Chapter 2, although reading was the major domain in PCAP 2007, the baseline year for reading was adjusted to 2010, when the PCAP target group changed from 13-year-old students to Grade 8 students. No significant changes in achievement scores in reading overall are evident when mean scores in 2019 and 2010 are compared (Appendix B.2.4).

In PCAP 2019, students in both the English- and French-language school systems in British Columbia showed no statistical difference in reading achievement compared to 2010. In Canada overall, the mean scores of anglophone students were stable, while the mean scores of francophone students were significantly higher than in 2010 (Appendix B.2.5).

Boys and girls in British Columbia both achieved reading scores in 2019 similar to those in 2010. At the pan-Canadian level, girls showed an increase in achievement scores in 2019 over 2010, while boys' scores were stable (Appendix B.2.6).

Figure BC.6 British Columbia: mean scores in reading, 2010–2019



Note: Darker shades denote significant difference compared to the adjusted baseline year 2010

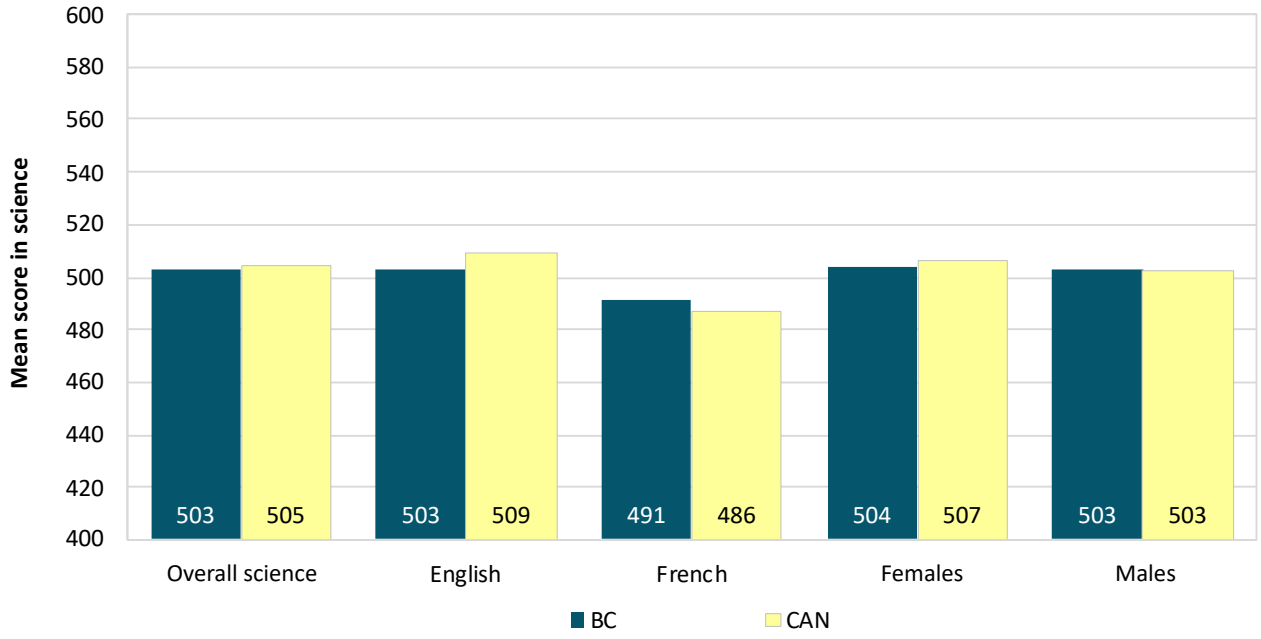
Results in science

Figure BC.7 shows mean scores in science overall in British Columbia and Canada, as well as by language of the school system and gender. In PCAP 2019, students in British Columbia achieved scores in science similar to the Canadian mean (Appendix B.3.1).

Students in both English- and French-language school systems in British Columbia obtained scores in science similar to the Canadian mean for the respective language groups. Within the province, anglophone students outperformed francophone students, a finding similar to that at the pan-Canadian level (Appendix B.3.2).

In British Columbia, both girls and boys achieved science scores statistically similar to the respective Canadian means. Within the province, there was no difference in the mean scores of girls and boys in science. This contrasts with the results for Canada overall, where girls outscored boys (Appendix B.3.3).

Figure BC.7 Canada–British Columbia: mean scores in science

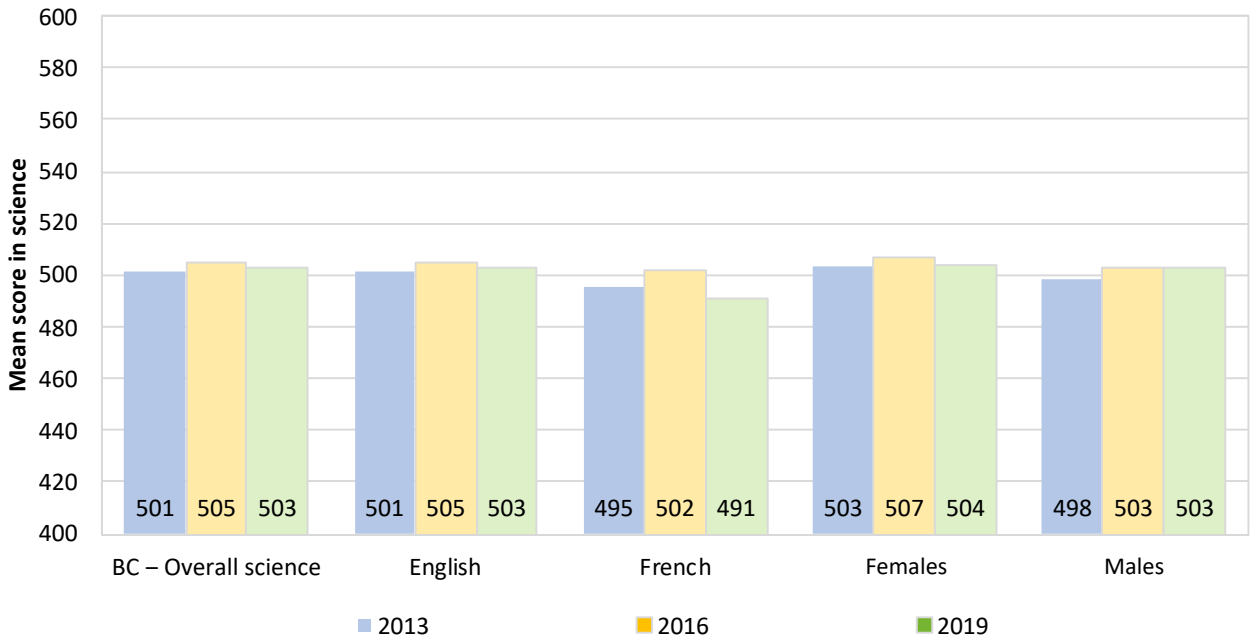


As shown in Figure BC.8, results in science for students in British Columbia were stable in PCAP 2019 compared to the baseline year of 2013. This finding differs from the pan-Canadian results, which showed positive change in science achievement (Appendix B.3.4).

Students in both English- and French-language school systems in British Columbia had achievement scores in 2019 that were statistically similar to those in 2013. In Canada overall, anglophone students saw improved performance in science, while francophone students' scores did not change (Appendix B.3.5).

In British Columbia, neither girls nor boys showed a change in science achievement in PCAP 2019 compared to the baseline year of 2013. In the respective gender groups at the pan-Canadian level, girls showed improvement, while boys' scores were stable (Appendix B.3.6).

Figure BC.8 British Columbia: mean scores in science, 2013–2019



Note: There were no significant changes over time in British Columbia in any of these categories.

ALBERTA

Context statement

Social context

Alberta is home to a culturally diverse population of more than four million people; international migration is the largest contributor to Alberta's population growth (Government of Alberta, 2019, p. 1). Alberta continues to remain the province with the youngest population, with an average age of 38.3 years as of July 1, 2019 (Government of Alberta, 2019, p. 2).

Organization of the school system

The province's *Education Act*, which came into force on September 1, 2019, specifies goals for Alberta's Early Childhood Services to Grade 12 (ECS–12) education system and identifies the roles and responsibilities of the ministry, school boards, charter schools, private schools, teachers, parents, and students.[21]

Educational options in Alberta include public, separate, and francophone schools, charter schools, private schools, home education, and online learning.[22] Students in Alberta are required to attend school from the age 6 to 16, although parents may choose to home-school their children.

Alberta has one publicly funded education system, which includes public, separate, and francophone schools. Public, separate, and francophone schools, which are operated by locally elected officials and overseen by the Government of Alberta, teach the Alberta curriculum to eligible students. These schools may choose optional programs as needed to meet the unique needs of their students and communities.[23]

In the 2018–19 school year, 730,375 Albertan students were registered in 2,384 schools. Of these students, 68 percent attended public schools, 24 percent attended separate schools, 1 percent attended francophone schools, and the remaining 7 percent attended private, charter, provincial, or federal schools.[24]

Alberta's *Mathematics, Kindergarten to Grade 9* program of studies (2007, updated 2016) has been derived from *The Common Curriculum Framework for K–9 Mathematics: Western and Northern Canadian Protocol*, May 2006 (the *Common Curriculum Framework*). This program of studies incorporates the conceptual framework for Kindergarten to Grade 9 mathematics and the general and specific outcomes that were established in the *Common Curriculum Framework*. The *Common Curriculum Framework* was developed by seven ministries of education (Alberta, British Columbia,

[21] The act can be accessed at **https://open.alberta.ca/publications/e00p3.**
[22] Information on educational options is available at **https://www.alberta.ca/education-options.aspx.**
[23] Information on education rights is available at **https://www.alberta.ca/education-rights.aspx.**
[24] Information on student population statistics is available at **https://www.alberta.ca/student-population-statistics.aspx.**

Manitoba, Northwest Territories, Nunavut, Saskatchewan, and Yukon) in collaboration with a number of stakeholder groups. The framework identifies beliefs about mathematics, general and specific student outcomes, and achievement indicators agreed upon by the seven jurisdictions.

From Kindergarten through Grade 9, all students are taught mathematics as per the prescribed provincial curriculum. Those students wishing to obtain a high school credential must take the prescribed curriculum up to Grade 11. From Kindergarten to Grade 7, the programs of study describe one mathematics program per grade. Beginning in Grade 8, students whose needs, interests, and abilities focus on basic mathematical understanding may enrol in Knowledge and Employability mathematics.[25] Knowledge and Employability mathematics courses focus on developing essential mathematics knowledge, skills, and attitudes needed for everyday living at home, in the workplace, and in the community. The courses emphasize career and life skills, teamwork, communication skills, and thinking processes.

Alberta has three mathematics programs of study for Grades 10–12: *Mathematics, Grades 10–12*, Mathematics 31, and Knowledge and Employability Mathematics 10-4, 20-4.

Mathematics, Grades 10–12 (2008) includes course sequences and topics rather than the strands that are used in *Mathematics, Kindergarten to Grade 9*. Three course sequences are available: "-1," "-2," and "-3." A combined course (Mathematics 10C) is the starting point for the "-1" course sequence and the "-2" course sequence. The "-1" course sequence is designed to provide students with the mathematical understandings and critical-thinking skills identified as necessary for entry into postsecondary programs that require the study of calculus. The "-2" course sequence is designed to provide students with the mathematical understandings and critical-thinking skills identified as necessary for postsecondary studies in programs that do not require the study of calculus. The "-3" course sequence is designed to provide students with the mathematical understandings and critical-thinking skills needed for entry into the majority of trades and for direct entry into the workforce. Mathematics 31 is an introductory calculus course, and Mathematics 10-4 and 20-4 are Knowledge and Employability mathematics courses.[26]

Current graduation requirements for an Alberta High School Diploma include the successful completion of Mathematics 20-1, Mathematics 20-2, or Mathematics 20-3.[27]

Alberta Education is currently developing new Kindergarten to Grade 12 provincial curriculum in six subject areas: language arts (English, Français, French), mathematics, social studies, sciences, arts education, and wellness education. Current curriculum will remain in effect until future provincial curriculum is approved by the Minister of Education.[28]

[25] For information on Knowledge and Employability courses, see *Knowledge and Employability Mathematics Grades 8 and 9* (2009), p. 3, retrieved from **https://education.alberta.ca/media/1089020/kemath89.pdf.**
[26] On mathematics options, see **https://education.alberta.ca/media/564054/alberta_ed_fs_course-progression_en_revisedv3.pdf.**
[27] Information on graduation requirements, credentials, and credits can be found at **https://www.alberta.ca/graduation-requirements-credentials-and-credits.aspx.**
[28] For more information on curriculum development, see **https://www.alberta.ca/curriculum-development.aspx.**

Mathematics teaching

Alberta's mathematics program encourages students to develop mathematical reasoning and problem-solving skills and make connections between mathematics and its applications. It also builds students' confidence in their mathematical skills and their appreciation of the subject.[29]

As outlined in Alberta's *Mathematics, Kindergarten to Grade 9* program of studies, the following points are referenced in relation to beliefs about students and mathematics learning:

- Students are curious, active learners with individual interests, abilities, and needs.
- Learning through problem solving is the focus of mathematics at all levels.
- Students learn by attaching meaning to what they do, and they need to construct their own meaning of mathematics.
- Students' understanding of mathematics is best developed when they encounter mathematical experiences that proceed from the simple to the complex and from the concrete to the abstract.
- At all levels, students benefit from working with a variety of materials, tools, and contexts when constructing meaning about new mathematical ideas.
- Meaningful student discussions provide essential links among concrete, pictorial, and symbolic representations of mathematical concepts.
- Students need to explore problem-solving situations in order to develop personal strategies and become mathematically literate. They must realize that it is acceptable to solve problems in a variety of ways and that a variety of solutions may be acceptable.
- The learning environment should value and respect the diversity of students' experiences and ways of thinking so that students are comfortable taking intellectual risks, asking questions, and posing conjectures.
- The seven mathematical processes (communication, connections, mental mathematics and estimation, problem solving, reasoning, technology, and visualization) are critical components that students must encounter in a mathematics program in order to achieve the goals of mathematics education and embrace lifelong learning in mathematics.
- The components of the nature of mathematics (change, constancy, number sense, patterns, relationships, spatial sense, and uncertainty) are woven throughout the mathematics program of studies.

The learning outcomes of the programs of study for mathematics for Kindergarten to Grade 9 are organized into four strands: number, patterns and relations, shape and space, and statistics and

[29] See the Math 7–9 page on the Alberta Education website, at **https://education.alberta.ca/mathematics-7-9/program-of-studies/.**

probability. The program of studies for these grades is presented in terms of general outcomes and specific outcomes.

Each course sequence in the *Mathematics Grades 10–12* program of studies is arranged by topic. Furthermore, the focus of student learning is on developing conceptual and procedural understandings of mathematics, which must be directly related to each other.

Assessment

Student Learning Assessments (SLAs) are digital tests administered annually in English and Français/French language arts, and mathematics in English and French at the beginning of the school year in Grade 3. They assess outcomes related to literacy and numeracy in language arts and mathematics in Alberta's Grade 2 provincial programs of study. For the 2020–21 school year, SLAs were to be mandatory for all school authorities; however, SLAs were suspended due to the COVID-19 pandemic.[30]

Provincial Achievement Tests (PATs) are administered annually in English and French language arts, Français, mathematics, science, and social studies in Grades 6 and 9. Grade 9 Provincial Achievement Tests based on the Knowledge and Employability programs of study in English language arts, mathematics, science, and social studies are also administered. French versions of all mathematics, science, and social studies PATs are available for students in francophone schools and French immersion programs (Alberta Education, 2019, p. 3).

Information about student performance on PATs is provided to school staff, school authorities, parents, and the public so that they may know how well students in their schools are meeting local targets and provincial expectations. Teachers and administrators can use this information in planning and delivering relevant and effective instruction in relation to learning outcomes in Alberta's programs of study (Alberta Education, 2019, p. 8).

Alberta's provincial assessments, including SLAs, PATs, and diploma exams, assess many of the outcomes set out in the provincial programs of study, but they don't assess them all during a single administration.

Diploma examinations are administered for select Grade 12 courses at different times throughout the school year; the examinations for Mathematics 30-1 and Mathematics 30-2 are administered five times each year. As of September 1, 2015, provincial diploma examinations are weighted at 30 percent of a student's final mark. The current 70/30 weighting puts more emphasis on course work and school-awarded marks. It better reflects the broad range of work students put in over the entire course.[31]

For more information, refer to Alberta Education's website:

- **https://www.alberta.ca/education.aspx** (English)
- **https://www.alberta.ca/fr-CA/education.aspx** (Français)

[30] For information on student Learning Assessments, see **https://www.alberta.ca/student-learning-assessments.aspx.**
[31] For an overview of diploma exams, see **https://www.alberta.ca/diploma-exams-overview.aspx.**

Results in mathematics

This section presents PCAP 2019 results in mathematics for Alberta and Canada overall by performance levels and mean scores. Student achievement is reported in mathematics overall, by language of the school system, and by gender. This section concludes with a comparison of changes over time in mathematics achievement.

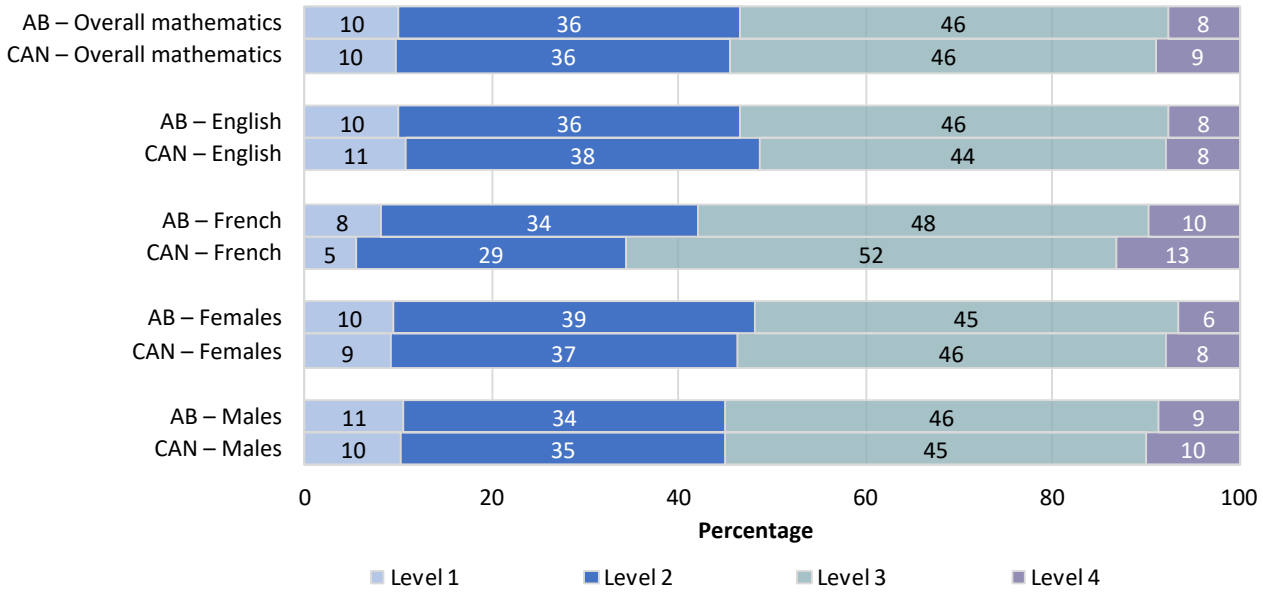
Results in mathematics by performance level

Figure AB.1 presents the results by performance level of students in Alberta and in Canada overall in the PCAP 2019 mathematics assessment. There was no significant difference between the percentage of students in Alberta and Canada overall that performed at or above Level 2 in mathematics (Level 2 is the baseline or expected level of mathematics proficiency for Grade 8 students). Eight percent of students in Alberta achieved the highest level of performance (Level 4), which was similar to the result for Canada overall (Appendix B.1.1).

Ninety percent of students in the English-language school system in Alberta and 92 percent of students in the French-language system achieved Level 2 or higher in mathematics, which was similar to the proportions observed for Canadian students overall in the two language groups. Within Alberta, a slightly higher proportion of francophone students than anglophone students achieved the expected proficiency level; however, this difference was not statistically significant (Appendix B.1.4b).

In Alberta, 90 percent of girls and 89 percent of boys performed at Level 2 or above in mathematics, which is similar to the proportions by gender for Canadian students overall. No gender gap was found in the province in the proportion of students achieving Level 2 or above or the highest performance level (Level 4) (Appendix B.1.8b).

Figure AB.1 Canada–Alberta: percentage of students at each performance level in mathematics



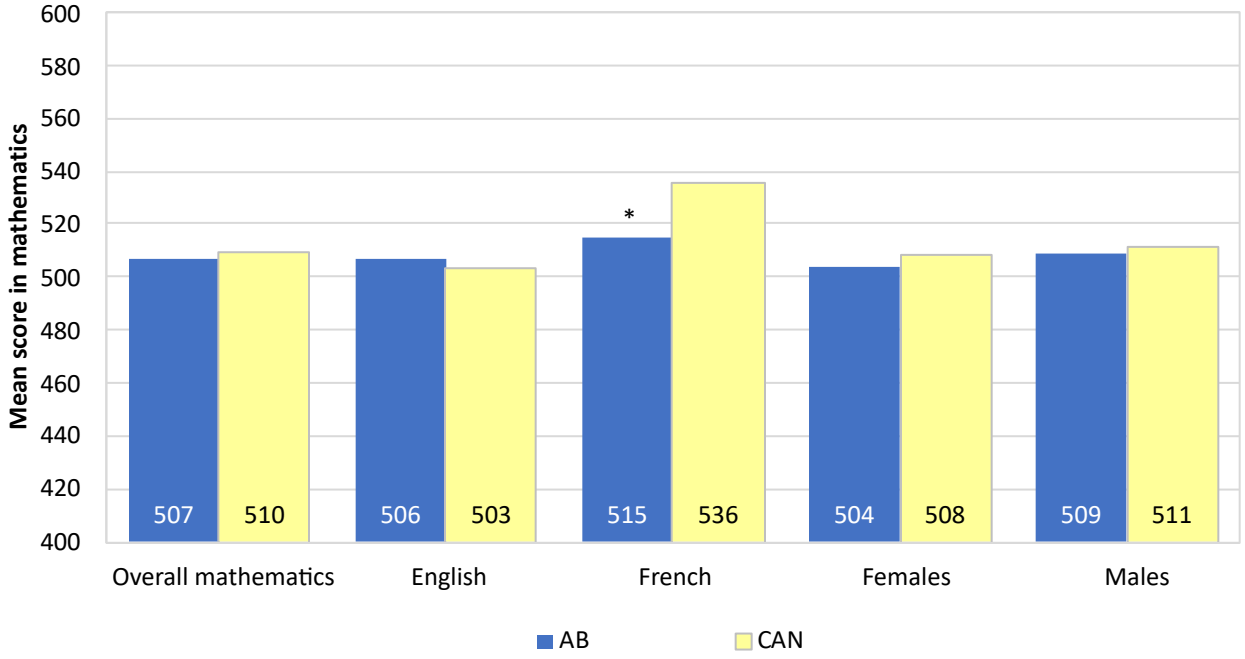
Results in mathematics by mean score

Figure AB.2 summarizes the results by mean score of the PCAP mathematics assessment for students in Alberta and Canada overall and by language of the school system and gender. It shows that Alberta students achieved scores similar to the Canadian mean for mathematics overall (Appendix B.1.2).

Students in the province's French-language schools had a mean score lower than the Canadian French mean, while students in English-language schools had a score similar to the Canadian English mean. Within the province, the mathematics results for the two language systems were similar. This finding contrasts with the results at the pan-Canadian level, where francophone students obtained significantly higher scores than their anglophone counterparts in mathematics (Appendix B.1.5).

Girls and boys in Alberta both obtained mean scores in mathematics similar to those of girls and boys across Canada (Appendix B.1.9). Within the province, there was no gender gap in mathematics, which is consistent with the results at the pan-Canadian level.

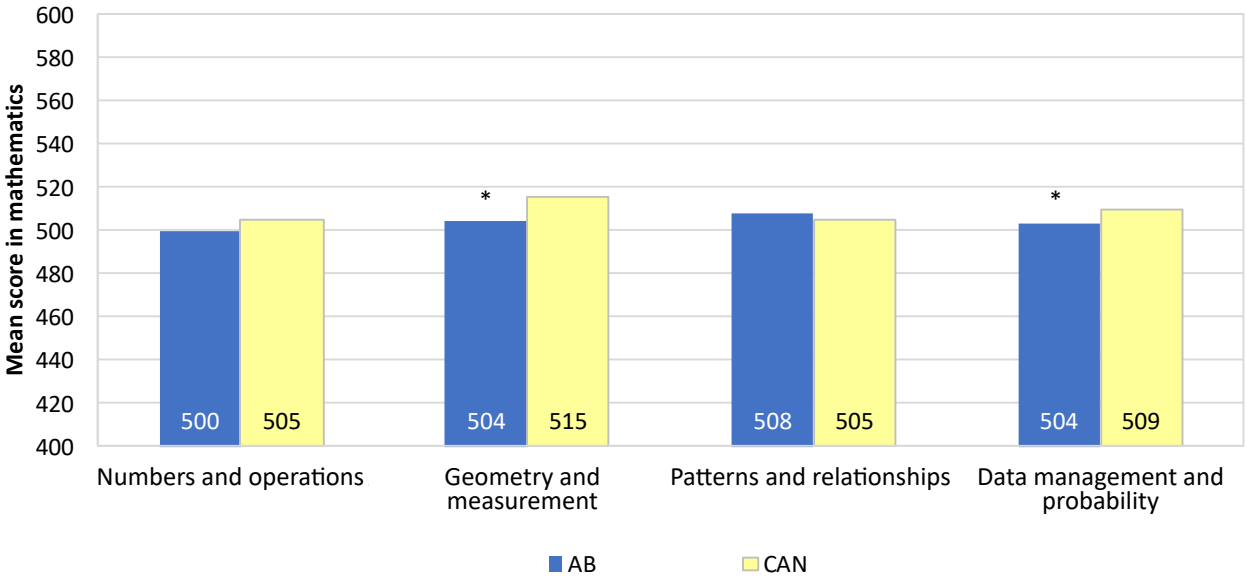
Figure AB.2 Canada–Alberta: mean scores in mathematics



* Denotes significant difference compared to Canada

Figure AB.3 presents the mean scores in mathematics by subdomain for Alberta and Canada overall. Students in the province achieved results significantly below the respective Canadian means in two subdomains: *geometry and measurement* and *data management and probability*, while results in the other two subdomains were similar to the Canadian average. Within the province, the strongest results were observed for the *patterns and relationships* subdomain (Appendix B.1.3).

Figure AB.3 Canada–Alberta: mean scores in mathematics subdomains



* Denotes significant difference compared to Canada

Across all subdomains, students in English-language schools in Alberta had achievements scores similar to the Canadian English means. Students in French-language schools had lower results compared to the respective Canadian French means in all subdomains except *patterns and relationships*, where results for the two groups were similar. Francophone students in Alberta outperformed their anglophone peers in all subdomains except *patterns and relationships*, where the results were similar between the two language groups (Table AB.1, Appendix B.1.6).

Table AB.1 Canada–Alberta: mean scores in mathematics subdomains by language of the school system

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN English	497	1.7	507	1.5	503	1.4	501	0.9
AB English	500	3.2	504	2.8	508	2.7	503	2.0
Difference	-3		3		-5		-2	
CAN French	534	2.6	544	2.3	512	1.9	541	1.9
AB French	518	3.0	519	3.7	511	3.1	532	2.8
Difference	16*		25*		1		9*	
AB English	500	3.2	504	2.8	508	2.7	503	2.0
AB French	518	3.0	519	3.7	511	3.1	532	2.8
Difference	-18*		-15*		-2		-29*	

* Denotes significant difference

Table AB.2 compares mathematics achievement scores in Alberta and Canada in each of the subdomains by gender. In the *geometry and measurement* subdomain, scores for both girls and boys in Alberta were lower than those for these cohorts in Canada overall. Girls in Alberta also had lower scores than girls in Canada overall in the d*ata management and probability* subdomain. In the remaining subdomains, Alberta students obtained results similar to the Canadian means. Within the province, boys outperformed girls in the *patterns and relationships* subdomain, while there was no gender gap in the remaining subdomains (Table AB.2, Appendix B.1.10).

Table AB.2 Canada–Alberta: mean scores in mathematics subdomains by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN female	504	1.7	514	1.5	504	1.3	508	1.0
AB female	500	3.4	503	2.9	505	3.0	502	2.4
Difference	4		11*		-1		7*	
CAN male	507	1.6	516	1.5	506	1.5	510	1.0
AB male	501	3.6	505	3.3	512	2.9	505	2.2
Difference	6		10*		-5		5	
AB female	500	3.4	503	2.9	505	3.0	502	2.4
AB male	501	3.6	505	3.3	512	2.9	505	2.2
Difference	-1		-2		-7*		-4	

* Denotes significant difference

Comparison of results over time

In PCAP, changes over time are determined by comparing the current assessment year to the baseline year — that is, the first year in which the subject was the primary focus of the assessment. For PCAP mathematics, the baseline year was 2010. In the baseline year, a larger number of items are administered in the major domain, which allows a broader coverage of the PCAP framework.

Table AB.3 and Figure AB.4 present a summary of the changes over time in achievement in mathematics in Alberta. From the baseline year in 2010, achievement in overall mathematics in the province increased in 2019 by 11 points (Appendix B.1.11). Additionally, there was a positive change in all subdomains except *numbers and operations*, where results were stable (Appendix B.1.14). At the pan-Canadian level, a positive change in achievement was found for mathematics overall and in each of the subdomains in 2019 compared to 2010 (Appendices B.1.11, B.1.14).

Mathematics results for both English- and French-language schools in Alberta were higher in 2019 than in 2010. These findings reflect the trends in both school systems in Canada as a whole (Appendix B.1.12).

Mathematics results for girls in Alberta improved in 2019 compared to 2010, while the results for boys were stable. By contrast, at the pan-Canadian level, changes in mathematics scores were positive for both girls and boys in 2019 compared to 2010 (Appendix B.1.13).

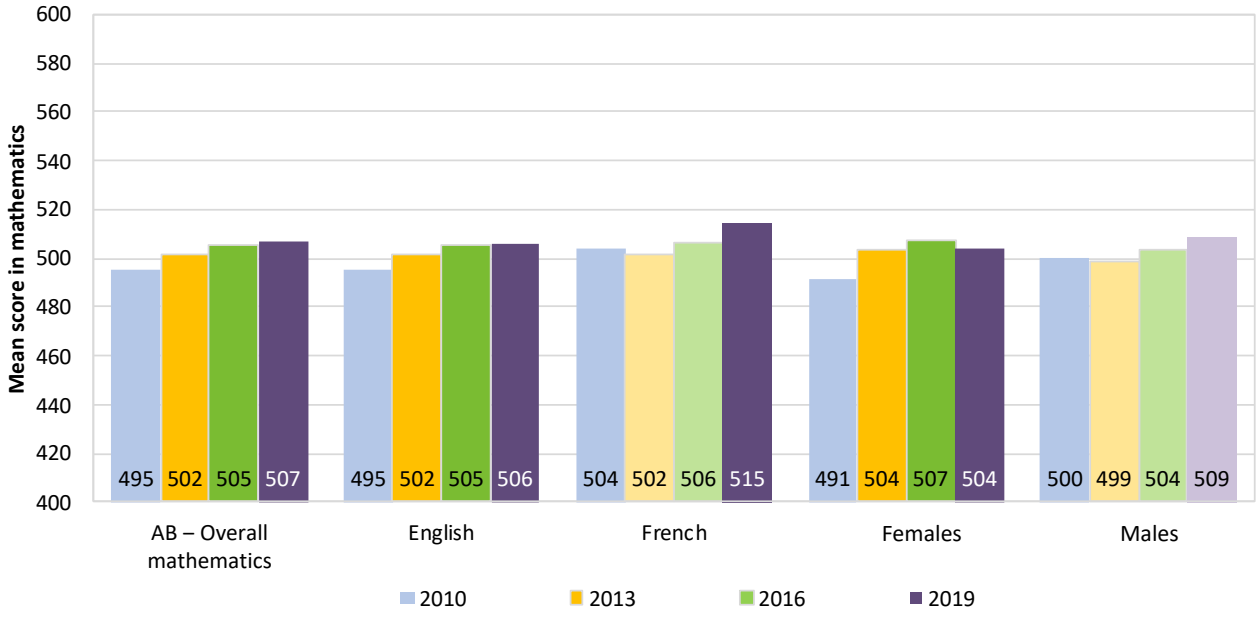
Data tables in Appendix B report results over time for the mathematics subdomains by language of the school system (Appendix B.1.15) and by gender (Appendix B.1.16).

Table AB.3 Alberta: summary of achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
AB - Overall mathematics	495	507	11*
Numbers and operations	501	500	-1
Geometry and measurement	485	504	20*
Patterns and relationships	495	508	14*
Data management and probability	496	504	8*
Anglophone school system	495	506	11*
Francophone school system	504	515	10*
Achievement gap (A - F)	-9	-8	
Females	491	504	13*
Males	500	509	8
Achievement gap (F - M)	-9	-5	

* Denotes significant difference compared to the baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Figure AB.4 Alberta: mean scores in mathematics, 2010–2019



Note: Darker shades denote significant difference compared to the baseline year 2010

Results in reading and science

As noted in the Introduction, reading and science are both minor domains in PCAP 2019. Results for these domains are reported by mean scores only. This section presents reading and science scores for Alberta, compares those scores with pan-Canadian results, reports results by language of the school system and by gender, and presents multiple comparisons over time.

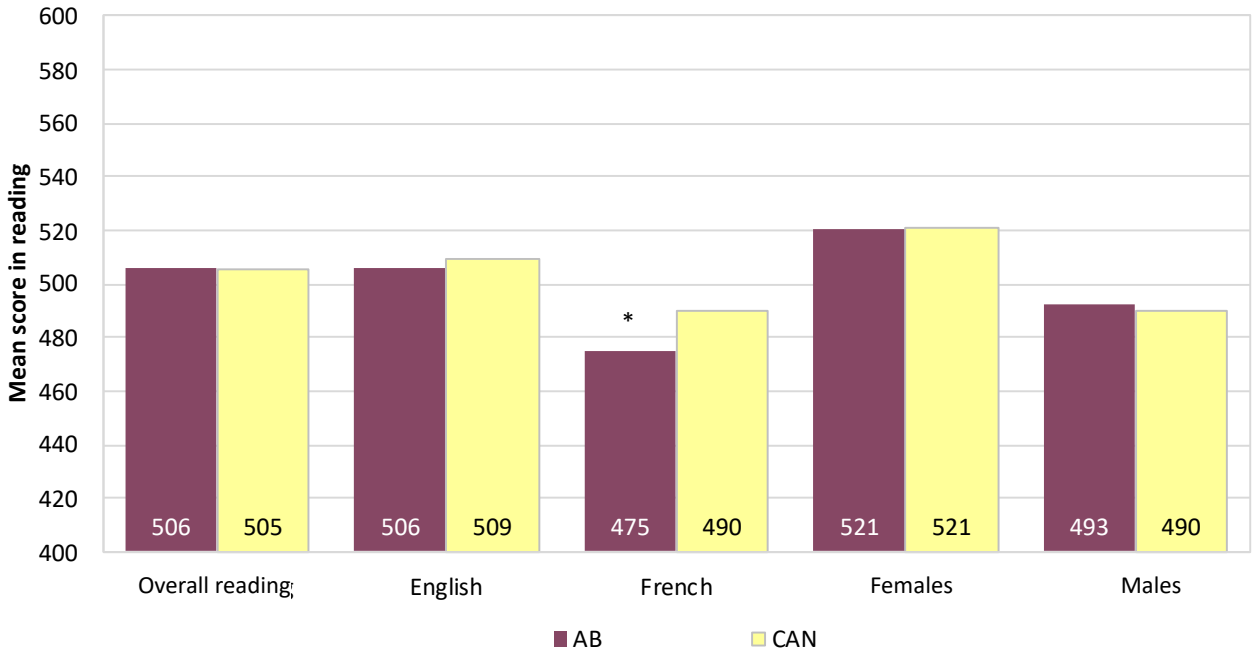
Results in reading

Figure AB.5 displays mean scores in reading overall in Alberta and Canada, as well as by language of the school system and gender. In PCAP 2019, students in Alberta had scores similar to the Canadian mean in reading overall (Appendix B.2.1).

Reading achievement in Alberta's anglophone schools was statistically similar to the Canadian English mean, while achievement in the francophone system was significantly below the Canadian French mean. Within the province, as was the case at the pan-Canadian level, students enrolled in English-language schools outperformed their French-language counterparts in reading (Appendix B.2.2).

In Alberta, boys and girls achieved scores in reading that were statistically similar to the Canadian mean for their respective cohorts. Within the province, girls significantly outperformed boys in reading, which reflects the trend at the pan-Canadian level (Appendix B.2.3).

Figure AB.5 Canada–Alberta: mean scores in reading



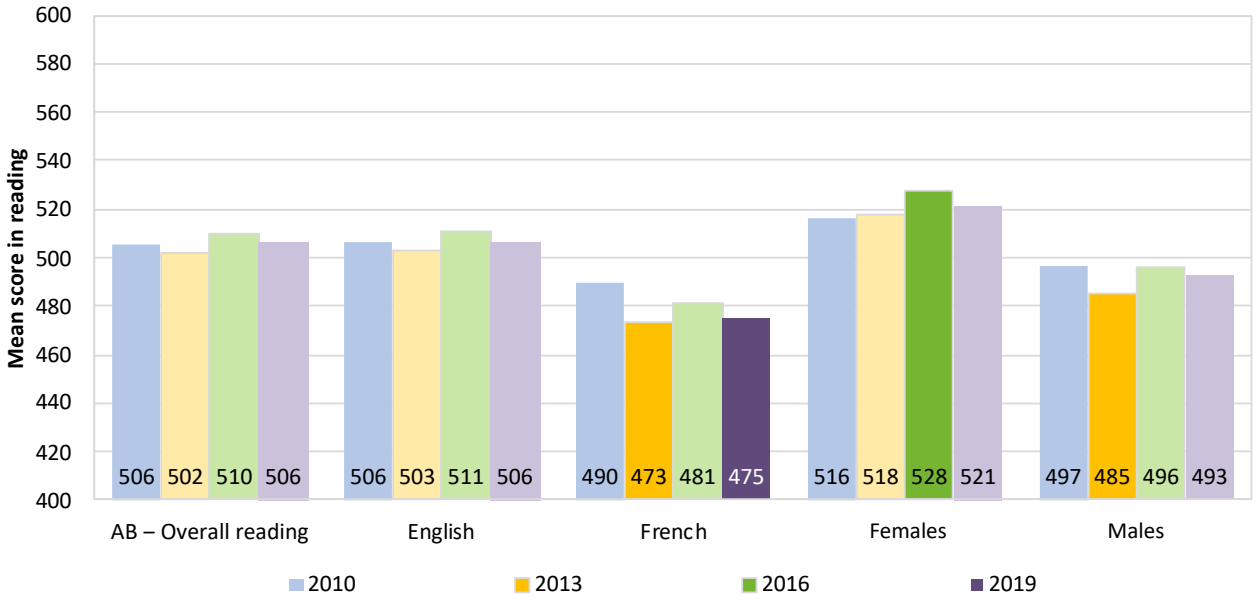
* Denotes significant difference compared to Canada

Figure AB.6 shows reading achievement over time for students in Alberta. As explained in Chapter 2, although reading was the major domain in PCAP 2007, the baseline year for reading was adjusted to 2010, when the PCAP target group changed from 13-year-old students to Grade 8 students. The mean scores of Alberta students in PCAP 2019 were similar to those in the baseline year 2010 (Appendix B.2.4).

In PCAP 2019, reading achievement results for students in English-language schools in Alberta were not statistically different from those obtained 2010. In French-language schools, reading results declined by 15 points. In Canada overall, mean scores of anglophone students were stable, while a positive change was found for francophone students (Appendix B.2.5).

In Alberta, both boys' and girls' 2019 reading scores were statistically similar to those obtained in 2010. At the pan-Canadian level, a positive change was found for girls' scores, while boys' scores were stable (Appendix B.2.6).

Figure AB.6 Alberta: mean scores in reading, 2010–2019



Note: Darker shades denote significant difference compared to the adjusted baseline year 2010

Results in science

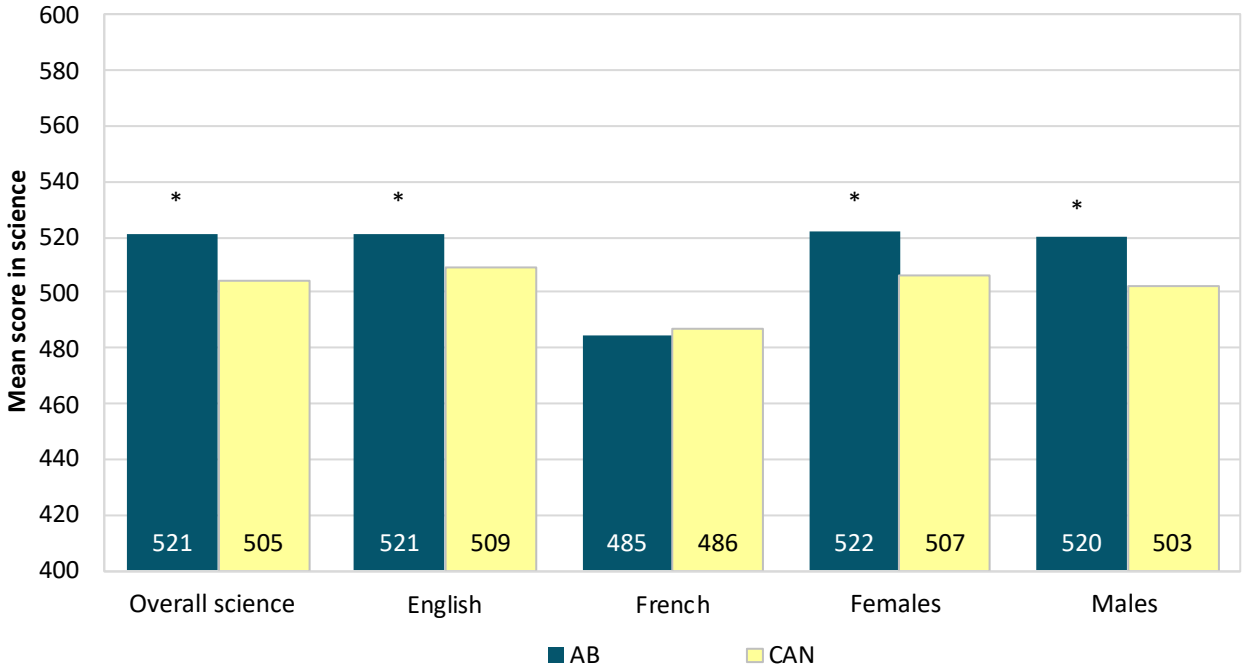
Figure AB.7 shows mean scores in science overall in Alberta and Canada, as well as by language of the school system and gender. The performance of Alberta students in PCAP science was significantly higher than that of Canadian students overall (Appendix B.3.1).

In Alberta, students in English-language schools achieved significantly higher scores in science compared to the Canadian English mean, while the results for students in French-language schools were similar to those of francophones in Canada overall. Anglophone students outperformed their

francophone counterparts within the province, a finding similar to that at the pan-Canadian level (Appendix B.3.2).

Both girls and boys in Alberta scored above the Canadian mean in science in 2019. There was no gender gap in science in the province, a result that differs from that in Canada overall, where girls achieved significantly higher scores than boys in science (Appendix B.3.3).

Figure AB.7 Canada–Alberta: mean scores in science



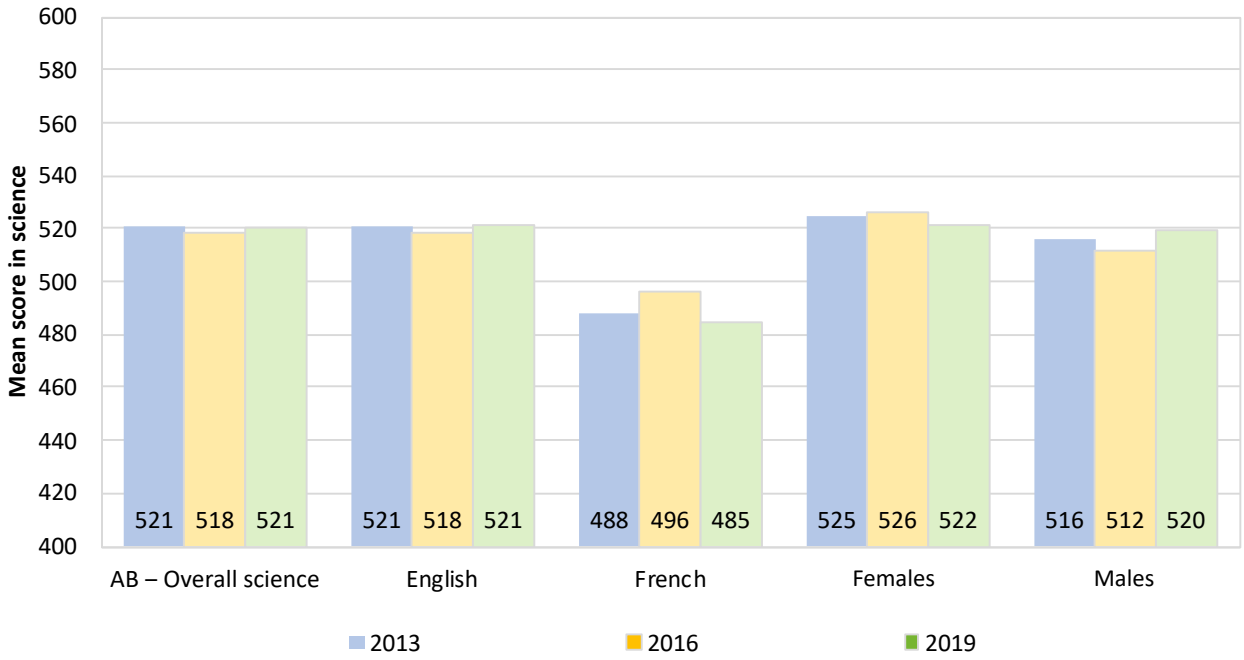
*Denotes significant difference compared to Canada

As shown in Figure AB.8, in Alberta, there was no change in overall science achievement scores in PCAP 2019 compared to the baseline year of 2013. This differs from the pattern observed at the pan-Canadian level, where performance improved over this time period (Appendix B.3.4).

Students enrolled in both the English- and French-language school systems in Alberta had no change in performance in science over time. For Canada overall, anglophone schools saw a positive change in 2019 over 2013, while francophone schools had stable results (Appendix B.3.5).

In Alberta, both girls and boys had similar scores in PCAP 2019 compared to the 2013 baseline. In Canada overall, girls showed improvement, while boys' results were stable (Appendix B.3.6).

Figure AB.8 Alberta: mean scores in science, 2013–2019



Note: There were no significant changes over time in Alberta in any of these categories.

SASKATCHEWAN

Context statement

Social context

Saskatchewan has a population of just over 1.1 million, the largest number in the past 60 years. The population is spread throughout a vast geographic area. About half of Saskatchewan's population live in towns, villages, rural municipalities, or on First Nation reserves, providing a strong rural influence in the province. Potash and uranium mining, oil production, agriculture, and forestry are the major industries. Saskatchewan has a diverse cultural and ethnic heritage, including a large and growing First Nation and Métis population and an increased number of immigrants from around the world.

Organization of the school system

Saskatchewan has approximately 202,000 students in Kindergarten to Grade 12. About 90 percent of elementary/secondary students attend 745 publicly funded provincial schools; 7 percent attend First Nation schools, postsecondary institution Adult Secondary Programs, or custody or care schools, or are home-schooled. The average class size is 19.2 students, with the typical rural classroom having about two to three fewer students than the typical urban classroom.

Mathematics teaching

The aim of the mathematics program in Saskatchewan is to graduate individuals who value mathematics and appreciate its role in society. The program seeks to prepare students to cope confidently and competently with everyday situations that demand the use of mathematical concepts, including interpreting quantitative information, estimating, performing calculations mentally, measuring, understanding spatial relationships, and problem solving. The mathematics program is intended to stimulate the spirit of inquiry within the context of mathematical thinking and reasoning. Students experience mathematics through various strands: numbers, patterns and relations, shape and space, and statistics and probability.

Students are encouraged to challenge the boundaries of their experiences and to view mathematics as a set of tools and a way of thinking that every society develops to meet its particular needs.

Experiencing broad-based mathematics through exploration of, and interactions in, interesting and relevant situations provides all students with the mathematical preparation essential to:

- develop and be able to apply mathematical reasoning processes, skills, and strategies to new situations and problems;

- develop an understanding of the meaning of, relationships between, properties of, roles of, and representations (including symbolic) of numbers, and apply this understanding to new situations and problems; and

- develop an understanding of 2-D shapes and 3-D objects and the relationships between geometrical shapes and objects and numbers, and apply this understanding to new situations and problems.

Assessment

Classroom teachers in Saskatchewan are responsible for assessment, evaluation, and promotion of students from Kindergarten through Grade 11. At the Grade 12 level, final marks are determined in two ways. In courses taught by non-accredited teachers, the teacher is responsible for determining 60 percent of each student's final mark; the remaining 40 percent is determined by a provincial examination administered by the Ministry of Education. In contrast, accredited teachers who are teaching Grade 12 courses are responsible for determining 100 percent of each student's final mark in those courses.

To support the teaching and learning of mathematics, the development of *Sample Math Outcome Questions: An Assessment Resource for Teachers* began in 2019. This resource provides possible questions, sample responses, and rubrics for classroom instruction and assessment. Its use is not mandatory, and teachers can adapt questions to meet the individual needs of students. The resource is designed to elicit responses that inform teachers' understanding of the concepts that students need to know and understand and the skills that they are able to use. It is intended to provide only one of many forms of evidence that teachers collect in order to report on student outcomes. Sample questions for all Grade 1–9 mathematics outcomes will be completed by 2021.

In all grades, students are assessed on the full range of knowledge, skills, attitudes, and values that are reflected in the curriculum. Teachers are encouraged to develop diversified evaluation plans that reflect the various instructional methods they use in adapting instruction to each class and to each student.

For more information about education in Saskatchewan, visit the Ministry of Education's website at **http://www.saskatchewan.ca/residents/education-and-learning.**

Results in mathematics

This section presents PCAP 2019 results in mathematics for Saskatchewan and Canada overall by performance levels and mean scores. Student achievement is reported in mathematics overall, by language of the school system, and by gender. This section concludes with a comparison of changes over time in mathematics achievement.

Results in mathematics by performance level

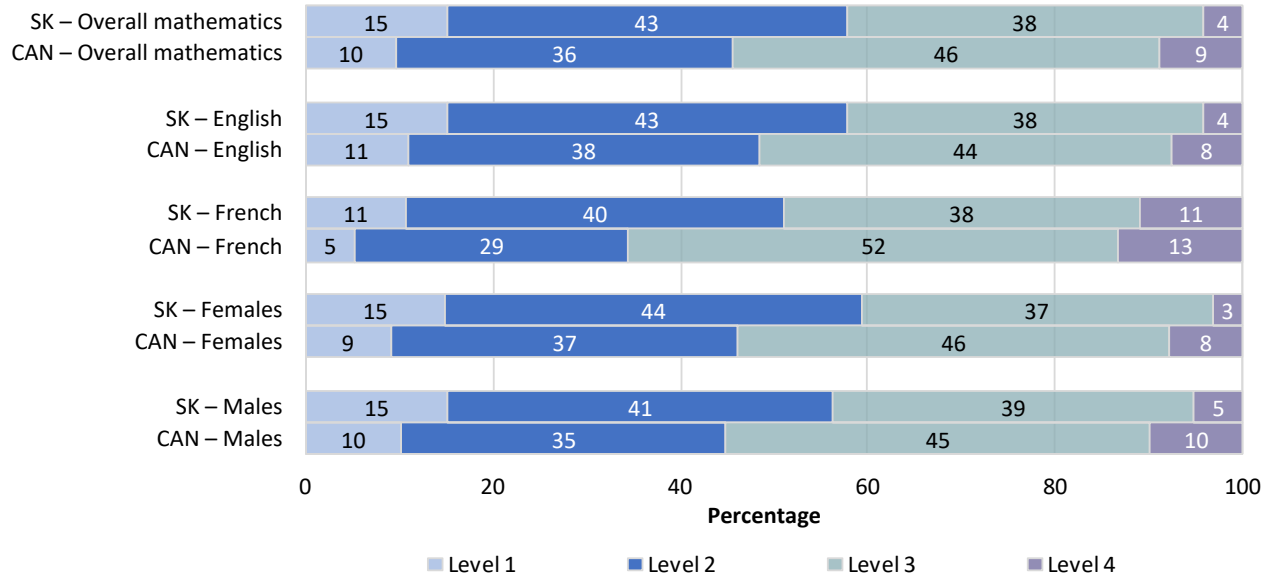
Figure SK.1 presents the results by performance level of students in Saskatchewan and in Canada overall in the PCAP 2019 mathematics assessment. In the province, 85 percent of students performed at or above Level 2 in mathematics (Level 2 is the baseline or expected level of mathematics proficiency for Grade 8 students), and 4 percent of students achieved the highest level of performance (Level 4). These proportions were lower than those of Canadian students overall (Appendix B.1.1).

Eighty-five percent of students in the English-language school system and 89 percent of students in the French-language school system in Saskatchewan attained Level 2 or higher in mathematics.

For both language groups, the proportion of students who reached expected proficiency was lower than that of students in the two language groups in Canada overall. Within the province, more francophone students than anglophone students achieved Level 2 or higher, a pattern consistent with the performance levels by language group for Canada as a whole (Appendix B.1.4b).

In Saskatchewan, 85 percent of both girls and boys performed at Level 2 or above in mathematics, which is lower than the proportions by gender observed for Canadian students overall (91 and 90 percent, respectively) (Appendix B.1.8b).

Figure SK.1 Canada–Saskatchewan: percentage of students at each performance level in mathematics



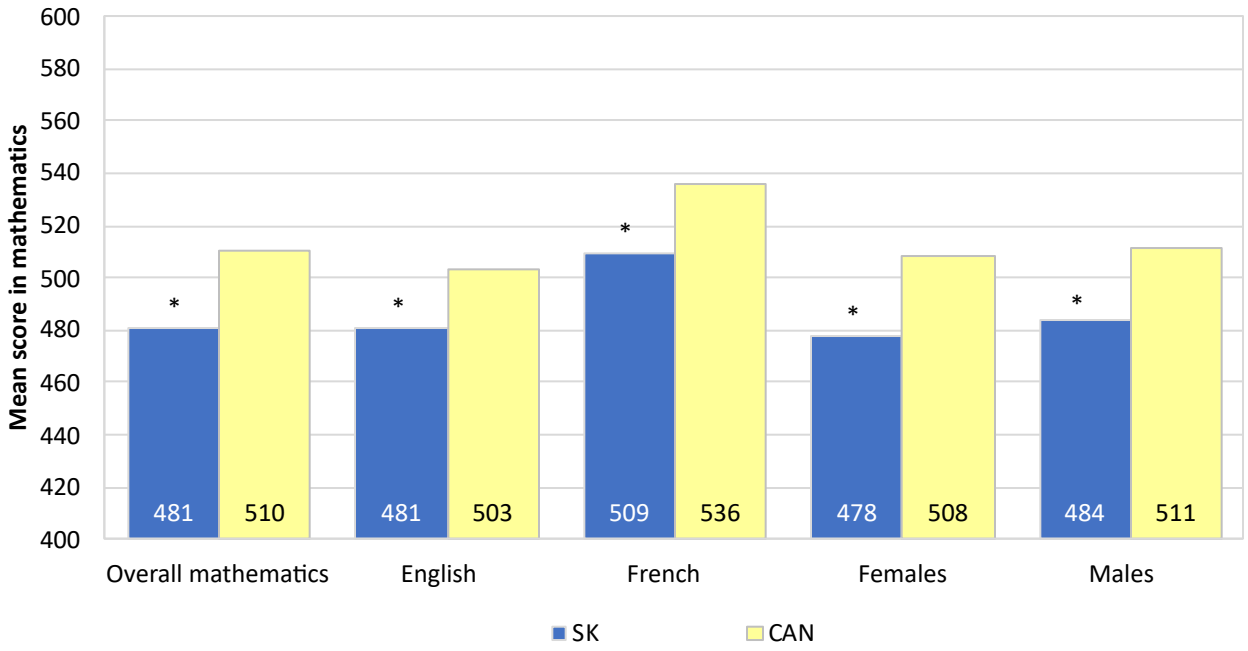
Results in mathematics by mean score

Figure SK.2 summarizes the results by mean score of the PCAP mathematics assessment for students in Saskatchewan and Canada overall and by language of the school system and gender. It shows that Saskatchewan students achieved below the Canadian mean in mathematics overall (Appendix B.1.2).

Students in both English-language and French-language schools in Saskatchewan had scores in mathematics that were lower than the respective Canadian averages. Within the province, students enrolled in francophone schools outperformed their peers in anglophone schools, which is consistent with the pattern observed at the pan-Canadian level (Appendix B.1.5).

Girls and boys in Saskatchewan both scored below the respective Canadian means in mathematics. No gender gap was found within the province, which is consistent with the trend at the pan-Canadian level (Appendix B.1.9).

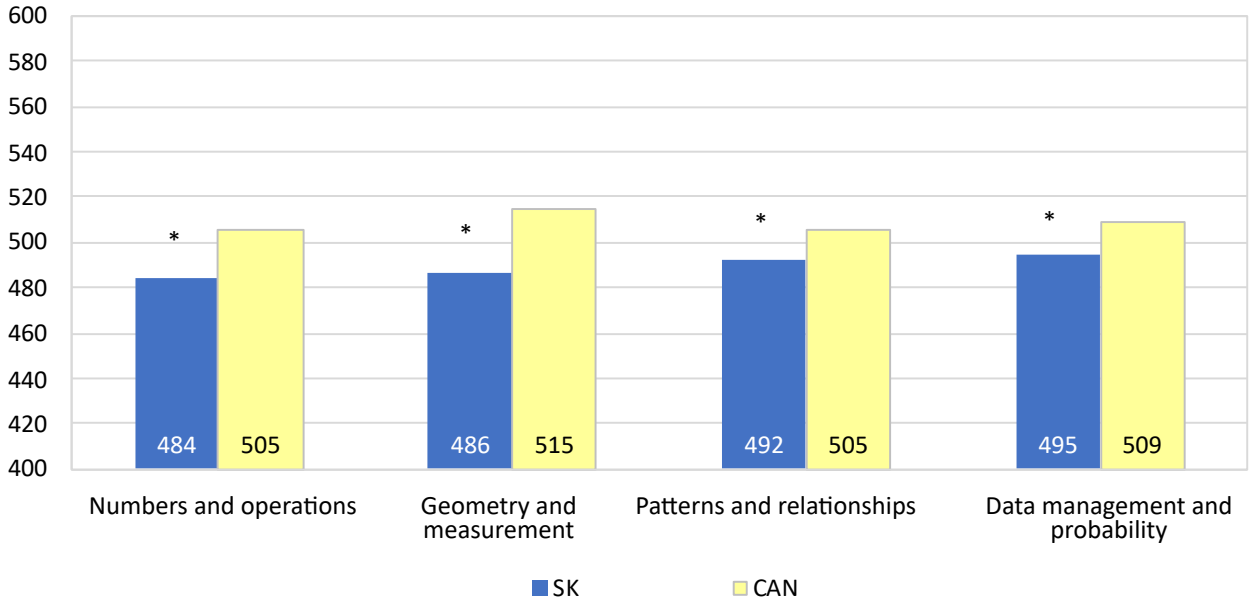
Figure SK.2 Canada–Saskatchewan: mean scores in mathematics



* Denotes significant difference compared to Canada

Figure SK.3 presents the results in mathematics by subdomain for Saskatchewan and Canadian students. Students in the province achieved results below the respective Canadian means in each of the four subdomains. Saskatchewan students had the strongest results in the *patterns and relationships* and *data management and probability* subdomains (Appendix B.1.3).

Figure SK.3 Canada–Saskatchewan: mean scores in mathematics subdomains



* Denotes significant difference compared to Canada

Examination of achievement scores in the subdomains by language of the school system reveals that students in both French- and English-language school systems in the province obtained scores below the Canadian means for the respective language groups in all four subdomains. In Saskatchewan, students enrolled in the French-language school system achieved higher scores than those in the English-language system in all four subdomains (Table SK.1, Appendix B.1.6).

Table SK.1 Canada–Saskatchewan: mean scores in mathematics subdomains by language of the school system

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN English	497	1.7	507	1.5	503	1.4	501	0.9
SK English	484	2.6	486	2.0	492	1.9	494	1.6
Difference	13*		21*		11*		7*	
CAN French	534	2.6	544	2.3	512	1.9	541	1.9
SK French	519	0.0	508	0.0	505	0.0	534	0.0
Difference	16*		37*		7*		7*	
SK English	484	2.6	486	2.0	492	1.9	494	1.6
SK French	519	0.0	508	0.0	505	0.0	534	0.0
Difference	-35*		-22*		-13*		-40*	

* Denotes significant difference

Table SK.2 shows subdomain scores for Saskatchewan and Canadian students by gender. In Saskatchewan, both girls and boys achieved below the Canadian mean in all subdomains. Within the province, boys outperformed girls in two subdomains: *geometry and measurement* and *data management and probability*. No gender gap was found in the other two subdomains (Appendix B.1.10).

Table SK.2 Canada–Saskatchewan: mean scores in mathematics subdomains by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN female	504	1.7	514	1.5	504	1.3	508	1.0
SK female	482	2.7	483	2.1	490	2.2	492	1.8
Difference	22*		31*		14*		16*	
CAN male	507	1.6	516	1.5	506	1.5	510	1.0
SK male	487	3.2	489	2.4	493	2.4	497	2.1
Difference	20*		27*		13*		14*	
SK female	482	2.7	483	2.1	490	2.2	492	1.8
SK male	487	3.2	489	2.4	493	2.4	497	2.1
Difference	-5		-6*		-3		-5*	

* Denotes significant difference

Comparison of results over time

In PCAP, changes over time are determined by comparing the current assessment year to the baseline year — that is, the first year in which the subject was the primary focus of the assessment. For PCAP mathematics, the baseline year was 2010. In the baseline year, a larger number of items are administered in the major domain, which allows a broader coverage of the PCAP framework.

Table SK.3 and Figure SK.4 present a summary of the changes over time for mathematics achievement scores in the province. Overall mathematics results in 2019 were similar to those in the baseline year. There was a positive change in all subdomains except *numbers and operations*; there, the results show no change. At the pan-Canadian level, a positive change in achievement was found for mathematics overall and in each of the subdomains (Appendices B.1.11, B.1.14).

Results for English-language schools in Saskatchewan in 2019 were similar to those in 2010, while scores increased in French-language schools. For Canada as a whole, both anglophone and francophone school systems had significant increases in mean scores (Appendix B.1.12).

In PCAP 2019, girls and boys in Saskatchewan both obtained mathematics scores similar to those achieved in 2010. By contrast, at the pan-Canadian level, change in mathematics was positive for both girls and boys (Appendix B.1.13).

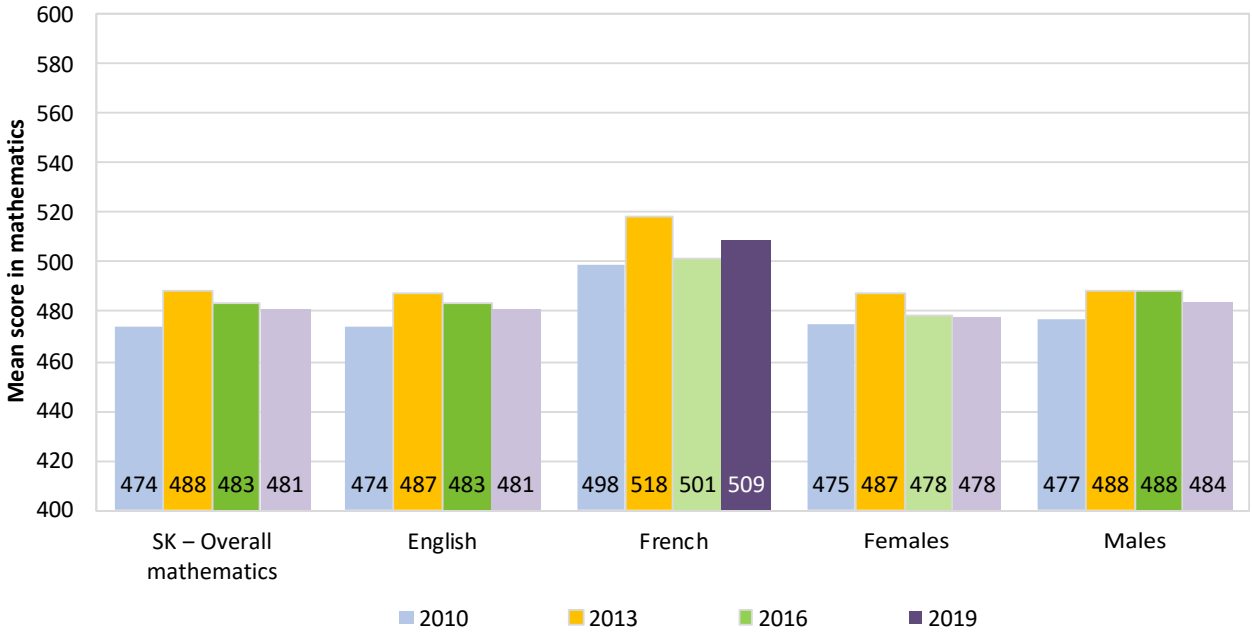
Data tables in Appendix B report results over time for the mathematics subdomains by language of the school system (Appendix B.1.15) and by gender (Appendix B.1.16).

Table SK.3 Saskatchewan: summary of achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
SK - Overall mathematics	474	481	7
Numbers and operations	488	484	-3
Geometry and measurement	464	486	22*
Patterns and relationships	473	492	19*
Data management and probability	477	495	17*
Anglophone school system	474	481	7
Francophone school system	498	509	11*
Achievement gap (A - F)	-25	-29	
Females	475	478	3
Males	477	484	7
Achievement gap (F - M)	-2	-6	

* Denotes significant difference compared to the baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Figure SK.4 Saskatchewan: mean scores in mathematics, 2010–2019



Note: Darker shades denote significant difference compared to the baseline year 2010

Results in reading and science

As noted in the Introduction, reading and science are both minor domains in PCAP 2019. Results for these domains are reported by mean scores only. This section presents reading and science scores for Saskatchewan, compares those scores with pan-Canadian results, reports results by language of the school system and by gender, and presents multiple comparisons over time.

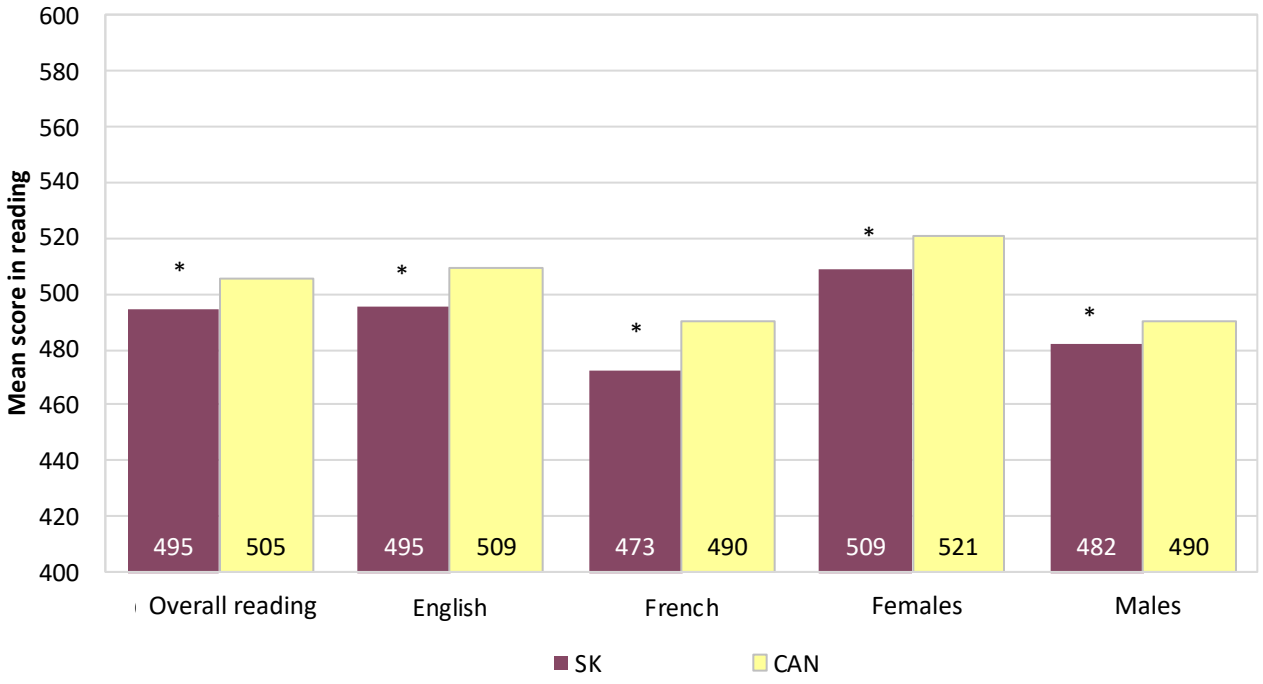
Results in reading

Figure SK.5 shows mean scores in reading overall in Saskatchewan and Canada, as well as by language of the school system and gender. In PCAP 2019, students in Saskatchewan achieved a mean score in reading significantly below that of Canadian students overall (Appendix B.2.1).

Students in both anglophone and francophone school systems in Saskatchewan achieved scores in reading lower than the Canadian mean scores for these respective groups. Within the province, students in English-language schools outperformed students in the French-language schools, a result consistent with that at the pan-Canadian level (Appendix B.2.2).

In Saskatchewan, the reading scores of both girls and boys were lower than the Canadian means by gender. Within the province, girls attained significantly higher scores than boys, which reflects the trend at the pan-Canadian level (Appendix B.2.3).

Figure SK.5 Canada–Saskatchewan: mean scores in reading



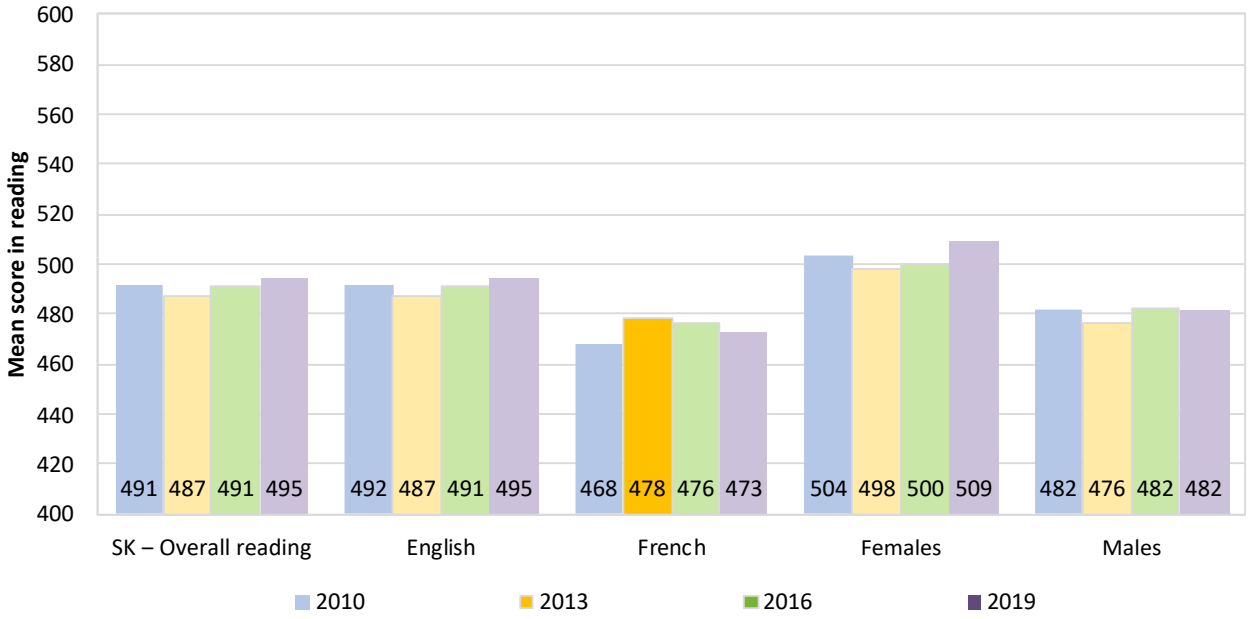
* Denotes significant difference compared to Canada

Figure SK.6 shows reading achievement over time for students in Saskatchewan. As explained in Chapter 2, although reading was the major domain in PCAP 2007, the baseline year for reading was adjusted to 2010, when the PCAP target group changed from 13-year-old students to Grade 8 students. The results of Saskatchewan students in reading achievement were stable between 2019 and the baseline year of 2010 (Appendix B.2.4).

In Saskatchewan, in both the anglophone and francophone school systems, results in reading achievement in 2019 were statistically similar to those in the baseline year. In Canada overall, the mean scores of anglophone students were stable, while the scores of francophone students showed a positive change (Appendix B.2.5).

The mean scores of boys and girls in Saskatchewan in 2019 showed no statistical change compared to those in 2010. At the pan-Canadian level, girls showed a positive change in achievement, while boys' scores were steady (Appendix B.2.6).

Figure SK.6 Saskatchewan: mean scores in reading, 2010–2019



Note: Darker shade denotes significant difference compared to the adjusted baseline year 2010

Results in science

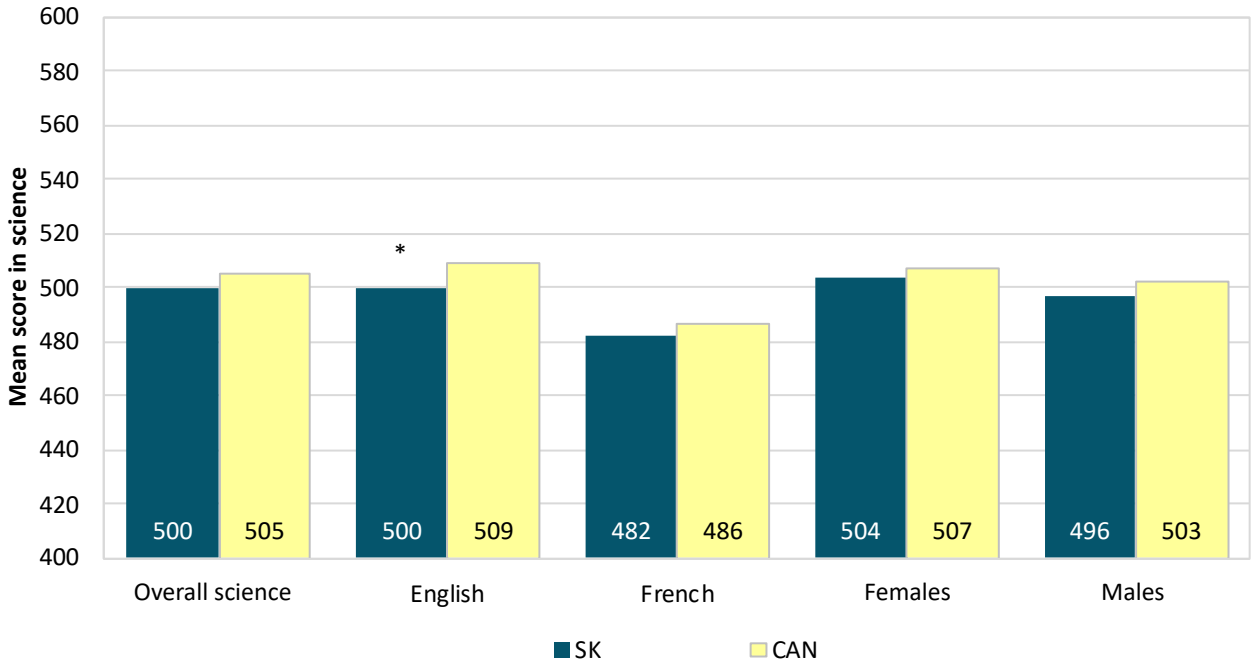
Figure SK.7 summarizes the results by mean score in the PCAP science assessment for students in Saskatchewan and Canada overall, as well as by language of the school system and gender. Students in the province achieved scores statistically similar to the Canadian mean in science overall (Appendix B.3.1).

Students in English-language schools in Saskatchewan obtained scores in science below the Canadian mean for anglophone students, while students in French-language schools had scores similar to those

of francophone students in Canada overall. Within the province, anglophone students outperformed francophone students, which reflects the results at the pan-Canadian level (Appendix B.3.2).

In Saskatchewan, both girls and boys scored at the Canadian mean in science for their corresponding cohorts in 2019. Within the province, girls outperformed boys in science achievement, which is consistent with the trend for Canada overall (Appendix B.3.3).

Figure SK.7 Canada–Saskatchewan: mean scores in science



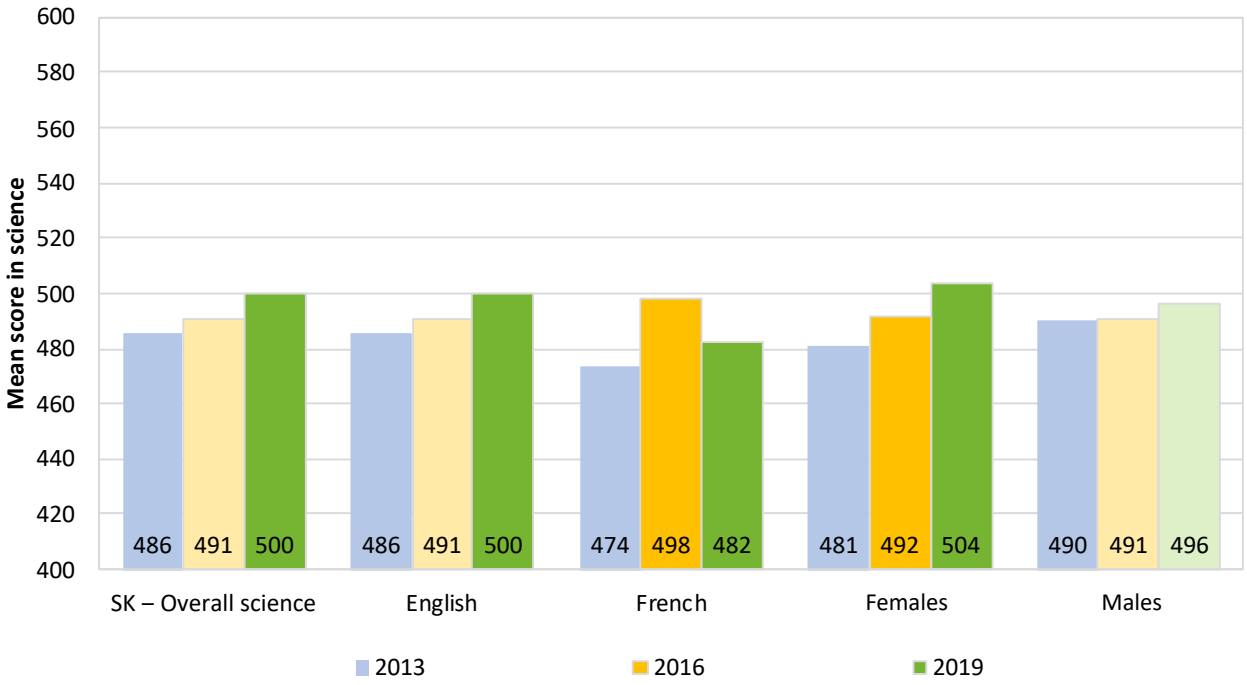
* Denotes significant difference compared to Canada

Figure SK.8 presents science achievement scores over time for Saskatchewan. In PCAP 2019, students in Saskatchewan had higher scores than those in the baseline year of 2013, a pattern similar to that at the pan-Canadian level (Appendix B.3.4).

Science scores in Saskatchewan were higher in both English- and French-language school systems in 2019 compared to 2013. For Canada overall, anglophone school systems showed improvement while francophone school systems had stable results (Appendix B.3.5).

The 2019 science scores of girls in Saskatchewan showed positive change compared to the 2013 baseline, while achievement for boys was stable. These findings are consistent with results for the respective groups at the pan-Canadian level (Appendix B.3.6).

Figure SK.8 Saskatchewan: mean scores in science, 2013–2019



Note: Darker shades denote significant difference compared to the baseline year 2013

MANITOBA

Context statement

Social context

Manitoba has a population of approximately 1.4 million people, about 54 percent of whom reside in the capital city of Winnipeg. Manitoba's population comprises a wide range of ethnic and cultural groups, including a strong Franco-Manitoban community and an Indigenous community, in both rural and urban areas. Manitoba has a broad and diverse economic base.

Organization of the school system

Manitoba's public and funded independent school system enrols about 199,000 students in Kindergarten to Grade 12 and employs about 15,000 teachers in 37 school divisions and funded independent schools. Students may choose courses from four school programs — the English Program, the Français Program (about 3 percent of students), the French Immersion Program (about 12 percent of students), and the Senior Years Technology Education Program. Children whose parents are French language right holders (as defined by section 23 of the Canadian Charter of Rights and Freedoms) may enrol in the Division scolaire franco-manitobaine (DSFM), which offers the Français Program. Individuals who do not fulfill these criteria may still submit an application to the DSFM, which is reviewed by the school board. Other educational options include non-funded independent schools, home-schooling, and federally funded on-reserve schools for First Nation students.

Schools group grades according to early years (Kindergarten to Grade 4), middle years (Grades 5 to 8), and senior years (Grades 9 to 12). Both public schools and provincially funded independent schools participated in PCAP. Students in the Français Program participated in French. French immersion students participated in either English or French at the discretion of the school; their results are included in the English results for the province.

Mathematics teaching

Manitoba's mathematics curricula were developed to communicate high expectations for students to education partners across Manitoba, to facilitate the development of common learning resources, and to reinforce the importance of conceptual understanding, procedural thinking, and problem solving for students in Kindergarten through Grade 12.

Manitoba's conceptual framework for K–12 mathematics describes the interrelated mathematical processes for teaching and learning mathematics. The processes guide students to engage in thinking about mathematics and support the acquisition and use of mathematical knowledge and the foundational skills that enable them to develop conceptual understanding. Under the framework, activities that take place in the mathematics classroom stem from a problem-solving approach, are based on mathematical processes, and lead students to an understanding of mathematics through the development of specific knowledge, skills, and attitudes associated with various topics and strands.

Curriculum framework documents for English, French, and French immersion programs present the philosophical and pedagogical foundations for learning mathematics within each program. General and specific learning outcomes describe the mathematical knowledge and skills that students are expected to learn at each grade level. A set of achievement indicators is provided that may be used to determine whether students have met the corresponding outcome. Each program's framework document differs only in terms of the philosophical foundations appropriate for each program to facilitate mathematics learning. The learning outcomes and achievement indicators are identical in all three programs.

Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes 2013 and *Grade 9 to 12 Mathematics: Manitoba Curriculum Framework of Outcomes 2014* are Manitoba's most recent clarification of the Western and Northern Canadian Protocol for Collaboration in Education common curriculum framework documents.

For additional information on the Manitoba curriculum documents, see:

- **https://www.edu.gov.mb.ca/k12/cur/math/mathcurr.html** (English Program)
- **https://www.edu.gov.mb.ca/m12/progetu/ma/document.html** (Français and French Immersion Programs)

Assessment

Manitoba has provincial classroom-based assessment policies that focus on certain competencies in mathematics at Grade 3 and Grade 7. Following criteria established by Manitoba Education, teachers base their evaluations of students' achievement on their ongoing observations of students' performance and products and on conversations with students. Results are reported to parents and to the department of education early in the school year for Grade 3 and at mid-year for Grade 7. Data are used by teachers and parents to support individual student learning; they are also aggregated to inform decisions about programming at the school and division levels. Results do not count toward students' grades.

At the Grade 12 level, Manitoba has summative provincial tests in Applied Mathematics, Essential Mathematics, and Pre-Calculus Mathematics, administered each semester. Applied and Pre-Calculus Mathematics count for 30 percent of students' final course grades, while Essential Mathematics counts for 20 percent.

For more information about Manitoba's assessment program, see **https://www.edu.gov.mb.ca/k12/assess/index.html.**

Results in mathematics

This section presents PCAP 2019 results in mathematics for Manitoba and Canada overall by performance levels and mean scores. Student achievement is reported in mathematics overall, by language of the school system, and by gender. This section concludes with a comparison of changes over time in mathematics achievement.

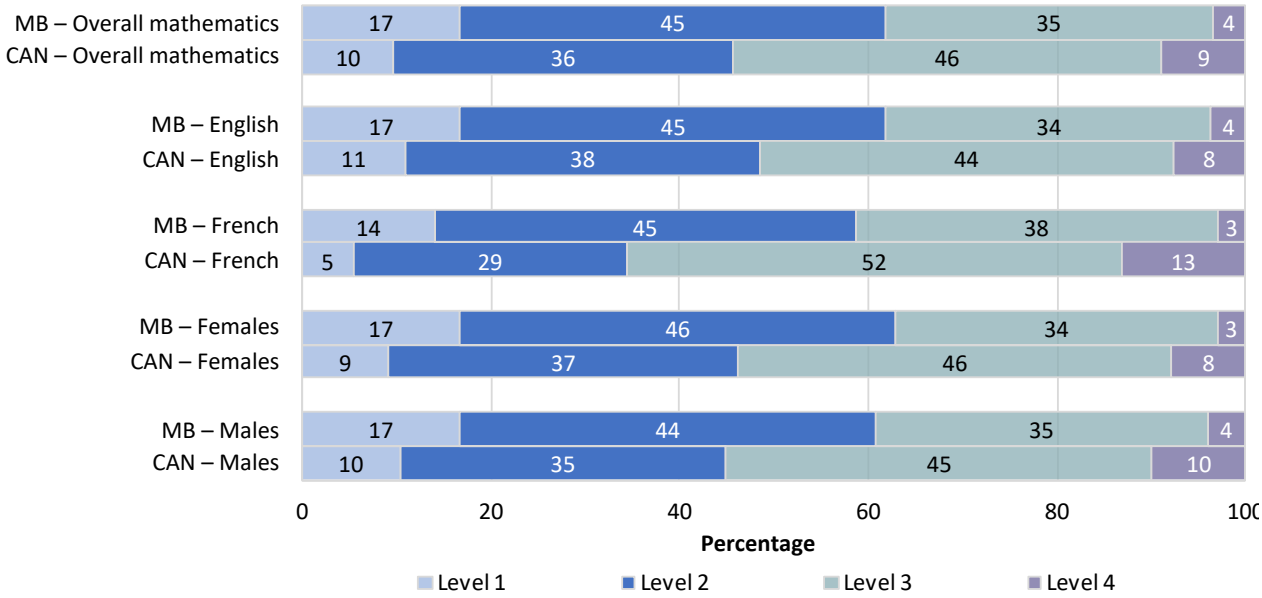
Results in mathematics by performance level

Figure MB.1 presents the results by performance level of students in Manitoba and in Canada overall in the PCAP 2019 mathematics assessment. In Manitoba, 83 percent of students performed at or above Level 2 in mathematics (Level 2 is the baseline or expected level of mathematics proficiency for Grade 8 students). Four percent of students in Manitoba achieved the highest level of performance (Level 4), which was lower than the 9 percent of students achieving this level of performance in Canada overall (Appendix B.1.1).

Within the province, 83 percent of students in the English-language school system (including French-immersion students) achieved Level 2 or higher in mathematics, which was less than the proportion of anglophone students in Canada overall. A higher proportion of students in the province's French-language schools achieved at or above Level 2 (86 percent); however, this was less than the proportion at the pan-Canadian level for French-language schools (95 percent). Within Manitoba, a higher proportion of francophone students than anglophone students achieved the expected proficiency level, a result that is consistent with the trend at the pan-Canadian level (Appendix B.1.4b).

In Manitoba, 83 percent of both girls and boys performed at Level 2 or above in mathematics, which is lower than the proportions observed for students in Canada by gender (91 and 90 percent, respectively). Within the province, equal proportions of girls and boys achieved at or above the expected level of performance, which was also the case for achievement by gender at the pan-Canadian level (Appendix B.1.8b).

Figure MB.1 Canada–Manitoba: percentage of students at each performance level in mathematics



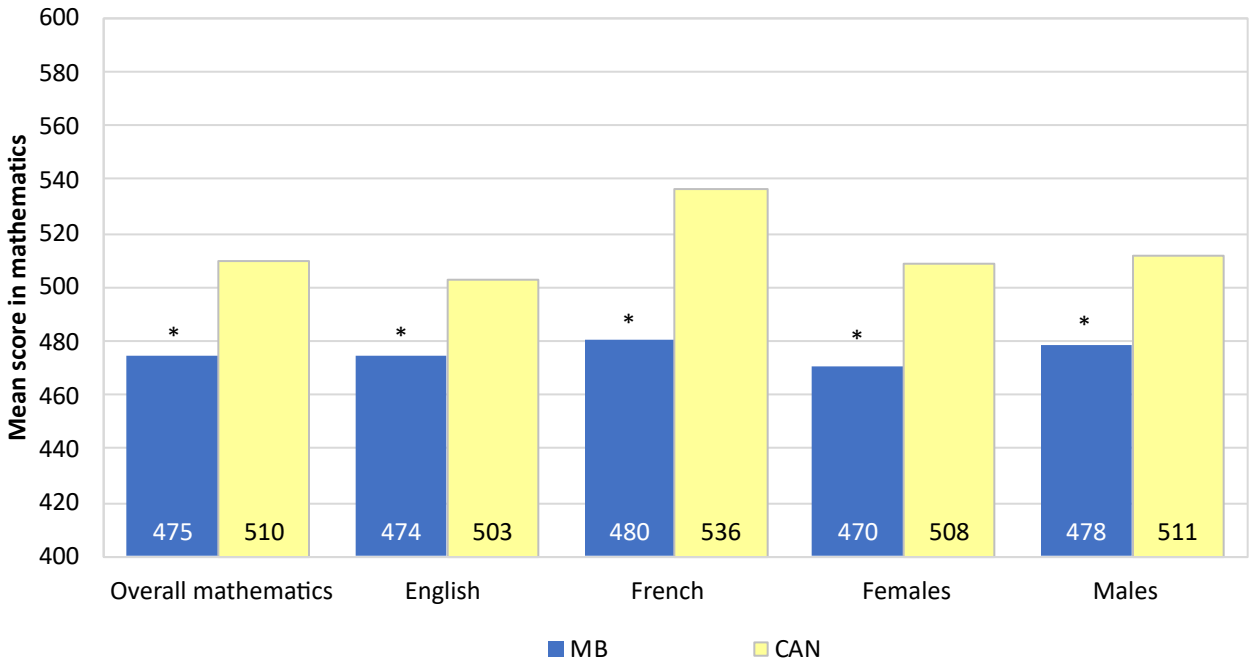
Results in mathematics by mean score

Figure MB.2 summarizes the results by mean score of the PCAP mathematics assessment for students in Manitoba and Canada overall and by language of the school system and gender. It shows that Manitoba students achieved below the Canadian mean in mathematics overall (Appendix B.1.2).

Students in both the English- and French-language school systems had scores in mathematics that were lower than the respective Canadian averages. Within the province, there was no significant difference in achievement between the two language systems. This result differs from the pattern at the pan-Canadian level, where students enrolled in francophone schools outperformed their anglophone peers (Appendix B.1.5).

Girls and boys in Manitoba both scored below the respective Canadian means in mathematics. Boys outperformed girls in mathematics in Manitoba, a finding that differs from the pattern at the pan-Canadian level, where no gender gap was observed (Appendix B.1.9).

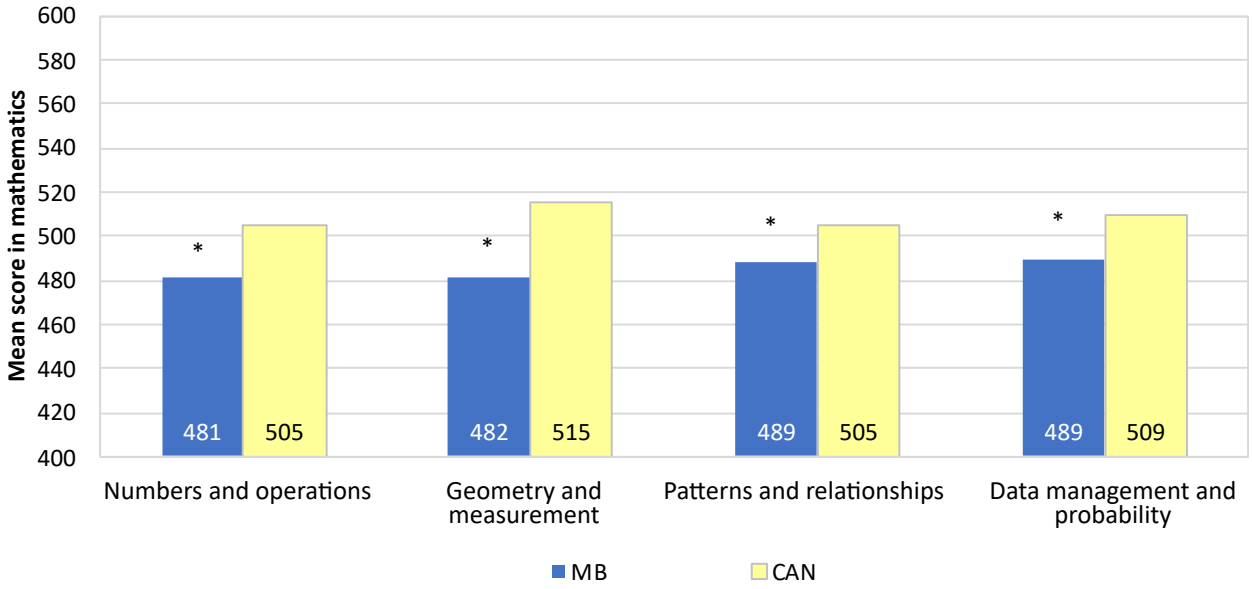
Figure MB.2 Canada–Manitoba: mean scores in mathematics



* Denotes significant difference compared to Canada

Figure MB.3 presents the mean scores in mathematics by subdomain for Manitoban and Canadian students. Students in the province achieved results below the respective Canadian means in all mathematics subdomains. Within the province, the strongest results were observed for the *patterns and relationships* and *data management and probability subdomains* (Appendix B.1.3).

Figure MB.3 Canada–Manitoba: mean scores in mathematics subdomains



* Denotes significant difference compared to Canada

Students enrolled in both English- and French-language schools in Manitoba obtained scores below the Canadian means for the respective language groups in all four mathematics subdomains. Within the province, students enrolled in French-language schools outperformed their English-language counterparts in all subdomains except *patterns and relationships*, in which the two language groups achieved similar scores (Table MB.1, Appendix B.1.6).

Table MB.1 Canada–Manitoba: mean scores in mathematics subdomains by language of the school system

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean core	Standard error	Mean score	Standard error
CAN English	497	1.7	507	1.5	503	1.4	501	0.9
MB English	480	2.3	481	2.0	489	1.9	488	1.5
Difference	17*		26*		15*		13*	
CAN French	534	2.6	544	2.3	512	1.9	541	1.9
MB French	504	0.0	487	0.0	486	0.0	520	0.0
Difference	30*		57*		26*		21*	
MB English	480	2.3	481	2.0	489	1.9	488	1.5
MB French	504	0.0	487	0.0	486	0.0	520	0.0
Difference	-23*		-6*		2		-32*	

* Denotes significant difference

In Manitoba, boys and girls obtained results that were lower than those of boys and girls in Canada overall in all four subdomains. Within the province, boys outperformed girls in the *geometry and measurement* and *data management and probability* subdomains, while no gender gap was found in the remaining two subdomains (Table MB.2, Appendix B.1.10).

Table MB.2 Canada–Manitoba: mean scores in mathematics subdomains by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN female	504	1.7	514	1.5	504	1.3	508	1.0
MB female	479	2.3	478	2.0	486	2.2	486	1.5
Difference	25*		36*		18*		22*	
CAN male	507	1.6	516	1.5	506	1.5	510	1.0
MB male	483	2.9	485	2.6	491	2.2	492	2.0
Difference	23*		31*		15*		18*	
MB female	479	2.3	478	2.0	486	2.2	486	1.5
MB male	483	2.9	485	2.6	491	2.2	492	2.0
Difference	-5		-7*		-5		-6*	

* Denotes significant difference

Comparison of results over time

In PCAP, changes over time are determined by comparing the current assessment year to the baseline year — that is, the first year in which the subject was the primary focus of the assessment. For PCAP mathematics, the baseline year was 2010. In the baseline year, a larger number of items are administered in the major domain, which allows a broader coverage of the PCAP framework.

Table MB.3 and Figure MB.4 present a summary of the changes over time in mathematics scores in Manitoba. Compared to the baseline year of 2010, there was an increase in achievement scores in mathematics overall in the province in 2019. A positive change was found in all subdomains except *numbers and operations*, where results were stable (Appendix B.1.14). At the pan-Canadian level, a positive change in achievement was found for mathematics overall and in each of the subdomains (Appendices B.1.11, B.1.14).

Mathematics scores of French-language students in Manitoba in 2019 were similar to those in 2010, while the scores of English-language students increased. This trend differs from the results at the pan-Canadian level, where a positive change was observed for both language groups (Appendix B.1.12).

In PCAP 2019, both girls and boys in Manitoba obtained mathematics scores similar to those achieved by the province's boys and girls in 2010. By contrast, in Canada overall, change in mathematics scores was positive for both girls and boys in 2019 compared to 2010 (Appendix B.1.13).

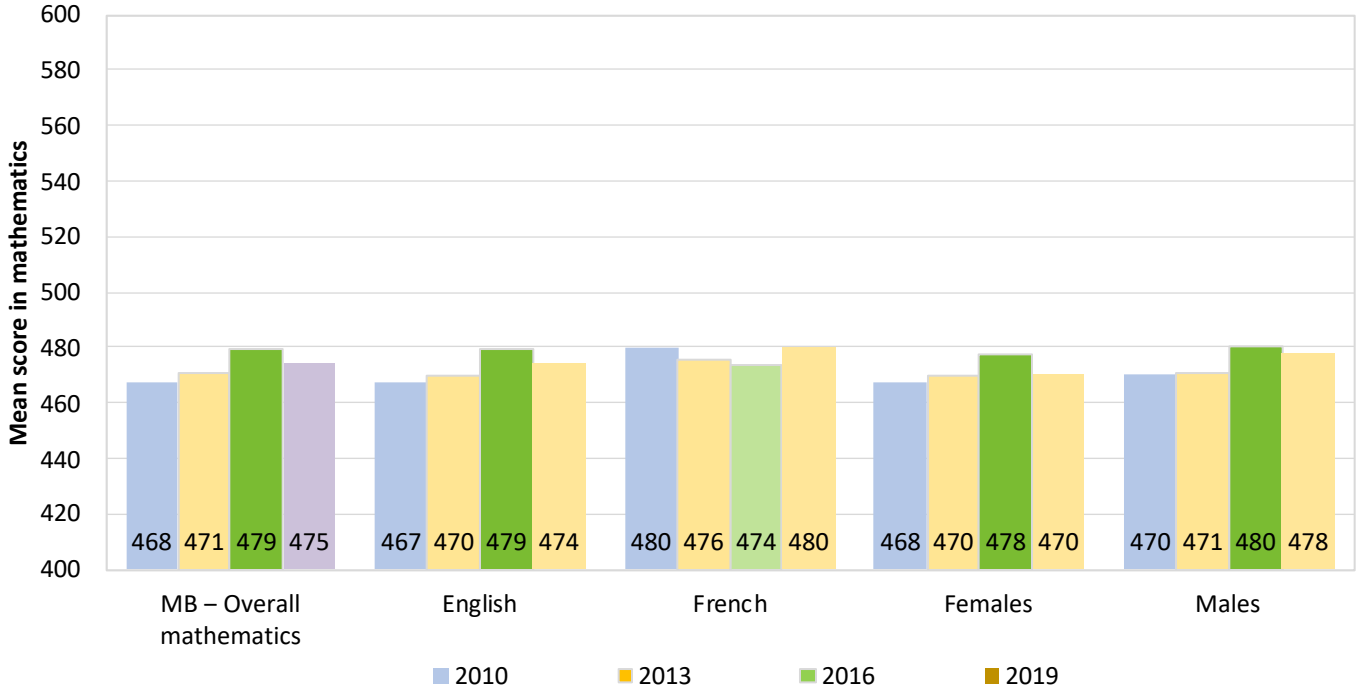
Data tables in Appendix B report results over time for the mathematics subdomains by language of the school system (Appendix B.1.15) and by gender (Appendix B.1.16).

Table MB.3 Manitoba: summary of achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
MB - Overall mathematics	468	475	7*
Numbers and operations	476	481	5
Geometry and measurement	459	482	23*
Patterns and relationships	478	489	11*
Data management and probability	473	489	16*
Anglophone school system	467	474	7*
Francophone school system	480	480	-1
Achievement gap (A - F)	-13	-5	
Females	468	470	3
Males	470	478	8
Achievement gap (F - M)	-3	-8	

* Denotes significant difference compared to the baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Figure MB.4 Manitoba: mean scores in mathematics, 2010–2019



Note: Darker shades denote significant difference compared to the baseline year 2010

Results in reading and science

As noted in the Introduction, reading and science are both minor domains in PCAP 2019. Results for these domains are reported by mean scores only. This section presents reading and science scores for Manitoba, compares those scores with pan-Canadian results, reports results by language of the school system and by gender, and presents multiple comparisons over time.

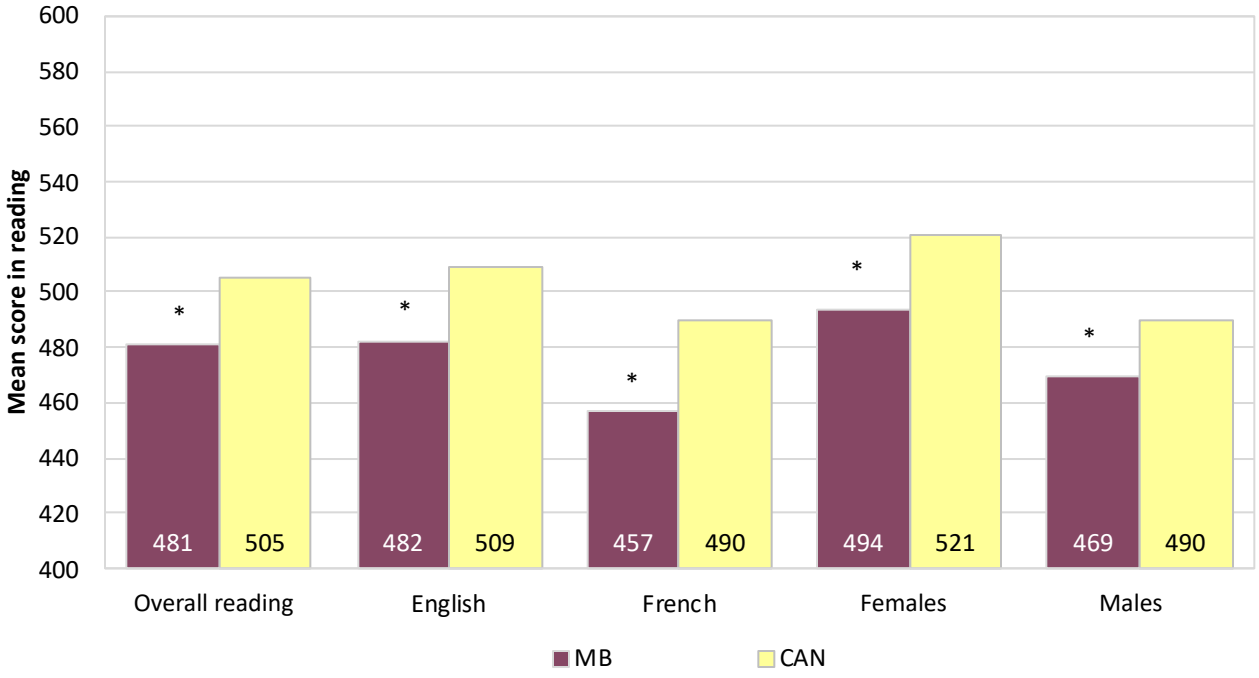
Results in reading

Figure MB.5 displays mean scores for reading overall in Manitoba and Canada, as well as by language of the school system and gender. In PCAP 2019, students in Manitoba achieved significantly lower scores in reading than students in Canada overall (Appendix B.2.1).

In Manitoba, students in both language groups achieved scores in reading lower than the Canadian mean scores for the respective groups. Within the province, students in the English-language school system outperformed students in the French-language school system. This result is consistent with that at the pan-Canadian level (Appendix B.2.2).

The reading scores of both girls and boys in Manitoba were lower than the Canadian means by gender. Within the province, girls attained significantly higher scores than boys, which is consistent with the pattern seen across Canada (Appendix B.2.3).

Figure MB.5 Canada–Manitoba: mean scores in reading



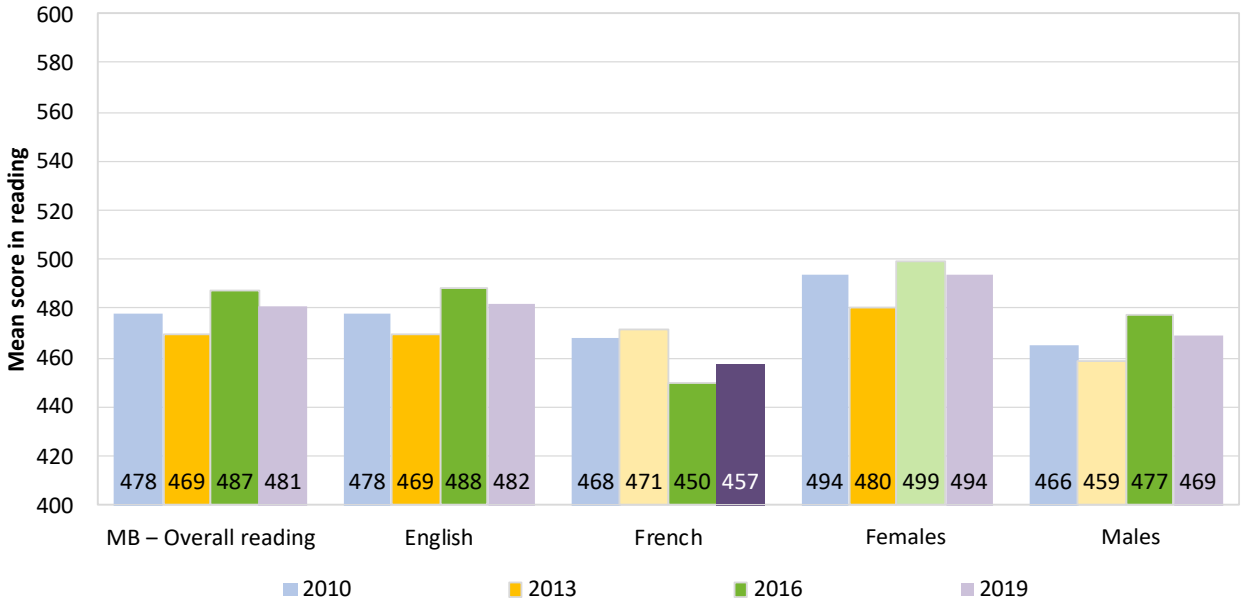
* Denotes significant difference compared to Canada

Figure MB.6 shows reading achievement over time for students in Manitoba. As explained in Chapter 2, although reading was the major domain in PCAP 2007, the baseline year for reading was adjusted to 2010, when the PCAP target group changed from 13-year-old students to Grade 8 students. The results of Manitoba students in reading achievement overall in PCAP 2019 were similar to those in the baseline year (Appendix B.2.4).

The results for English-language students in 2019 were similar to those in 2010, while those for French-language students declined. A similar pattern was seen at the pan-Canadian level for anglophone schools, but, unlike in Manitoba, a positive change, was observed for francophone schools in Canada overall (Appendix B.2.5).

In 2019, boys and girls in Manitoba both achieved reading scores similar to those obtained in 2010. At the pan-Canadian level, girls' reading scores showed a positive change, while boys' scores were stable (Appendix B.2.6).

Figure MB.6 Manitoba: mean scores in reading, 2010–2019



Note: Darker shades denote significant difference compared to the adjusted baseline year 2010

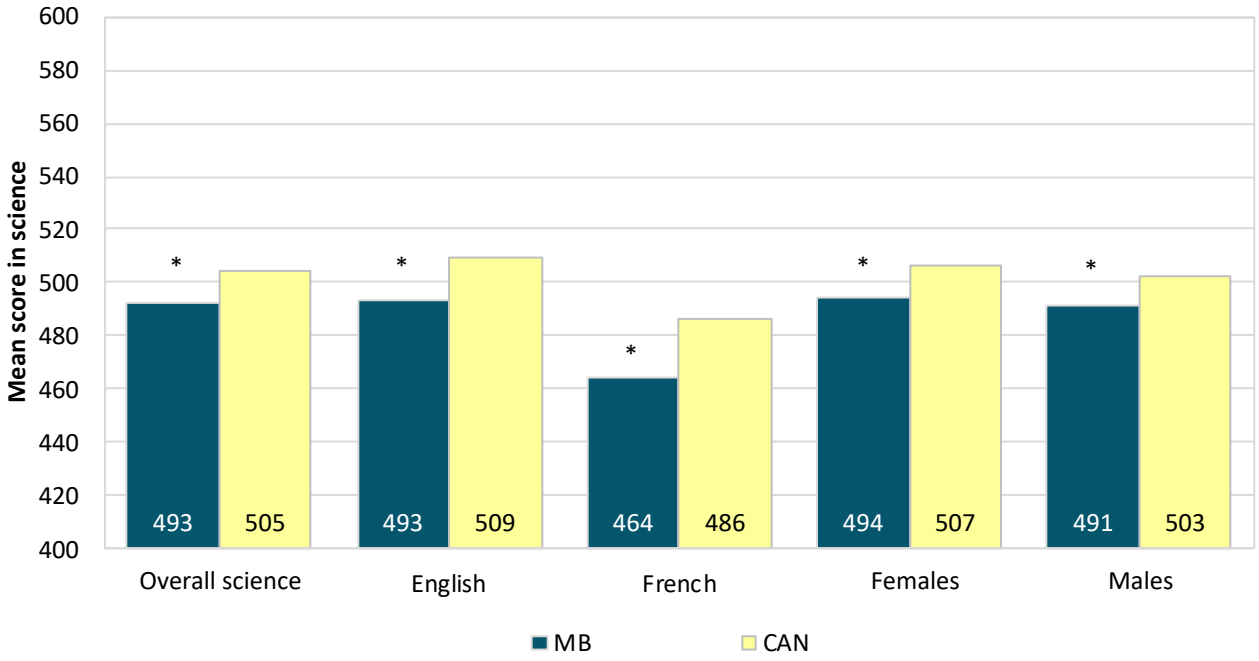
Results in science

Figure MB.7 summarizes the results by mean score in the PCAP science assessment for students in Manitoba and Canada overall, as well as by language of the school system and gender. Students in the province achieved below the Canadian mean in science overall in PCAP 2019 (Appendix B.3.1).

Anglophone and francophone students in Manitoba achieved scores significantly lower than the Canadian mean scores in science for the respective language groups. Within the province, students in English-language schools outperformed students in French-language schools, which is consistent with the pattern in Canada as a whole (Appendix B.3.2).

In Manitoba, both girls and boys scored below the Canadian means in science for the corresponding cohorts. There was no gender gap in Manitoba, while girls outperformed boys in science at the pan-Canadian level (Appendix B.3.3).

Figure MB.7 Canada–Manitoba: mean scores in science



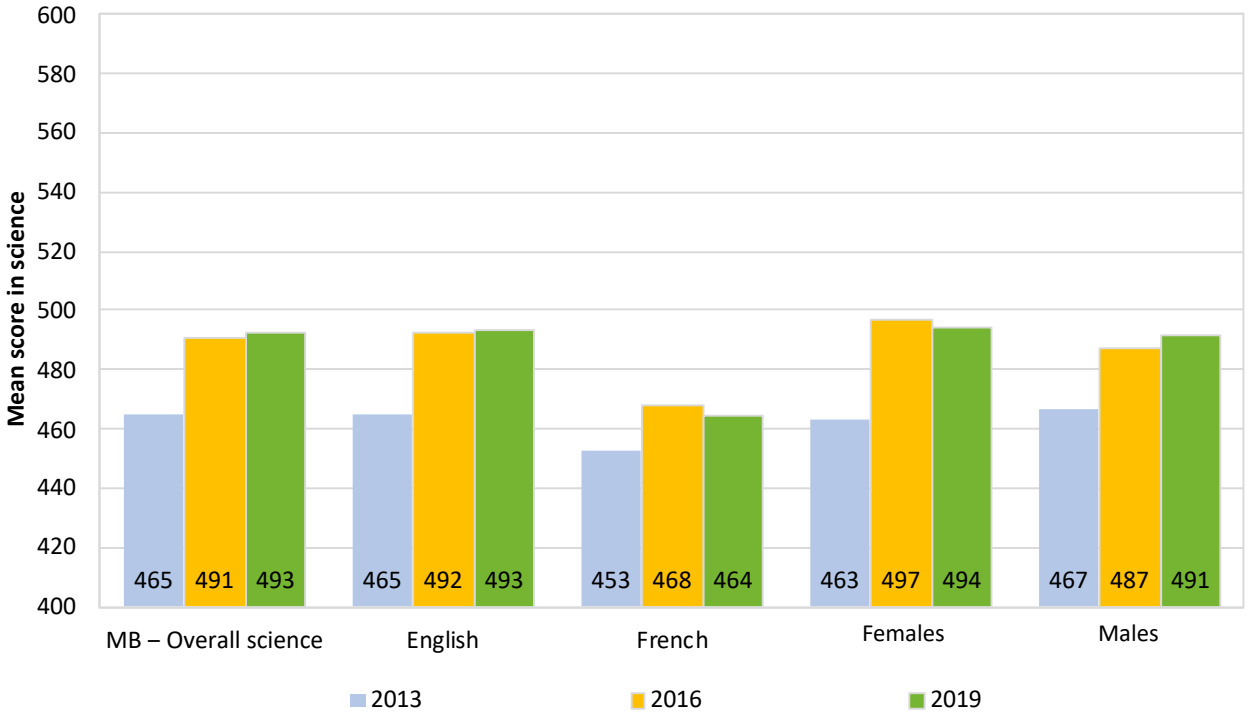
*Denotes significant difference compared to Canada

Figure MB.8 presents changes over time in science achievement in Manitoba. Changes in overall science scores in 2019 compared to the baseline year of 2013 were positive, which is consistent with the pattern at the Canadian level (Appendix B.3.4).

Students in both English- and French-language schools in Manitoba had higher scores in 2019 than in 2013. For Canada overall, anglophone school systems saw a positive change in science achievement, while the results in francophone schools were stable (Appendix B.3.5).

In Manitoba, achievement in science increased significantly from 2013 to 2016 for both girls and boys. In Canada overall, girls achieved higher scores, and boys' scores remained stable (Appendix B.3.6).

Figure MB.8 Manitoba: mean scores in science, 2013–2019



Note: Compared to the baseline year, there was a positive change in Manitoba in each year in all categories.

ONTARIO

Context statement

Social context

According to the 2016 Census, Ontario's population is approximately 13.48 million. First Nation, Métis, and Inuit individuals constitute 2.8 percent of the population of the province. Ontario's school-aged Indigenous population (ages 5–19) is estimated to be 93,345 (Statistics Canada, 2017b). English is Ontario's official language, with French language rights extended to the legal and education systems (Government of Ontario, 2019). According to 2016 Census data, approximately 67 percent of Ontarians reported English as their first language, 4 percent reported French, and 27 percent reported a language other than English or French (Statistics Canada, 2017b). Languages other than English often spoken at home in Ontario include Chinese, Italian, German, Polish, Spanish, Punjabi, Ukrainian, and Portuguese.

The Ministry of Education works to promote successful outcomes for all students, including students who face barriers to consistent academic success, such as those whose first language is neither English nor French; students who are new to Canada; students with special education needs; First Nation, Métis, and Inuit students; students who live in low-income households; students with parents who have not completed postsecondary education; students who are children and youth in care; and students who are unable to attend regular school due to a court order or their primary need for care or treatment.

Organization of the school system

Approximately 93 percent of Ontario's students are enrolled in publicly funded schools.[32] Ontario has 72 district school boards — 31 English public, 29 English Catholic, 4 French public, and 8 French Catholic.[33] There are 10 school authorities: four geographically isolated boards and six hospital-based school authorities. There is one Provincial Schools Authority. According to preliminary data from 2019–20, there are over 2,000,000 students in the publicly funded education system, enrolled in approximately 4,000 elementary and 900 secondary schools. About two-thirds of Ontario's students are enrolled in public schools and one-third in public Catholic schools.[34] Approximately 5.5 percent of Ontario's students are enrolled in French-language schools.[35]

In addition to the Ontario district school boards, there are five provincial schools that serve students who are Deaf, hard of hearing, blind, low-vision, or deafblind, and four demonstration schools for students with severe learning disabilities.

[32] As reported by schools through the Ontario School Information System, 2018–2019: 2018–2019 (Public), Final public posting as of September 4, 2020 (note: subsequent revisions may be made by school boards); 2018–2019 (Private), Final as of November 6, 2020.
[33] Unless otherwise indicated, statistics in this section are taken from "Education Facts, 2019–2020 (Preliminary)," available on the Ontario Ministry of Education's website, at **http://www.edu.gov.on.ca/eng/educationFACTS.html.**
[34] As reported by schools through the Ontario School Information System, preliminary 2019–2020: 2019–2020, Preliminary as of May 21, 2021, with all schools with completed data submissions.
[35] As reported by schools through the Ontario School Information System, preliminary 2019–2020: 2019–2020, Preliminary as of May 21, 2021, with all schools with completed data submissions.

Some students are unable to attend school because of their primary need for care, rehabilitation, or treatment, or because of a court order to serve a custodial or detention sentence. These students may be enrolled in an Education and Community Partnership Program. These are voluntary programs developed between school boards and government-approved facilities such as custody and correctional facilities, mental health agencies, or hospitals, wherein education continues to be provided while students receive treatment or care. The ministry provides these students with educational programming that supports treatment objectives, student success, and improved life outcomes.

Approximately 1,200 private schools operate in Ontario.[36] Students in private schools represent approximately 7 percent of all students in Ontario schools,[37] although many students taking one or two classes in private schools in Grades 11 and 12 are also enrolled in publicly funded schools at the same time. Private schools do not receive government funding; however, the ministry inspects all private secondary schools that seek the authority to grant credits leading to the Ontario Secondary School Diploma.

Ontario has a two-year Kindergarten program that is child-centred and developmentally appropriate for four- and five-year-olds. The purpose of the program is to establish a strong foundation for learning in the early years, and to do so in a safe and caring play- and inquiry-based environment that promotes the physical, social, emotional, and cognitive development of all children. Parents may enrol their children in the first year of Kindergarten at age four or the second year of Kindergarten at age five. Some students may start the first year of Kindergarten at age three, if their fourth birthday is between September 1 and December 31. While Kindergarten is not mandatory, 90 percent of eligible children are enrolled.[38]

Students who are six years old on or before the first day of school are required to attend school. All students must attend school until they reach the age of 18 unless they have already graduated or are otherwise excused from attendance at school.[39]

In Ontario, there are four education divisions: primary (Kindergarten to Grade 3), junior (Grades 4 to 6), intermediate (Grades 7 to 10), and senior (Grades 11 and 12). Teachers who hold qualifications in the primary and junior divisions are qualified to teach all subjects in Kindergarten to Grade 6. Teachers who hold qualifications in the intermediate division and a specific subject (e.g., mathematics) are qualified to teach that subject in Grades 7 and 8 and Grades 9 and 10.

Grades 1 to 8 constitute the elementary grades. At this level, students receive 25 hours per week of instructional time, with a requirement of 300 minutes per week for instruction in mathematics.[40] Decisions regarding the amount of time spent on other areas of the elementary curriculum (with the exception of French as a second language in English-language schools only, and of daily physical activity in all schools) are made at the local level to allow educators choice in integrating subject

[36] As reported by schools through the Ontario School Information System, preliminary 2019–2020: 2019–2020, Preliminary as of May 21, 2021, with all schools with completed data submissions.
[37] "Quick Facts: Ontario Schools, 2016–17," retrieved from **http://www.edu.gov.on.ca/eng/general/elemsec/quickfacts/2016_2017.html.**
[38] As reported by schools through the Ontario School Information System, preliminary 2019–2020: 2019–2020: Preliminary as of May 21, 2021, with all schools with completed data submissions; Statistics Canada (2020).
[39] Legal reasons for being absent from school (e.g., receiving satisfactory instruction at home or elsewhere) continue to apply. For more information, see the memo on Learning to Age 18, at **http://www.edu.gov.on.ca/eng/policyfunding/memos/Bill52Implementation.pdf.**
[40] For more information about the protected instruction time for mathematics, see Policy/Program Memorandum No. 160, Protected Time for Daily Mathematics Instruction, Grades 1–8, at **http://www.edu.gov.on.ca/extra/eng/ppm/ppm160.pdf.**

content. Grades 9 to 12 constitute the secondary level. At this level, students earn credits through the successful completion of courses that are a minimum of 110 hours in length.

Mathematics teaching

The *Ontario Curriculum, Grades 1 to 8: Mathematics* (2005) and *Le curriculum de l'Ontario — Mathématiques, de la 1re à la 8e année* (2005) were the guiding documents under which Ontario students participated in the PCAP 2019 assessment. In June 2020, the ministry released a new elementary mathematics curriculum to better prepare students for the labour market and life in a rapidly changing world, strengthen mathematics competence, and improve achievement. The new mathematics curriculum is part of a four-year math strategy that will ensure that students have a strong understanding of math fundamentals and how to apply them.

The 2005 mathematics curriculum recognized student diversity and was based on the belief that all students can learn mathematics. The curriculum supported equity by promoting the active participation of all students, and by identifying the knowledge and skills students were expected to demonstrate in every grade. It recognized different learning styles and expected that teachers would use a variety of instructional strategies and assessment tools. Further, it aimed to challenge all students by including expectations that required them to use higher-order thinking skills and to make connections between related mathematical concepts and between mathematics, other disciplines, and the real world.

The 2005 French-language curriculum was developed, implemented, and revised alongside the English-language curriculum. There are slight differences in the progression of learning in the English- and French-language curriculum documents and, consequently, in the math content covered in Grade 8. A distinct feature of the French-language education system in the province is the *Aménagement linguistique* policy (Ontario Ministry of Education, 2004), which is intended to promote, enhance, and expand the use of the French language and culture in a minority setting and in all spheres of activity.

The 2005 mathematics curriculum included five strands or major areas of knowledge and skills: number sense and numeration, measurement, geometry and spatial sense, patterning and algebra, and data management and probability. Seven mathematical processes were also identified: problem solving, communicating, reasoning and proving, reflecting, representing, connecting, and selecting tools and computational strategies. These processes describe the practices students needed to learn and apply in all areas of their mathematics studies. The terminology used to describe these processes in the 2005 French-language math curriculum differed slightly but reflects the same content.[41] In Grades 1 to 12, students engaged actively in applying these mathematical processes throughout their programs of study.

Problem solving is central to learning mathematics. By learning to solve problems and by learning through problem solving, students connect mathematical ideas and processes, and develop conceptual understanding. Problem solving allows students to use the knowledge they bring to school and helps

[41] The processes in the 2005 French-language mathematics curriculum were problem solving, communication, reasoning, thinking, modelling, making connections, and selecting appropriate technological tools or materials.

them connect mathematics with situations outside the classroom. It gives meaning to skills and concepts in all strands. It provides opportunities for students to reason, communicate ideas, make connections, and apply their knowledge and skills, and it promotes collaboration, the sharing of ideas and strategies, and the discussion of mathematics.

In Grade 8 mathematics, students were expected to develop the following knowledge and skills:

- Number sense and numeration — Use equivalent representations for numbers, including positive exponents; solve problems involving whole numbers, decimal numbers, fractions, and integers; and use proportional reasoning in meaningful contexts to solve problems

- Measurement — Learn about applications of volume and capacity measurements, and determine relationships among units and measurable attributes, including the area of circles and volume of cylinders

- Geometry and spatial sense — Learn about the geometric properties of quadrilaterals and circles; develop relationships and solve problems involving lines, triangles, and polyhedra; and use the coordinate plane to represent transformations

- Patterning and algebra — Use graphs, algebraic expressions, and equations to represent linear growth patterns; model linear relationships, both graphically and algebraically; and solve and verify algebraic equations

- Data management and probability — Collect and organize categorical, discrete, or continuous primary data and secondary data; display data using charts and graph; make convincing arguments about data; and use probability models to make predictions about real-life events

Assessment

In Ontario, teachers are responsible for classroom assessment and evaluation to improve student learning. Teachers and early childhood educators bring varied assessment and evaluation approaches to the classroom, grounded in assessment "for, as, and of" learning (Ontario Ministry of Education, 2010). The ministry's curriculum policy documents include an achievement chart that identifies four categories of knowledge and skills: knowledge and understanding, thinking, application, and communication. The achievement chart is a standard province-wide guide used by teachers to make judgments about student work that are based on clear performance standards and on a body of evidence collected over time.

The Education Quality and Accountability Office (EQAO), an agency of the Ministry of Education, develops and administers annual large-scale provincial assessments. These assessments are administered in English and French to all students in Grades 3 and 6 in reading, writing, and mathematics, in Grade 9 in mathematics, and in Grade 10, when the Ontario Secondary School Literacy Test (OSSLT)/*Test provincial de compétences linguistiques* (TPCL) is first administered. Results do not affect student grades or promotion in Grades 3 and 6; in Grade 9, schools and/or school boards have the option to count the results of the mathematics assessment as a portion of the overall course grade (up to 30 percent). To obtain an Ontario Secondary School Diploma, all students must meet a graduation literacy requirement. Passing the OSSLT/TPCL is the main means of meeting the literacy requirement. Students who are not

successful on this test may retake it or satisfy the requirement by completing the Ontario Secondary School Literacy Course instead.

The Grade 3, 6, and 9 assessments are based on Ontario curriculum expectations, and the OSSLT/TPCL is based on cross-curricular reading and writing expectations up to the end of Grade 9. All assessments include both selected-response and open-response questions, and all writing assessments include extended writing.

To complement classroom and provincial-level assessment efforts, Ontario participates in PCAP and in the following international assessments, which assess math among other domains: the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS). Together, classroom, provincial, national, and international assessments constitute the province's multi-level assessment effort, with the goal of improving student learning so that Ontario students successfully advance to postsecondary education, training, and/or the workforce.

More information on provincial, national, and international assessments in Ontario can be found on the EQAO website:

- English: **https://www.eqao.com/the-assessments/**
- French: **https://www.eqao.com/les-tests/?lang=fr**

Results in mathematics

This section presents PCAP 2019 results in mathematics for Ontario and Canada overall by performance levels and mean scores. Student achievement is reported in mathematics overall, by language of the school system, and by gender. This section concludes with a comparison of changes over time in mathematics achievement.

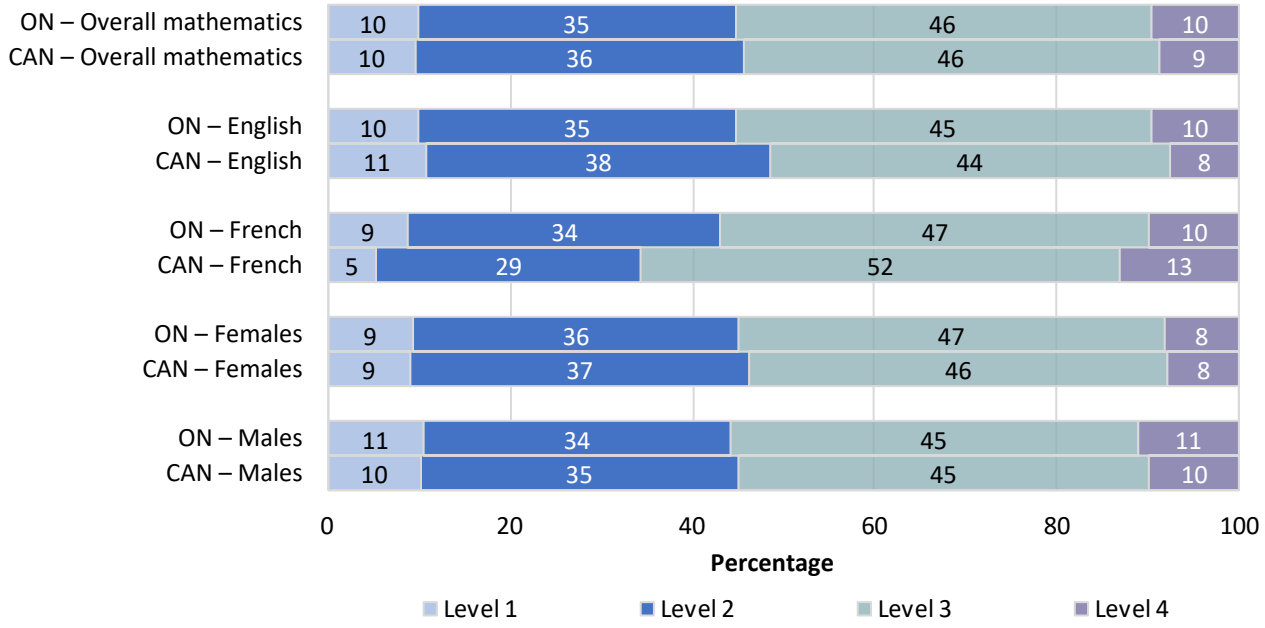
Results in mathematics by performance level

Figure ON.1 presents the results by performance level of students in Ontario and in Canada overall in the PCAP 2019 mathematics assessment. In Ontario, 90 percent of students performed at or above Level 2 in mathematics (Level 2 is the baseline or expected level of mathematics proficiency for Grade 8 students), and 10 percent achieved the highest level of performance (Level 4). These proportions are similar to those for Canadian students overall (Appendix B.1.1).

Ninety percent of students in English-language schools in Ontario achieved Level 2 or higher in mathematics, a proportion similar to the Canadian average. Ninety-one percent of students in the province's French-language schools achieved at or above Level 2, which was lower than the proportion in Canada overall (95 percent). Within the province, similar proportions of anglophones and francophones achieved Level 2 or higher. This contrasts with performance levels by language group for Canada as a whole, where fewer anglophone than francophone students achieved Level 2 or above in mathematics (Appendix B.1.4b).

In Ontario, 91 percent of girls and 89 percent of boys performed at Level 2 or above in mathematics, which was similar to the proportions by gender observed for Canadian students overall. Within the province, there was no gender gap for students performing at these levels, which is consistent with the pattern observed at the pan-Canadian level (Appendix B.1.8b).

Figure ON.1 Canada–Ontario: percentage of students at each performance level in mathematics



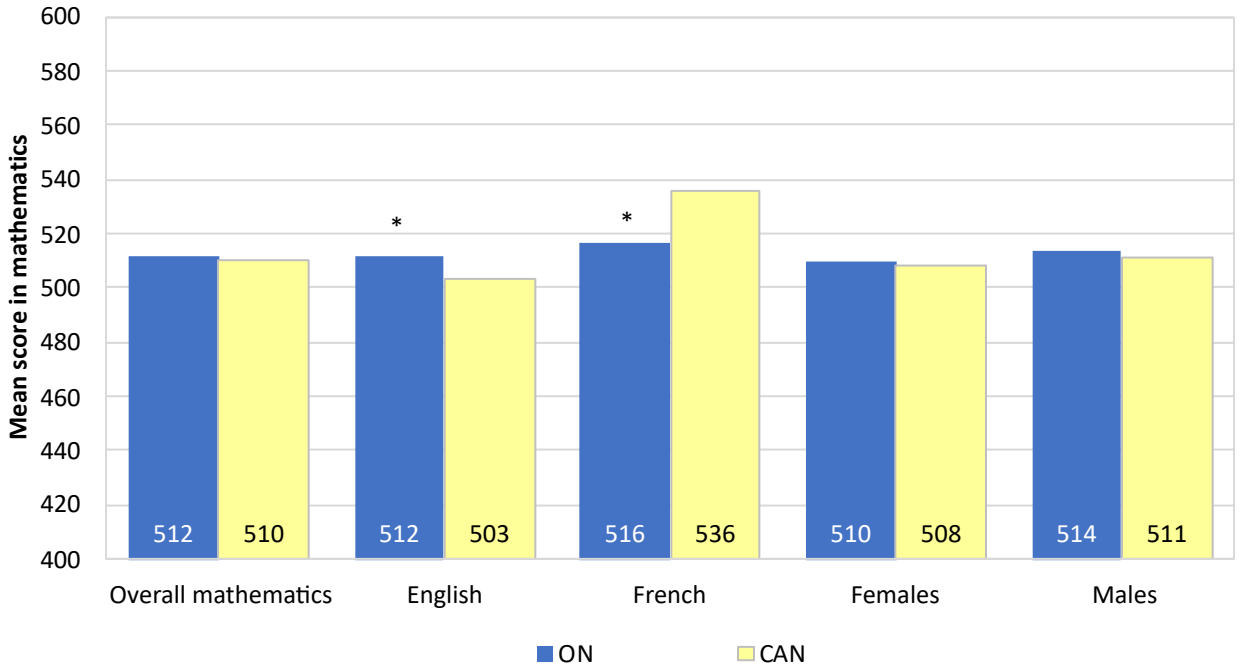
Results in mathematics by mean score

Figure ON.2 displays the mean scores of Ontario and Canadian students in mathematics overall and by language of the school system and gender. Overall, students in Ontario achieved mean scores in mathematics similar to those of Canadian students (Appendix B.1.2).

Students enrolled in Ontario's English-language schools achieved scores higher than the Canadian anglophone sample, while students in the province's French-language schools achieved lower scores compared to the Canadian French mean. Within Ontario, the mathematics results were similar between the two language systems. This finding contrasts with the results at the pan-Canadian level, where francophone students obtained significantly higher scores than their anglophone counterparts (Appendix B.1.5).

Both girls and boys in Ontario achieved scores in mathematics similar to those of girls and boys in the Canadian sample. In both Ontario and Canada overall, no gender gap was found in mathematics (Appendix B.1.9).

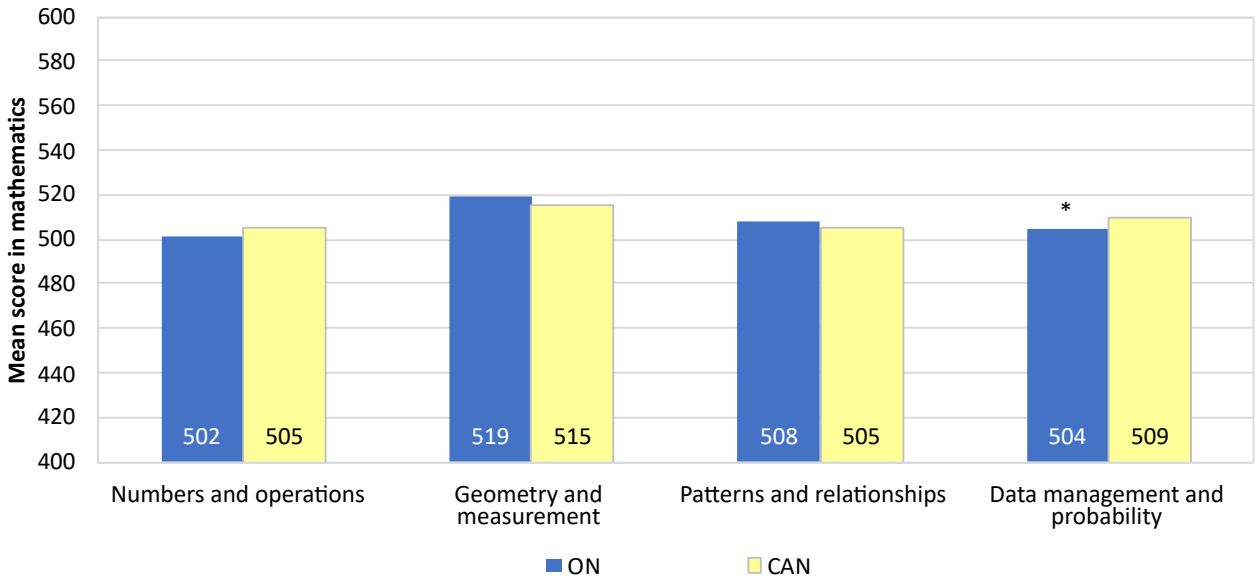
Figure ON.2 Canada–Ontario: mean scores in mathematics



* Denotes significant difference compared to Canada

Figure ON.3 presents the achievements scores in mathematics by subdomain for Ontario and Canadian students. Students in the province achieved results similar to the respective Canadian means in all subdomains except *data management and probability,* where results were lower than those for Canadian students overall. Within the province, the strongest results were observed in the *geometry and measurement* subdomain (Appendix B.1.3).

Figure ON.3 Canada–Ontario: mean scores in mathematics subdomains



* Denotes significant difference compared to Canada

Table ON.1 compares mathematics achievement scores in Ontario and Canada in each of the subdomains by language of the school system. Students in anglophone schools in Ontario scored above the Canadian English average in *geometry and measurement* and *patterns and relationships*, and at the Canadian English means for the other two subdomains. Students in the province's francophone schools scored below the Canadian French mean in all subdomains except *patterns and relationships*, where results were similar to the Canadian French mean. Students enrolled in French-language schools outperformed those in English-language schools in all subdomains except *patterns and relationships*, where no difference was found between the two language systems (Appendix B.1.6).

Table ON.1 Canada–Ontario: mean scores in mathematics subdomains by language of the school system

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN English	497	1.7	507	1.5	503	1.4	501	0.9
ON English	501	3.2	519	2.8	508	2.8	503	1.7
Difference	-4		-11*		-4*		-2	
CAN French	534	2.6	544	2.3	512	1.9	541	1.9
ON French	512	2.1	533	2.6	508	2.2	530	1.8
Difference	23*		11*		4		12*	
ON English	501	3.2	519	2.8	508	2.8	503	1.7
ON French	512	2.1	533	2.6	508	2.2	530	1.8
Difference	-11*		-15*		-1		-27*	

* Denotes significant difference

Ontario girls and boys achieved results similar to girls and boys in Canada in all subdomains except data management and probability, where the results were below the respective Canadian averages. In Ontario, boys outperformed girls in numbers and operations and data management and probability, while there was no gender gap for the other two subdomains (Table ON.2, Appendix B.1.10).

Table ON.2 Canada–Ontario: mean scores in mathematics subdomains by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN female	504	1.7	514	1.5	504	1.3	508	1.0
ON female	498	3.4	520	3.0	507	2.9	502	2.0
Difference	5		-5		-3		6*	
CAN male	507	1.6	516	1.5	506	1.5	510	1.0
ON male	505	3.5	519	3.1	508	3.2	506	2.0
Difference	2		-3		-2		4*	
ON female	498	3.4	520	3.0	507	2.9	502	2.0
ON male	505	3.5	519	3.1	508	3.2	506	2.0
Difference	-7*		1		-1		-4*	

* Denotes significant difference

Comparison of results over time

In PCAP, changes over time are determined by comparing the current assessment year to the baseline year — that is, the first year in which the subject was the primary focus of the assessment. For PCAP mathematics, the baseline year was 2010. In the baseline year, a larger number of items are administered in the major domain, which allows a broader coverage of the PCAP framework.

Table ON.3 and Figure ON.4 present a summary of the changes over time in mathematics achievement scores in the province. No significant change is evident in mean scores in Ontario for mathematics overall or for any of the subdomains of mathematics in 2019 compared to 2010. At the pan-Canadian level, a positive change in achievement was found for mathematics overall and in each of the subdomains (Appendices B.1.11, B.1.14).

Results for both English- and French-language school systems in Ontario in 2019 were similar to those in 2010. For Canada as a whole, results for both anglophone and francophone school systems showed significant, positive increases (Appendix B.1.12).

There was no significant difference in the mathematics scores of either girls or boys in Ontario in 2019 compared to 2010. By contrast, at the pan-Canadian level, changes in mathematics scores were positive for both girls and boys (Appendix B.1.13).

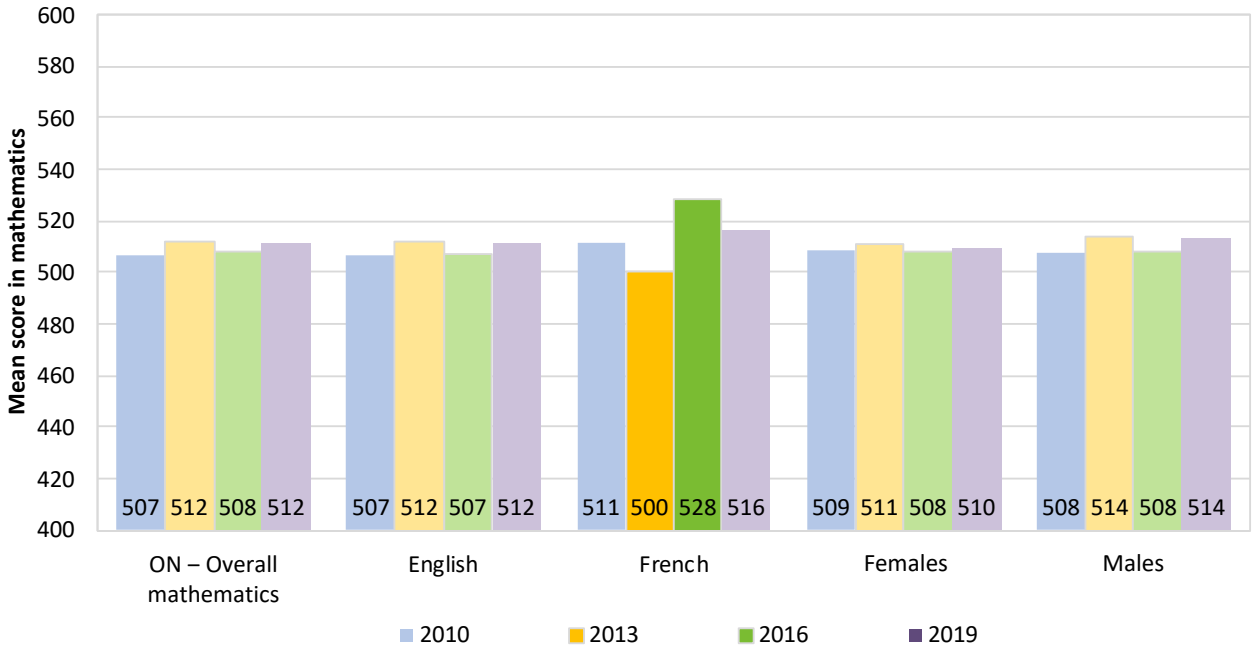
Data tables in Appendix B reports results over time for the mathematics subdomains by language of the school system (Appendix B.1.15) and by gender (Appendix B.1.16).

Table ON.3 Ontario: summary of achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
ON - Overall mathematics	507	512	5
Numbers and operations	498	502	4
Geometry and measurement	513	519	6
Patterns and relationships	511	508	-4
Data management and probability	505	504	0
Anglophone school system	507	512	5
Francophone school system	511	516	5
Achievement gap (A - F)	-4	-5	
Females	509	510	1
Males	508	514	6
Achievement gap (F - M)	1	-4	

Note: Test for significance cannot be calculated for change over time for achievement gaps

Figure ON.4 Ontario: mean scores in mathematics, 2010–2019



Note: Darker shades denote significant difference compared to the baseline year 2010

Results in reading and science

As noted in the Introduction, reading and science are both minor domains in PCAP 2019. Results for these domains are reported by mean scores only. This section presents reading and science scores for Ontario, compares these scores with pan-Canadian results, reports results by language of the school system and by gender, and presents multiple comparisons over time.

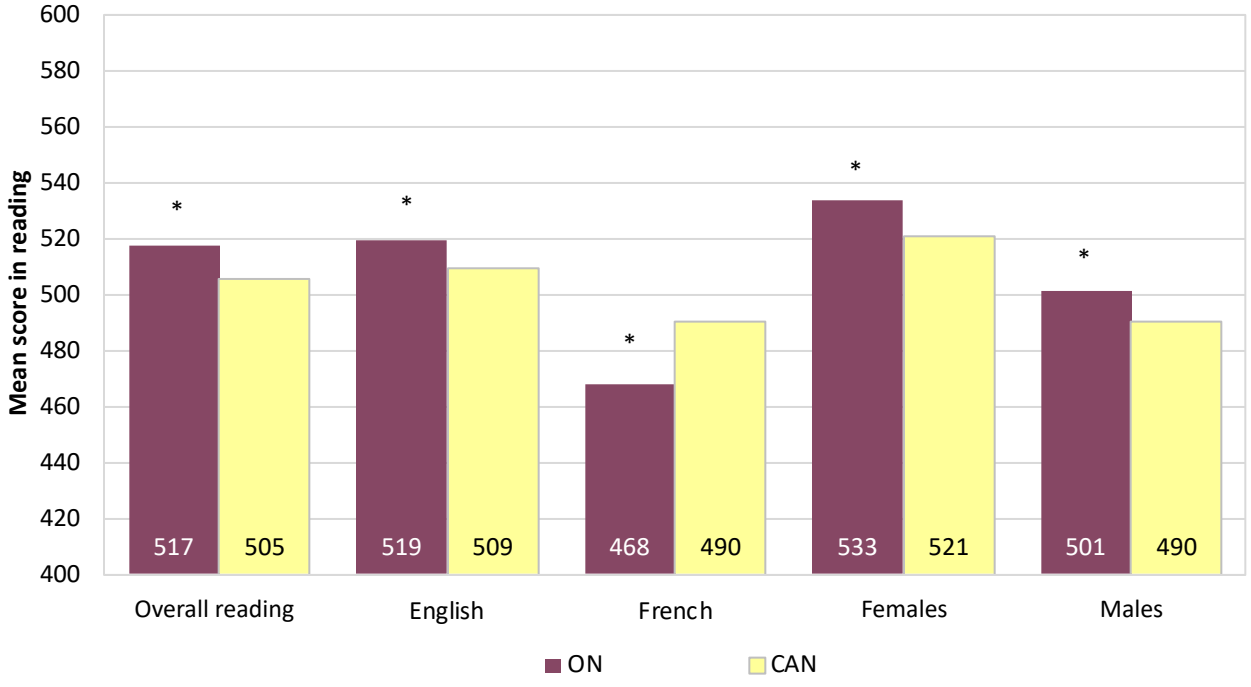
Results in reading

Figure ON.5 displays mean scores for reading overall in Ontario and Canada, as well as by language of the school system and gender. In PCAP 2019, students in Ontario achieved scores that were higher than the Canadian mean in reading (Appendix B.2.1).

Students in English-language schools in the province obtained higher scores in reading than anglophone students in Canada overall, whereas students in the province's French-language schools achieved scores that were below the Canadian francophone mean. Within the province, anglophone students outperformed francophone students in reading, a finding that is consistent with the pattern for Canada overall (Appendix B.2.2).

Boys and girls in Ontario achieved scores in reading that were above the respective Canadian means. Within the province, girls significantly outperformed boys in reading, which is consistent with the results at the pan-Canadian level (Appendix B.2.3).

Figure ON.5 Canada–Ontario: mean scores in reading



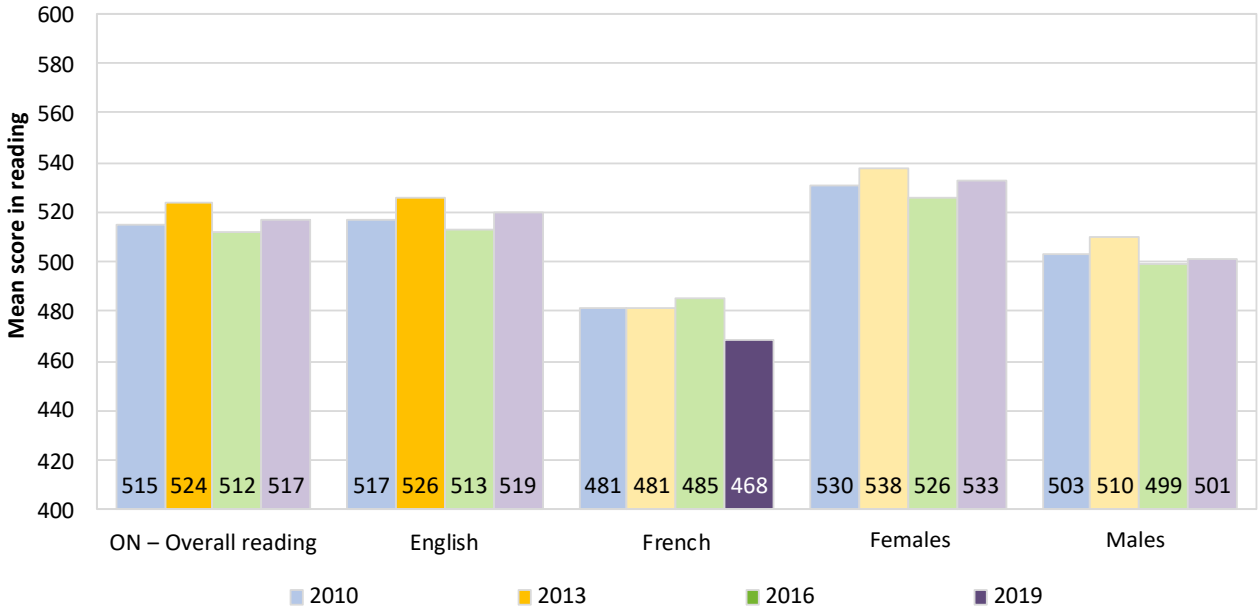
* Denotes significant difference compared to Canada

Figure ON.6 shows PCAP reading achievement over time for students in Ontario. As explained in Chapter 2, although reading was the major domain in PCAP 2007, the baseline year for reading was adjusted to 2010, when the PCAP target group changed from 13-year-old students to Grade 8 students. The results for Ontario students in reading achievement in 2019 were similar to those in the baseline year (Appendix B.2.4).

In Ontario, the reading results for English-language students in 2019 were similar to those in 2010, while those for French-language students declined. In Canada overall, results for anglophone schools were stable, while a positive change was observed for francophone schools (Appendix B.2.5).

Boys and girls in Ontario both achieved reading scores in 2019 similar to those obtained in 2010. At the pan-Canadian level, the reading scores of girls showed positive changes while those of boys were stable (Appendix B.2.6).

Figure ON.6 Ontario: mean scores in reading, 2010–2019



Note: Darker shades denote significant difference compared to the adjusted baseline year 2010

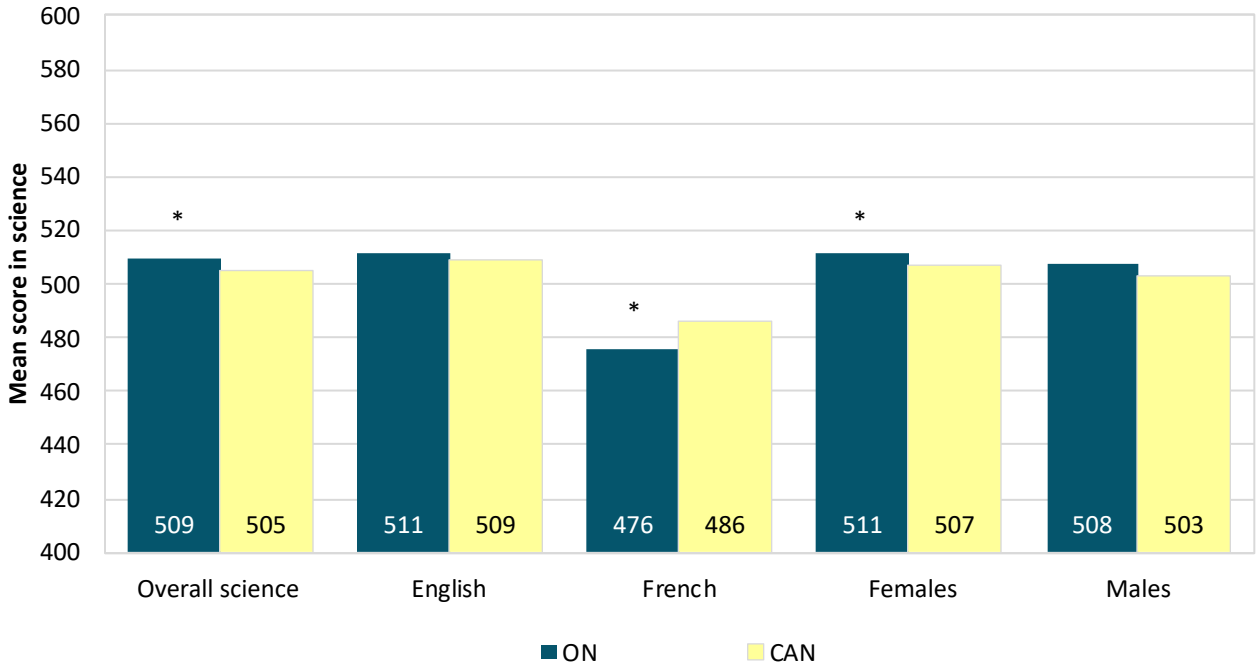
Results in science

Figure ON.7 shows mean scores in science overall for Ontario and Canada, as well as by language of the school system and gender. In the PCAP 2019 science assessment, Ontario students achieved scores that were higher than the Canadian mean (Appendix B.3.1).

In Ontario, students in English-language schools achieved scores in science similar to the Canadian English mean, while students in French-language schools achieved lower scores than the Canadian French mean. Within Ontario, anglophone students obtained higher scores than francophone students, which is consistent with the pattern at the pan-Canadian level (Appendix B.3.2).

Girls in Ontario achieved higher science scores than the Canadian mean for their gender while the mean score for boys was similar to that for boys in Canada overall. Within Ontario, there was no gender gap in science; this differs from the results at the pan-Canadian level, where girls outperformed boys in science (Appendix B.3.3).

Figure ON.7 Canada–Ontario: mean scores in science



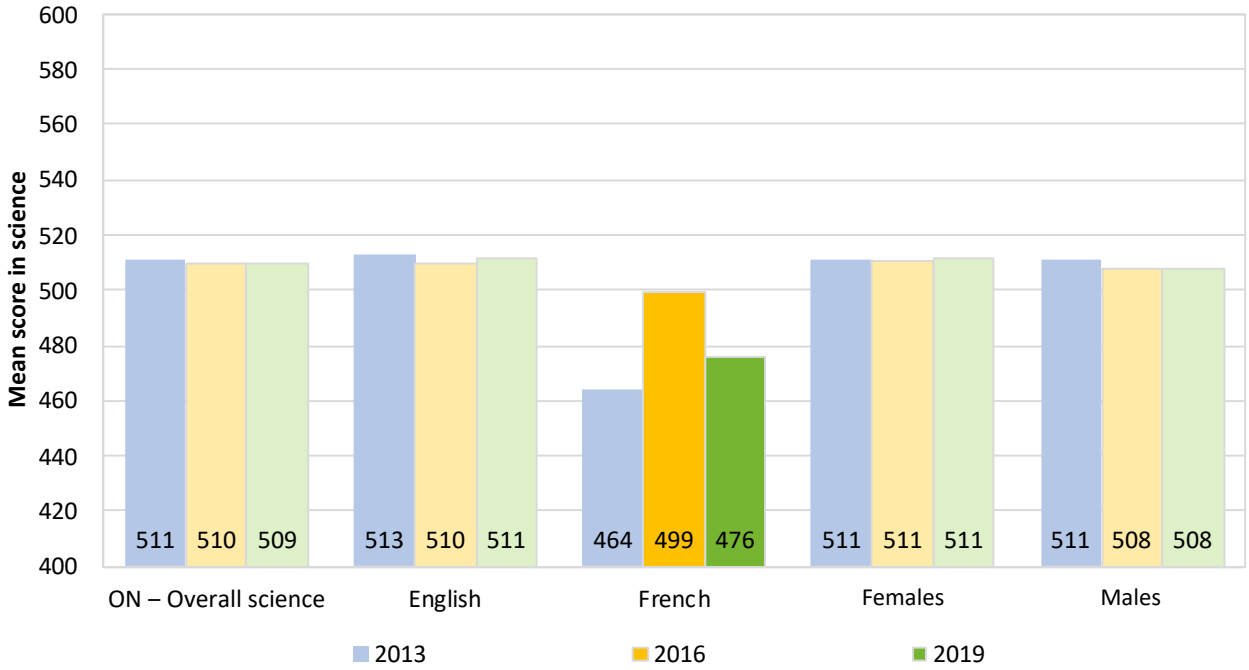
* Denotes significant difference compared to Canada

Figure ON.8 presents changes over time in science achievement in the province. No significant change is evident in overall science scores in Ontario from 2013 (the baseline year) to 2019. This differs from the pan-Canadian results, which showed positive change in science achievement (Appendix B.3.4).

In PCAP 2019, the results in science for English-language students in Ontario were similar to those in 2013, while the scores for French-language students improved. This is the opposite of the trends at the pan-Canadian level, where the scores of anglophone students improved while those of francophones were stable (Appendix B.3.5).

In Ontario, achievement in science from 2013 to 2019 remained stable for both girls and boys. In Canada overall, girls achieved higher scores in 2019 than in 2013, while boys' scores were stable (Appendix B.3.6).

Figure ON.8 Ontario: mean scores in science, 2013–2019



Note: Darker shades denote significant difference compared to the baseline year 2013

QUEBEC

Context statement

Social context

Quebec's population of more than eight million is concentrated in the south of the province, mostly in its largest city, Montreal, and its capital city, Quebec City. The official language of Quebec is French. Francophones account for around 78 percent of Quebec's total population. Anglophones make up around 8 percent of the population; they have access to a full system of educational institutions, from preschool to university. Quebec is also home to 11 Indigenous nations. For eight of these nations, youth education is the responsibility of the federal government, with support from the *Ministère de l'Éducation et de l'Enseignement supérieur* (MEES) as needed. For the other three, the schools are part of the MEES system but have special powers under the rights and provisions set out in the James Bay and Northern Quebec Agreement and the Northeastern Quebec Agreement.

An increase in immigration, especially in the Greater Montreal Area, has resulted in a massive inflow of students whose first language is neither French nor English. Under provincial legislation, these students attend French schools. To meet the needs of this new client group, schools have implemented special measures, including francization programs and welcoming classes.

Organization of the school system

Quebec has four levels of education: elementary (preschool to Grade 6), secondary (Secondary I to V and professional training), college (cégep), and university. Full- and part-time enrolment in all four levels was approximately 1.8 million in 2015–16. All persons residing in Quebec have the right to receive a free preschool, elementary, and secondary education. Cégep and university students pay tuition fees. Children are admitted to preschool at five years of age and elementary school at six years of age, and school attendance is compulsory until the age of 16. The official language of instruction at the elementary and secondary levels is French. Education in English is available mainly to students whose father or mother received most of their elementary education in English in Canada or whose brother(s) or sister(s) received most of their elementary or secondary education in English in Canada. In 2015–16, 9.6 percent of Quebec students were educated in English. In Quebec, some 65 percent of private schools receive a subsidy from the MEES. The per student subsidy allocated to private schools is equal to approximately 60 percent of the per student subsidy allocated to public schools for educational services. For Indigenous schools covered under the James Bay and Northern Quebec Agreement and the Northeastern Quebec Agreement, instruction is given in the students' mother tongue during preschool and the first three years of elementary school. French or English is introduced gradually starting in Grade 3.

Full-time preschool is offered to children who are four or five years of age. While it is not compulsory, almost all children attend preschool at five years of age.

Elementary school lasts six years and is divided into three two-year cycles. Secondary school lasts five years and is divided into two cycles. The first secondary school cycle, which lasts two years, is a

continuation of elementary school and aims to provide the same basic education to all students. The second cycle lasts three years. The last year of compulsory education is the year the student turns 16, which generally corresponds to the fourth year of secondary school, known as Secondary IV.

In 2015–16, a total of 1,015,626 students were registered in general non-adult classes in Quebec's 2,624 elementary and secondary schools. These include 2,328 public schools run by 72 school boards, and 296 private schools.

The Quebec Education Program (QEP) for preschools and elementary and secondary schools focuses on skills development. It includes certain cross-curricular competencies that are required for the broad areas of learning — which correspond to the major spheres of students' lives — as well as programs of study organized into subject areas. The QEP defines a competency as a set of behaviours based on the effective mobilization and use of a range of resources. One aim of a competency-based program is to ensure that students' learnings serve as tools for both action and thought (which is also a form of action). In this context, competency is complex and progressive. It is more than a simple combination or juxtaposition of elements, and students can continue to develop it throughout the school curriculum and beyond. Additional documents have been created to define the knowledge that students must acquire and be able to use in each year of elementary and secondary school. The preschool and elementary school programs have been in place in Quebec schools since September 2000. The program was introduced for Secondary Cycle 1 in September 2005 and was implemented gradually from September 2007 to September 2009 for Secondary Cycle 2.

Mathematics teaching

The MEES determines curriculum content in close collaboration with professional subject experts, curriculum developers, teachers, and school board consultants.[42] Since 2013, a group of guidance counsellors from different regions of Quebec have participated in a community of practice where one of the topics is mathematics in underprivileged communities. Taking into account the special circumstances and needs of these students, guidance counsellors share their experiences and concerns with regard to their work.

In Quebec, mathematics is compulsory at all elementary and secondary school levels. Mathematics curricula present prescribed concepts and processes using a problem-solving approach. Concepts are grouped by cycle for the three elementary school cycles and for Secondary Cycle 1 but are presented separately for each of the three years of Secondary Cycle 2. Three learning profiles, or options, are offered to Secondary IV and V students: cultural, social, and technical; technical and scientific; and science. Students who want to study science or certain technical fields at the college level (Grades 12 and 13) must enrol in and pass a specific learning profile.

Mathematics teaches students to:

- use mathematical reasoning — that is, form conjectures and critique, justify, or disprove a proposition using an organized set of mathematical knowledge;

[42] Note that Indigenous schools covered under the James Bay and Northern Quebec Agreement and the Northeastern Quebec Agreement can develop special curricula for the client groups they serve.

- communicate — that is, interpret, produce, or convey messages in situations where the subject of the message, the purpose of the communication, and the target audience play an important role;

- solve problems using different comprehension, organizational, solution, validation, and communication strategies.

Through these processes, students develop their ability to interpret reality and to anticipate, generalize, and make decisions in a changing world.

Assessment

The ministry gives students a compulsory mathematics examination at the end of Elementary Cycle 3. The examination is marked by teachers with the help of a marking guide. Sometimes the ministry reviews a sample of students' booklets for a sense of what students have learned.

To earn their credential, students must pass a standardized mathematics examination at the end of Secondary IV. These examinations are marked in part at the ministry (for the multiple-choice questions) and in part at the school (for the short-answer and constructed-response questions) using answer keys provided by the ministry. Evaluating the students is the responsibility of the schools, which must adopt a local evaluation policy in accordance with current ministerial frameworks.

At the secondary level, the mathematics curriculum is weighted as follows for Cycles 1 and 2:

- solving situational problems: 30 percent

- using mathematical reasoning: 70 percent

For more information on curriculum and evaluation in Quebec, visit:

- **http://www.education.gouv.qc.ca/en/references/programs-of-study/**

- **http://www.education.gouv.qc.ca/en/teachers/quebec-education-program/**

- **http://www.education.gouv.qc.ca/contenus-communs/parents-et-tuteurs/examens-et-epreuves/documents-dinformation-sur-les-epreuves/** (available in French only)

- **http://www.education.gouv.qc.ca/en/contenus-communs/parents-and-guardians/exams-and-ministerial-examinations/**

Results in mathematics

This section presents PCAP 2019 results in mathematics for Quebec and Canada overall by performance levels and mean scores. Student achievement is reported in mathematics overall, by language of the school system, and by gender. This section concludes with a comparison of changes over time in mathematics achievement.

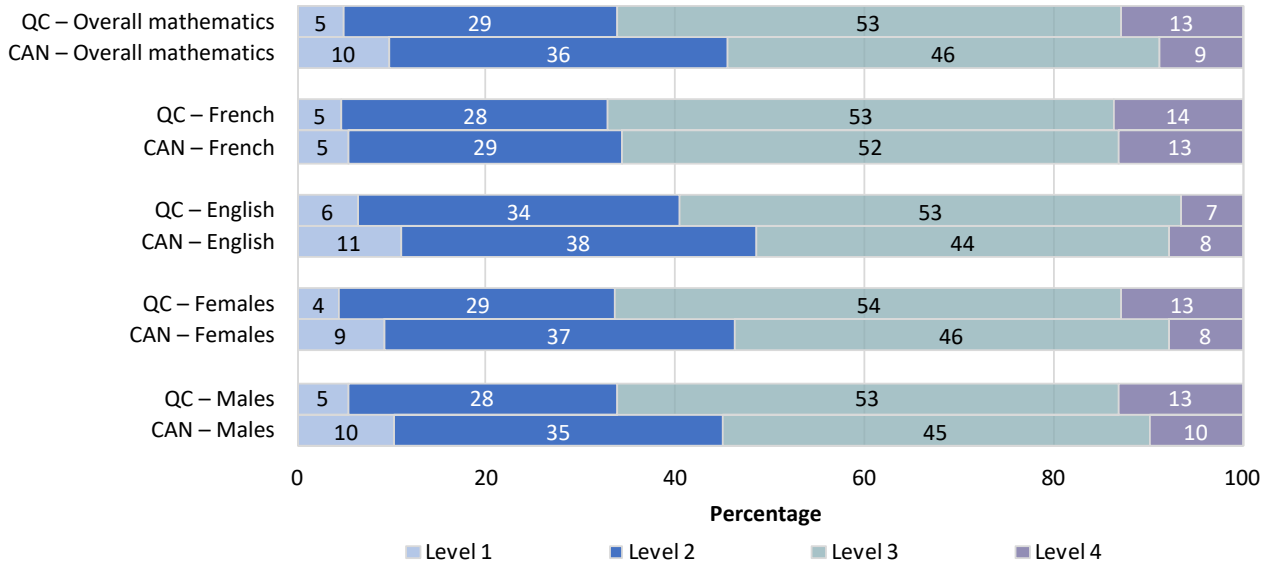
Results in mathematics by performance level

Figure QC.1 presents the results by performance level of students in Quebec and in Canada overall in the PCAP 2019 mathematics assessment. Ninety-five percent of students in Quebec achieved Level 2 or higher in mathematics (Level 2 is the baseline or expected level of mathematics proficiency for Secondary II students), and 13 percent of students achieved the highest level of performance (Level 4). These proportions are higher than those among Canadian students overall (Appendix B.1.1).

In Quebec, a higher proportion of both anglophone and francophone students attained Level 2 or above than was seen in the respective pan-Canadian samples. Within the province, similar proportions of students in both language systems achieved the expected level or above. A higher proportion of French-language students than English-language students achieved Level 4, which is consistent with the pattern at the pan-Canadian level (Appendix B.1.4b).

A higher proportion of Quebec girls and boys achieved at or above Level 2 compared to the respective Canadian averages. There was no gender gap in achievement at the highest performance level within Quebec, while, at the pan-Canadian level, a higher proportion of boys than girls achieved this level (Appendix B.1.8b).

Figure QC.1 Canada–Quebec: percentage of students at each performance level in mathematics



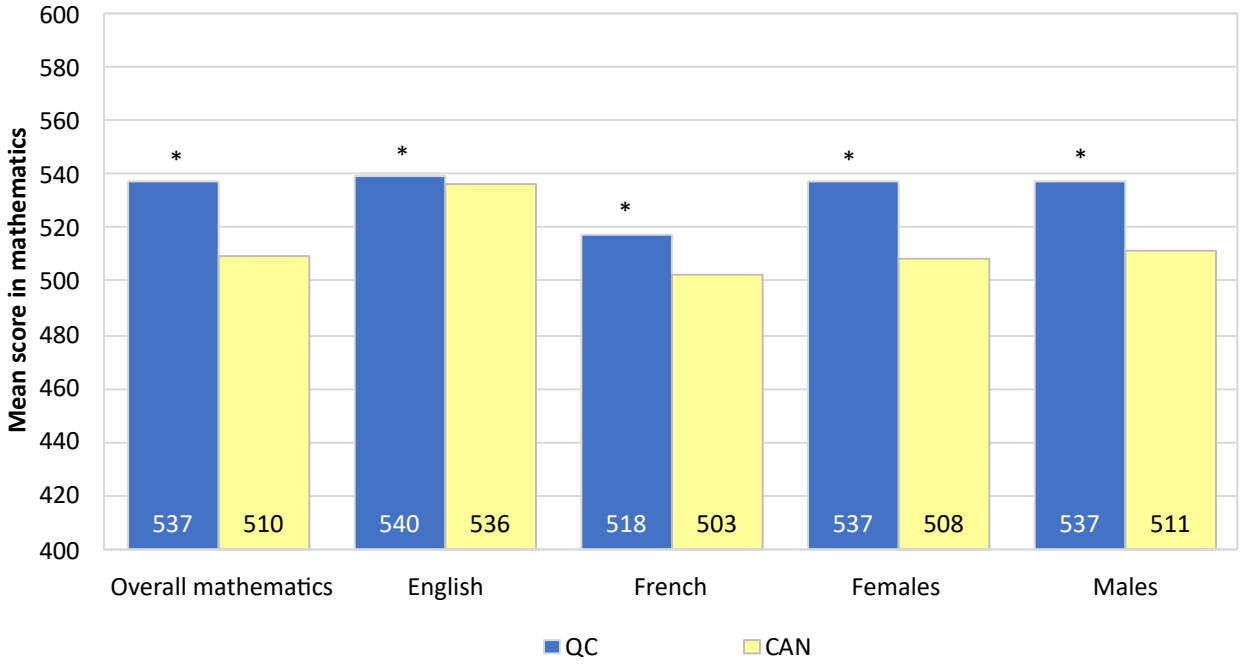
Results in mathematics by mean score

As shown in Figure QC.2, which displays the mean scores in mathematics of students in Quebec and in Canada overall in PCAP 2019, students in the province scored above the Canadian mean (Appendix B.1.2).

Students in both English- and French-language schools in Quebec achieved scores above the respective Canadian means in mathematics by language. Within the province, students in francophone schools outperformed those in anglophone schools, which is consistent with the results for Canada overall (Appendix B.1.5).

Both girls and boys in Quebec achieved scores in mathematics that were significantly higher than those for girls and boys at the pan-Canadian level. However, within the province, and for Canada overall, there was no gender gap in mathematics (Appendix B.1.9).

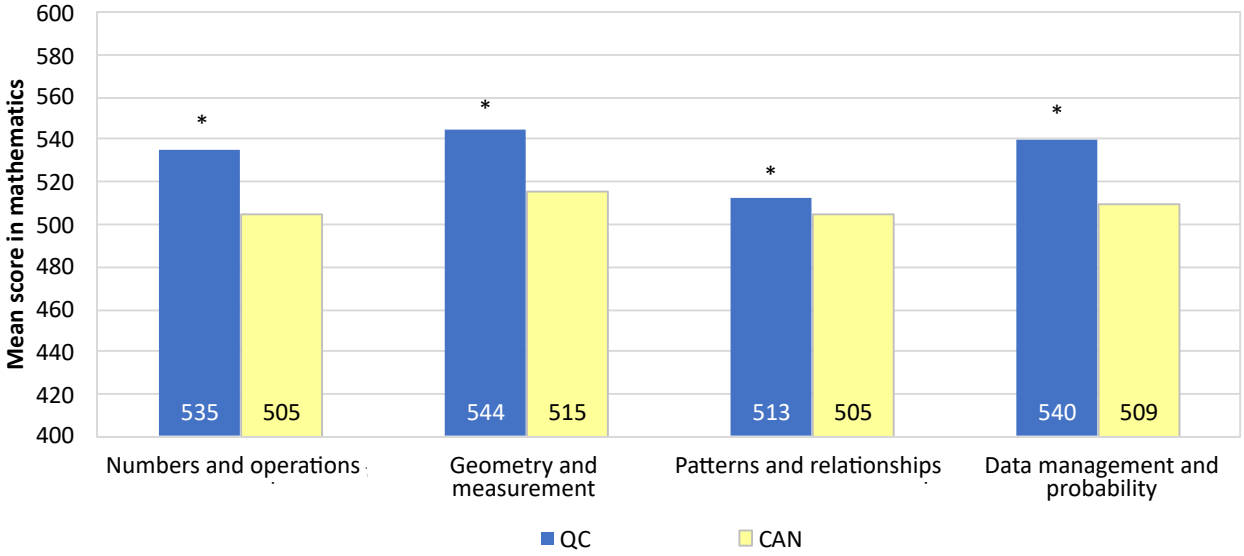
Figure QC.2 Canada–Quebec: mean scores in mathematics



* Denotes significant difference compared to Canada

Figure QC.3 presents the mean scores in mathematics by subdomain for Quebec and Canadian students. Students in the province achieved results above the respective Canadian means in each of the four subdomains in mathematics. Within Quebec, the strongest results were observed for the *geometry and measurement* and *data management and probability* subdomains (Appendix B.1.3).

Figure QC.3 Canada–Quebec: mean scores in mathematics subdomains



* Denotes significant difference compared to Canada

Table QC.1 compares the mathematics achievement scores in Quebec and Canada overall in each of the subdomains by language of the school system. Students in Quebec's English- and French-language school systems achieved higher scores compared to the Canadian average across all subdomains except *patterns and relationships*, in which they scored at the respective Canadian means. In all but this subdomain, Quebec's francophone students outperformed their anglophone peers (Appendix B.1.6).

Table QC.1 Canada–Quebec: mean scores in mathematics subdomains by language of the school system

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN English	497	1.7	507	1.5	503	1.4	501	0.9
QC English	509	3.3	523	3.1	511	2.8	509	2.8
Difference	-11*		-16*		-8		-8*	
CAN French	534	2.6	544	2.3	512	1.9	541	1.9
QC French	538	3.0	547	2.6	513	2.3	543	2.2
Difference	-3*		-2*		-1		-2*	
QC English	509	3.3	523	3.1	511	2.8	509	2.8
QC French	538	3.0	547	2.6	513	2.3	543	2.2
Difference	-29*		-23*		-2		-34*	

* Denotes significant difference

Table QC.2 shows mathematics subdomain scores for Quebec and Canadian students by gender. In Quebec, girls achieved above the Canadian mean scores in all four subdomains, while boys achieved above the Canadian means in three of the four subdomains. There was no gender gap in the province in any of the mathematics subdomains (Appendix B.1.10).

Table QC.2 Canada–Quebec: mean scores in mathematics subdomains by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN female	504	1.7	514	1.5	504	1.3	508	1.0
QC female	536	3.2	543	2.7	513	2.4	540	2.2
Difference	-32*		-28*		-9*		-32*	
CAN male	507	1.6	516	1.5	506	1.5	510	1.0
QC male	534	3.1	546	2.8	513	2.5	539	2.5
Difference	-27*		-30*		-7		-28*	
QC female	536	3.2	543	2.7	513	2.4	540	2.2
QC male	534	3.1	546	2.8	513	2.5	539	2.5
Difference	2		-3		0		2	

* Denotes significant difference

Comparison of results over time

In PCAP, changes over time are determined by comparing the current assessment year to the baseline year — that is, the first year in which the subject was the primary focus of the assessment. For PCAP mathematics, the baseline year was 2010. In the baseline year, a larger number of items are administered in the major domain, which allows a broader coverage of the PCAP framework.

Table QC.3 and Figure QC.4 present a summary of the changes over time in mathematics achievement scores in Quebec. In comparison to the baseline year in 2010, achievement in 2019 improved in mathematics overall and in each of the four subdomains. These patterns are consistent with those at the pan-Canadian level (Appendices B.1.11, B.1.14).

Mathematics results in both French- and English-language schools in Quebec improved in 2019 compared to 2010. These trends were also found at the pan-Canadian level (Appendix B.1.12).

In Quebec, the mathematics results for both girls and boys in 2019 improved over those in 2010, a trend that is consistent with the results at the pan-Canadian level (Appendix B.1.13).

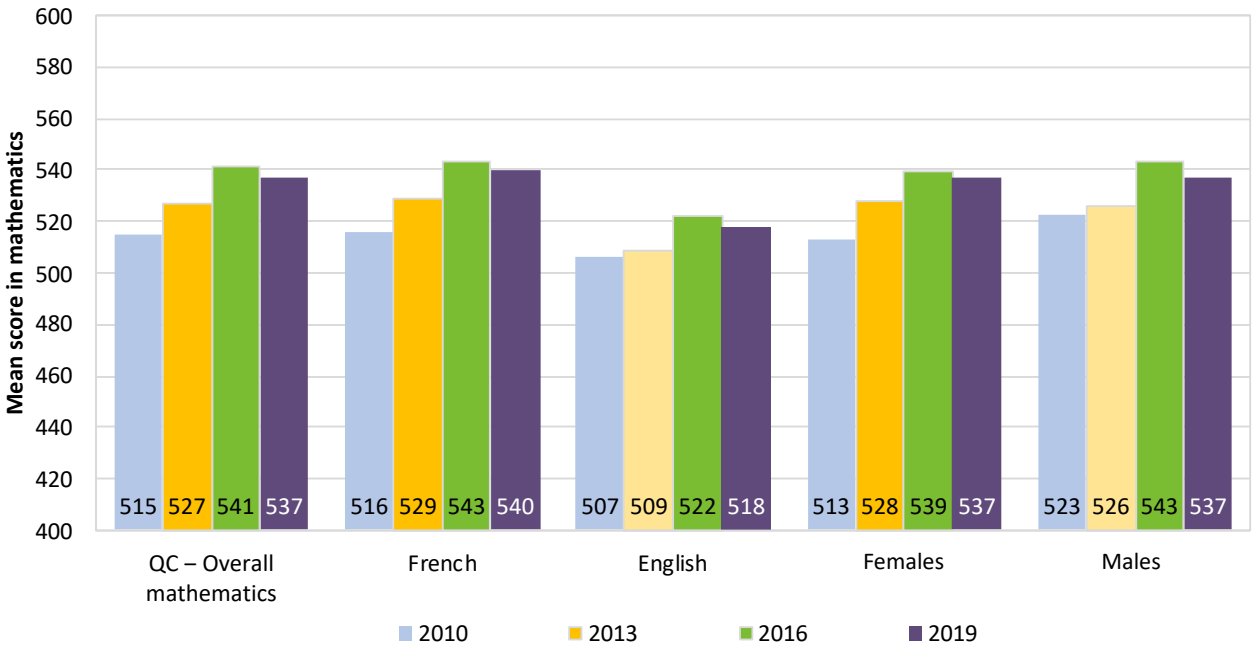
Data tables in Appendix B report results over time for the mathematics subdomains by language of the school system (Appendix B.1.15) and by gender (Appendix B.1.16).

Table QC.3 Quebec: summary of achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
QC - Overall mathematics	515	537	22*
Numbers and operations	520	535	15*
Geometry and measurement	517	544	27*
Patterns and relationships	504	513	9*
Data management and probability	510	540	29*
Anglophone school system	507	518	11*
Francophone school system	516	540	23*
Achievement gap (A - F)	-9	-22	
Females	513	537	24*
Males	523	537	15*
Achievement gap (F - M)	-10	0	

* Denotes significant difference compared to the baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Figure QC.4 Quebec: mean scores in mathematics, 2010–2019



Note: Darker shades denote significant difference compared to the baseline year 2010

Results in reading and science

As noted in the Introduction, reading and science are both minor domains in PCAP 2019. Results for these domains are reported by mean scores only. This section presents reading and science scores for Quebec, compares those scores with pan-Canadian results, reports results by language of the school system and by gender, and presents multiple comparisons over time.

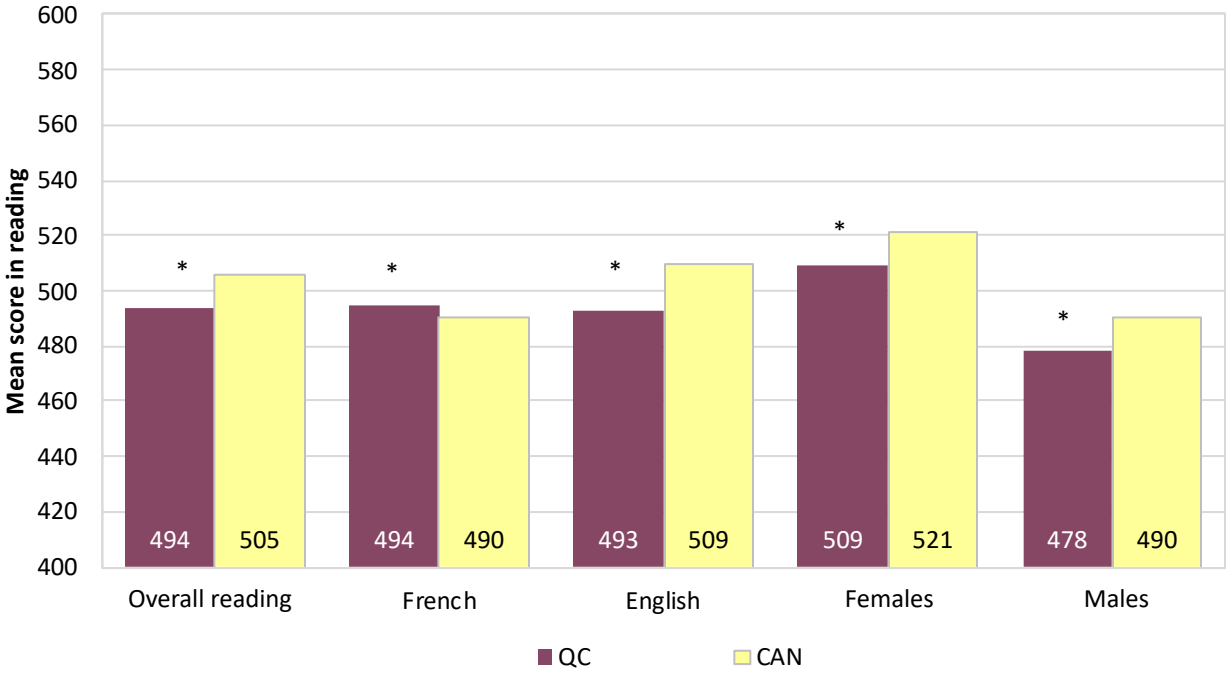
Results in reading

Figure QC.5 summarizes the results by mean scores of the PCAP reading assessment for Quebec and Canada, including by language of the school system and gender. It shows that Quebec students scored significantly below the Canadian mean in reading overall (Appendix B.2.1).

Students enrolled in Quebec's French-language schools achieved scores in reading that were higher than the Canadian francophone mean, while students in the province's English-language schools achieved scores that were lower than the Canadian English mean. Within Quebec, the results were similar between the two language systems. This finding contrasts with the results at the pan-Canadian level, where anglophone students obtained significantly higher scores than their francophone counterparts (Appendix B.2.2).

The reading scores of both girls and boys in Quebec were significantly lower than the Canadian means by gender. Within the province, girls attained significantly higher scores than boys, which reflects the trend at the pan-Canadian level (Appendix B.2.3).

Figure QC.5 Canada–Quebec: mean scores in reading



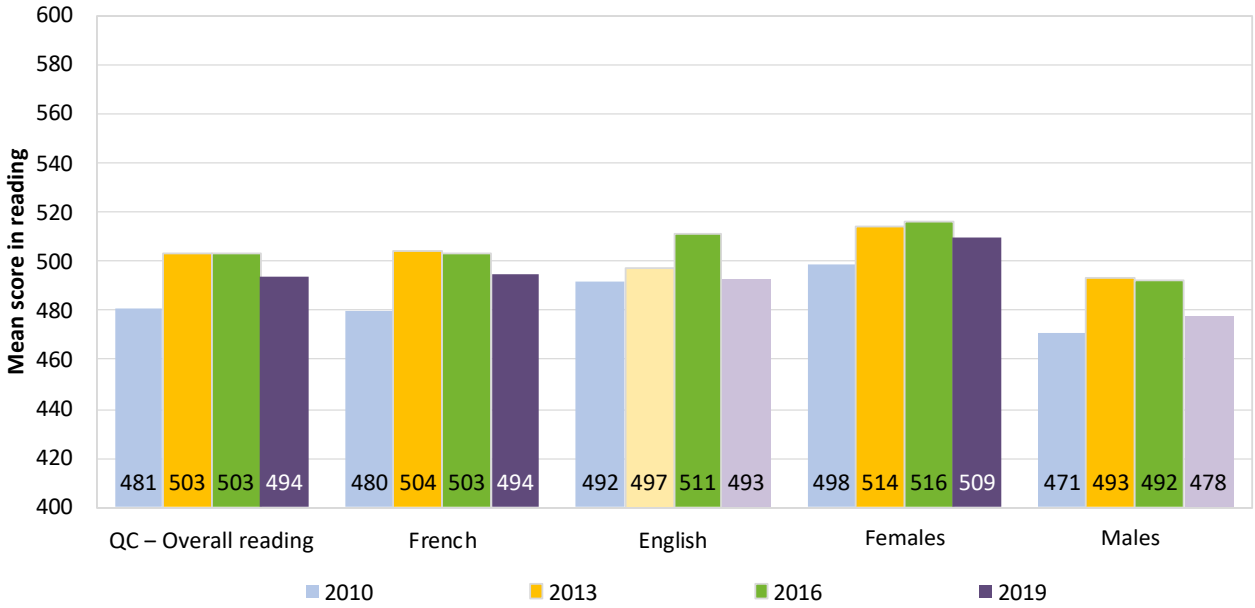
* Denotes significant difference compared to Canada

Figure QC.6 presents changes over time in reading achievement in Quebec. As explained in Chapter 2, although reading was the major domain in PCAP 2007, the baseline year for reading was adjusted to 2010, when the PCAP target group changed from 13-year-old students to Secondary II students. In Quebec, changes in reading scores from the baseline year of 2010 to 2019 were positive, which is consistent with the pattern at the pan-Canadian level (Appendix B.2.4).

Within Quebec, anglophone students had no significant change in reading achievement in 2019 compared to 2010. By contrast, francophone students show a significant improvement compared to the baseline year. These trends in Quebec are consistent with those in Canada overall (Appendix B.2.5).

Within the province, girls' reading scores in 2019 showed a positive change compared to the 2010 baseline, while boys' results were stable. A similar pattern was found at the pan-Canadian level (Appendix B.2.6).

Figure QC.6 Quebec: mean scores in reading, 2010–2019



Note: Darker shades denote significant difference compared to the adjusted baseline year 2010

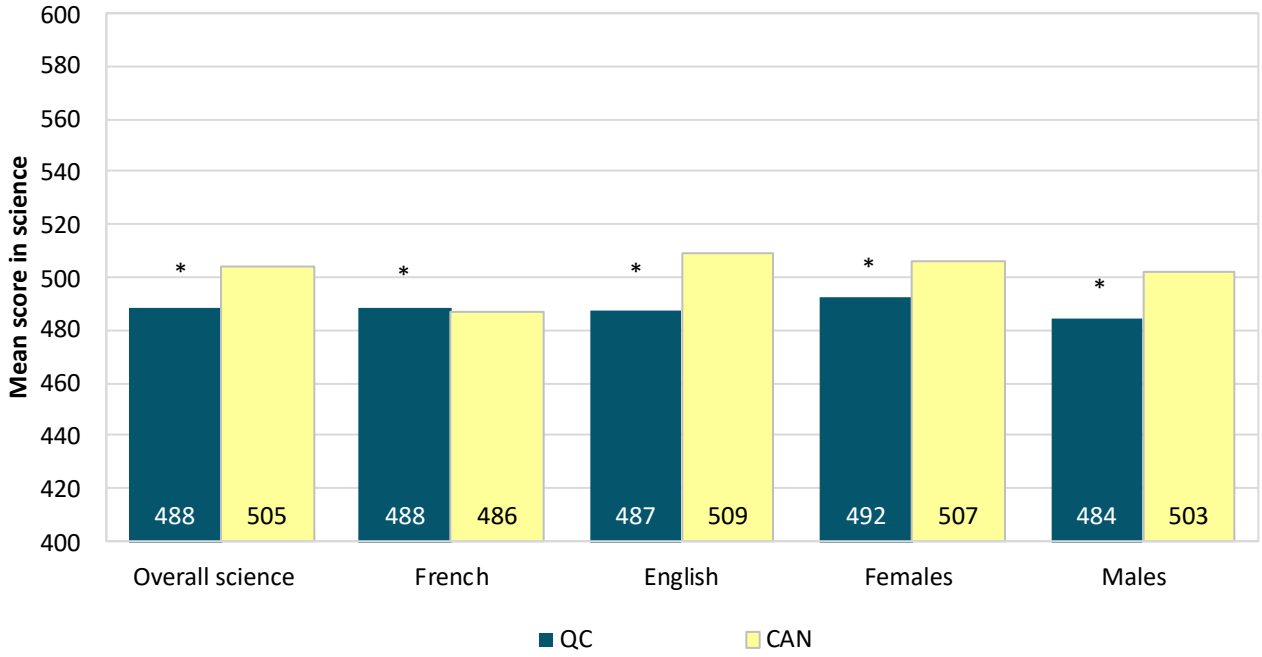
Results in science

Figure QC.7 shows mean scores in PCAP 2019 science in Quebec and Canada overall, as well as by language of the school system and gender. In science overall, students in the province achieved below the Canadian mean score (Appendix B.3.1).

Students in French-language schools in Quebec achieved higher scores than the Canadian French mean in science, while students in English-language schools achieved lower scores than the Canadian English mean. Within the province, there was no achievement gap between the English- and French-language school systems. This finding differs from the results at the pan-Canadian level, where anglophone students outperformed their francophone counterparts (Appendix B.3.2).

The science scores of both girls and boys in Quebec were below the respective Canadian means by gender. Within the province, as was the case in Canada overall, girls outperformed boys in science (Appendix B.3.3).

Figure QC.7 Canada–Quebec: mean scores in science



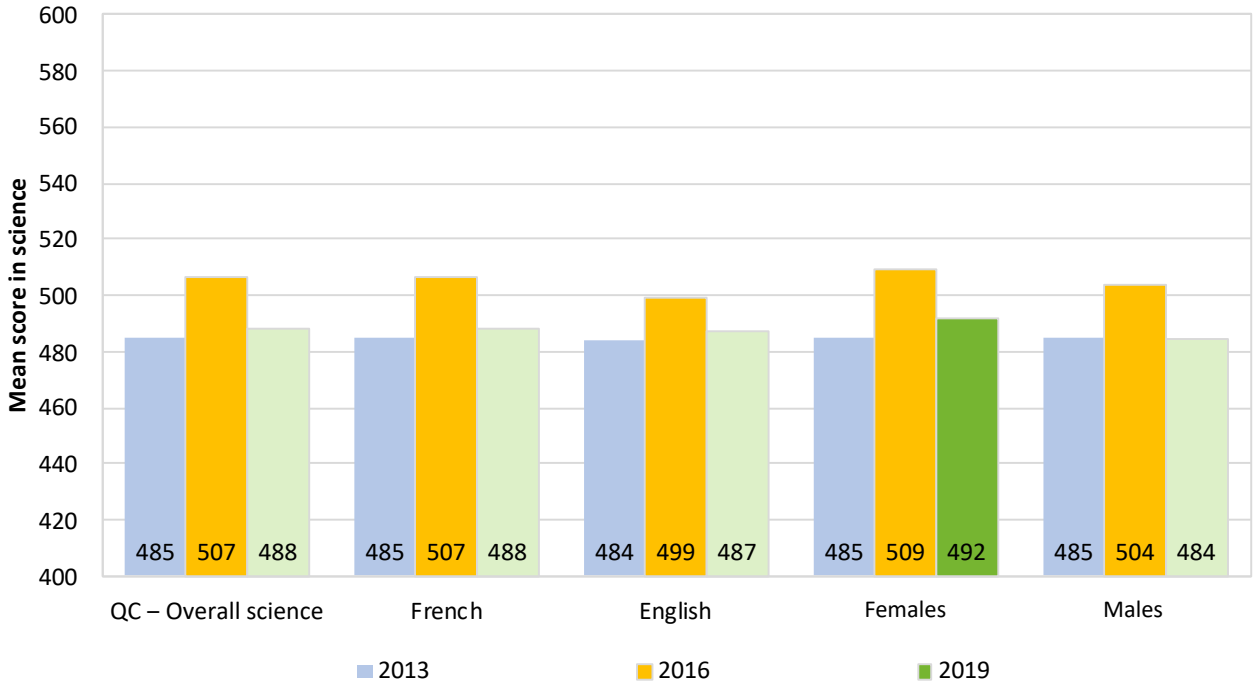
* Denotes significant difference compared to Canada

Figure QC.8 displays changes over time in science achievement in Quebec. When results from the 2013 baseline and 2019 are compared, students in Quebec showed stable performance in science. By contrast, students in Canada overall had improved results in science (Appendix B.3.4).

In Quebec, the results in both English- and French-language school systems in 2019 were similar to those in 2013. Across Canada, anglophone school systems saw a positive change in science achievement, and francophone school systems had stable results (Appendix B.3.5).

In Quebec, science results for girls were higher in 2019 than in the 2013 baseline year, while the results for boys were stable. These findings are consistent with the pattern at the pan-Canadian level (Appendix B.3.6).

Figure QC.8 Quebec: mean scores in science, 2013–2019



Note: Darker shades denote significant difference compared to the baseline year 2013

NEW BRUNSWICK

Context statement

Social context

As Canada's only officially bilingual province, New Brunswick offers students the opportunity to learn in both English and French. In addition, students can take language and culture classes in Wolastoqey and Mi'kmaq. Peskotomuhkati are also Treaty signatories and therefore are owed the honour of the Crown with respect to the duty to consult on Aboriginal and Treaty rights. The Department of Education and Early Childhood Development engages and consults with this nation on language. According to the 2016 Census, there are approximately 17,575 First Nation people in New Brunswick; 58.7 percent reside in First Nation communities and 41.2 percent are living off-community. On July 1, 2016, the estimated total population of New Brunswick was 756,800, an increase of 0.33 percent over the preceding year. Although the province's population remained fairly stable over the previous five years, enrolment in francophone and anglophone schools had been decreasing since 2005. Enrolment began to stabilize in 2017 and then increased by just over 1,000 students in 2019.

Since 2009, the number of older people in New Brunswick has exceeded the number of children. According to 2016 Census information, the median age in the province was 45.7, compared to 40.2 for all of Canada. The exception to this trend is New Brunswick's Indigenous population: the average age was 31.9 years for First Nation people.

Organization of the school system

New Brunswick's *Education Act* affirms the right of all students to be educated in a common learning environment to the fullest extent practicable. Inclusive education has been entrenched in the public education system since 1986. Recently developed provincial policy has strengthened the requirements for supporting all learners to enable them to develop to their full potential in a common, positive learning environment. A recent amendment to the *Education Act* reinforced the obligation of the minister to approve programs and services that foster an understanding of Indigenous history and culture among all students.

In 1974, New Brunswick recognized its linguistic duality in public education by establishing two parallel but distinct school systems. The francophone sector of the Department of Education and Early Childhood Development is responsible for francophone schools, including curriculum, student support services, and assessment; the anglophone sector is responsible for the same in anglophone schools. Schools are organized within seven school districts, three francophone and four anglophone. Each school district is governed by a district education council, whose members are locally elected by the public and who are responsible for policy development and decision making regarding school and district operations, through the superintendent of the school district.

In the 2018–19 school year, 29,139 students were enrolled in the francophone sector and 68,756 students in the anglophone sector. These students represented 29.8 percent and 70.2 percent,

respectively, of the total enrolment of 97,895 in the province from Kindergarten to Grade 12. On September 30, 2018, there were 1,376 students living in First Nation communities in the province and attending provincial schools. Of these, 1,301 attended anglophone schools and 75 attended francophone schools. The number of Indigenous students living and attending schools off-community is not tracked.

"School age" is defined in the *Education Act* as age 5 to 21. Children who are five years old, or who will be five by December 31 of that school year, are enrolled in Kindergarten in September. School attendance is compulsory until the end of secondary school (graduation) or the age of 18, whichever comes first. Some students, depending on their learning plan, may stay in public school until the age of 21.

In 2010, early childhood development was integrated into the Department of Education to allow greater continuity in programming in support of early learning and support and services in French and English. Early learning services and programs are offered by the Department and school districts and through agencies to children under the age of eight, with after-school programming available for children up to age 12.

The Department oversees licensing of early learning and childcare facilities, which operate primarily within the private sector. In 2017, the Department introduced a voluntary New Brunswick Early Learning Centre (NBELC) designation for facilities serving children from infancy to Kindergarten entry as part of its transformational initiative toward a more publicly managed early learning and childcare system. Designated NBELCs use one of the two provincial early learning and childcare curriculum frameworks (anglophone or francophone), which align the early learning and childcare system with New Brunswick's dual public education sectors.

For more information about New Brunswick's anglophone school districts, see **http://www2.gnb.ca/content/gnb/en/departments/education/k12.html.**

For more information about New Brunswick's francophone school districts, see **http://www2.gnb.ca/content/gnb/fr/ministeres/education/m12/content/secteur_francophone/francophone.html.**

Mathematics teaching

Mathematics is a core subject in New Brunswick schools. Mathematics courses are compulsory in the province for all students from Kindergarten to Grade 11. The anglophone sector implemented new math curricula for Kindergarten to Grade 12 between 2008 and 2014, while the francophone sector implemented its new curricula for Kindergarten to Grade 12 from 2011 to 2014.

Beginning in Grade 11, New Brunswick students enrol in courses from three mathematics pathways — Financial and Workplace Mathematics, Foundations of Mathematics, and Pre-Calculus — which are associated with different postsecondary and work-ready options. In the francophone sector, students can choose between two pathways starting in Grade 10, which lead, in Grade 11, to the same three pathways that exist in the anglophone sector.

The aim of the mathematics curricula is to develop mathematically literate students who can express their understanding of mathematics, connect mathematical ideas, demonstrate fluency with mental math and estimation, apply their ability to reason and solve problems, and choose technological

tools. In the anglophone sector, the math curriculum is focused on the nature of mathematics and key processes. It is organized into four strands: number, patterns and relations, shapes and space, and statistics and probability. In the francophone sector, learning outcomes are integrated in the following strands: number sense and operations, patterns and algebra, geometry, measurement, and data processing and probability.

Assessment

At the provincial level, both language sectors administer mathematics examinations that include multiple-choice and constructed-response/problem-solving questions and assess all domains of the curriculum. Teachers participate in every stage of the development, administration, and marking of the examinations.

In the anglophone sector, mathematics examinations take place in Grades 4, 6, and 10. Detailed statistical reports on success rates are then provided to school districts and schools to enable them to set goals for improvement and provide information on student achievement to parents and the general public.

In the francophone sector, mathematics examinations take place in Grades 3, 6, 8, and 10. The tests take place in May and June, with individual student results made available to schools and parents before the end of the school year. The four assessments generate standardized data on progress in learning at key points in students' careers.

Results in mathematics

This section presents PCAP 2019 results in mathematics for New Brunswick and Canada overall by performance levels and mean scores. Student achievement is reported in mathematics overall, by language of the school system, and by gender. This section concludes with a comparison of changes over time in mathematics achievement.

Results in mathematics by performance level

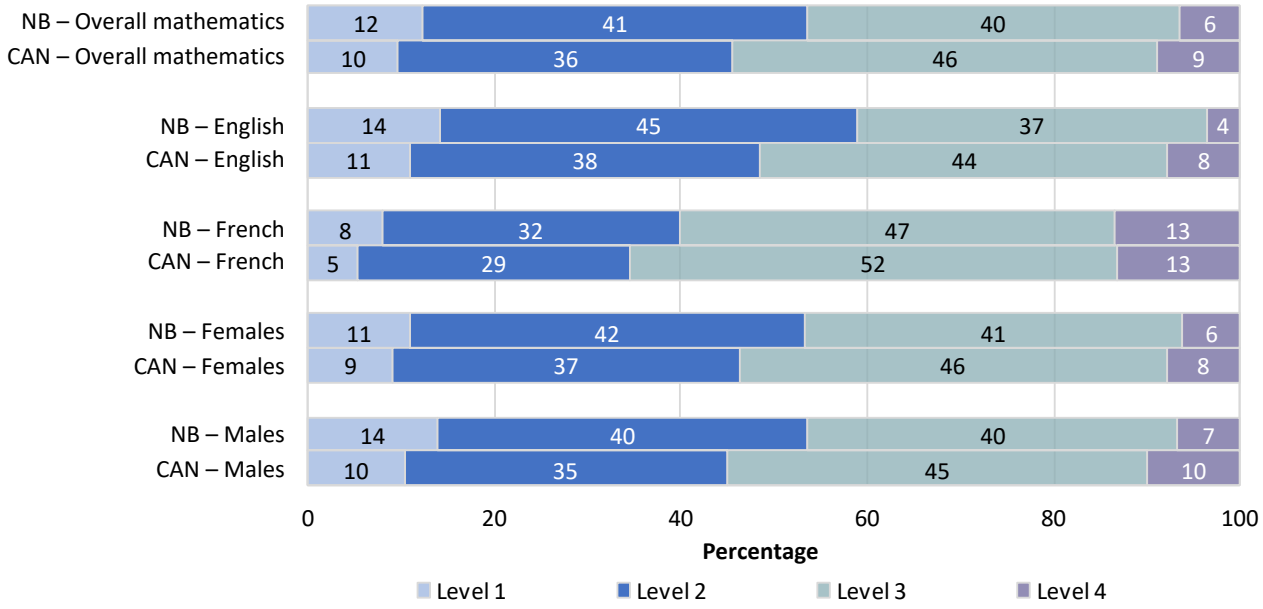
Figure NB.1 presents the results by performance level of students in New Brunswick and in Canada overall in the PCAP 2019 mathematics assessment. Eighty-eight percent of New Brunswick students achieved Level 2, compared to 90 percent of students across Canada (Appendix B.1.1).

Eighty-six percent of students in the English-language school system and 92 percent of students in the French-language school system in New Brunswick attained Level 2 or higher in mathematics. For both language groups, the proportion of students who reached expected proficiency was lower than that of students in the two language groups in Canada overall. Within the province, a higher proportion of francophone than anglophone students obtained these levels of achievement, a trend similar to that at the pan-Canadian level (Appendix B.1.4b).

In New Brunswick, 89 percent of girls and 86 percent of boys performed at Level 2 or above in mathematics, which is lower than the proportions by gender for Canadian students overall. While

no gender gap was found at the pan-Canadian level, a higher proportion of girls than boys in New Brunswick achieved at or above the expected level of performance in mathematics (Appendix B.1.8b)

Figure NB.1 Canada–New Brunswick: percentage of students at each performance level in mathematics



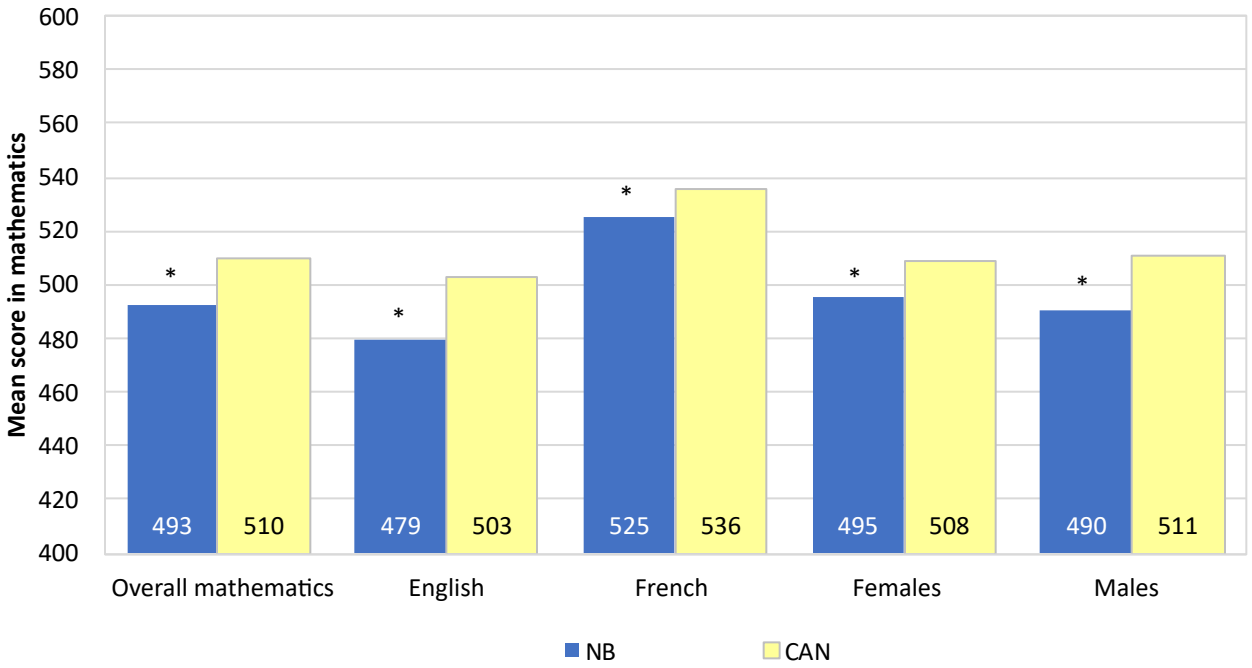
Results in mathematics by mean score

Figure NB.2 summarizes the results by mean score of the PCAP mathematics assessment for students in New Brunswick and Canada overall. Students in New Brunswick achieved scores in mathematics below the Canadian mean (Appendix B.1.2).

Students in both French- and English-language school systems in the province scored below the Canadian means in mathematics for the respective language groups. Within the province, students in francophone schools outperformed those in anglophone schools, which is consistent with the pattern at the pan-Canadian level (Appendix B.1.5).

Girls and boys in New Brunswick scored below the respective Canadian means in mathematics. Within the province, girls outperformed boys in mathematics, whereas no gender gap was found in Canada as a whole (Appendix B.1.9).

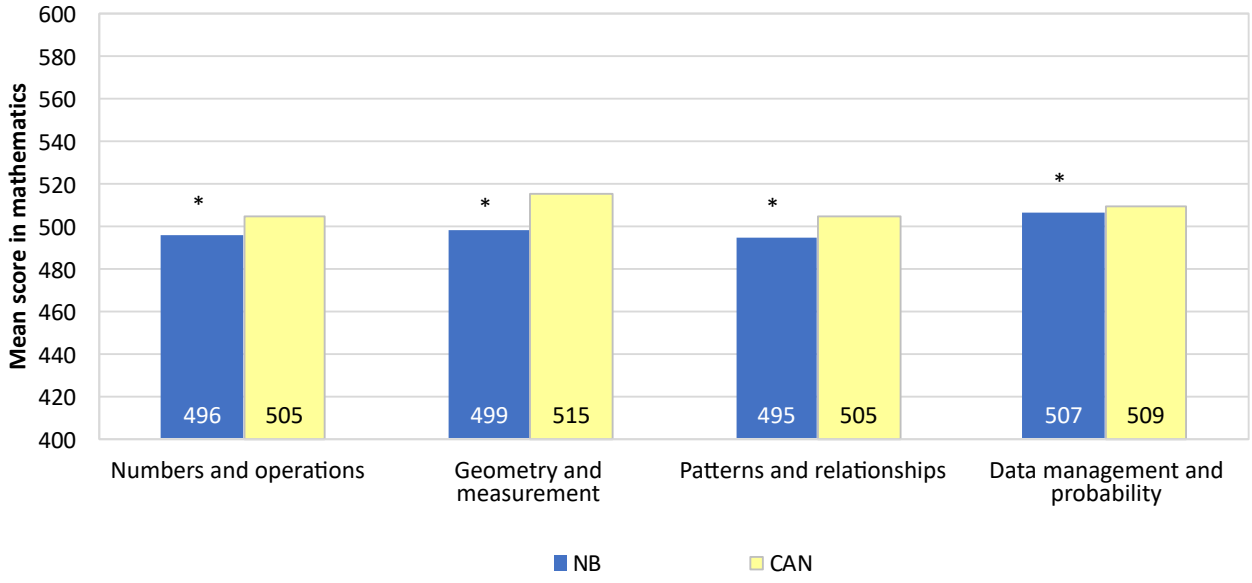
Figure NB.2 Canada–New Brunswick: mean scores in mathematics



* Denotes significant difference compared to Canada

Figure NB.3 presents the achievement scores in mathematics by subdomain for New Brunswick and Canadian students. Students in the province achieved results below the respective Canadian means in each of the four subdomains in mathematics. In New Brunswick, the strongest results were observed for the *data management and probability* subdomain (Appendix B.1.3).

Figure NB.3 Canada–New Brunswick: mean scores in mathematics subdomains



* Denotes significant difference compared to Canada

Examination of achievement scores by subdomain and language of the school system reveals that students in English-language schools in the province obtained scores below the Canadian means in all four subdomains. The same trend held for francophone students except in *data management and probability*, where the provincial and Canadian mean scores were similar. In New Brunswick, students enrolled in the French-language sector achieved higher scores than those in the English-language sector in all four subdomains, which is consistent with the pattern at the pan-Canadian level (Table NB.1, Appendix B.1.6).

Table NB.1 Canada–New Brunswick: mean scores in mathematics subdomains by language of the school system

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN English	497	1.7	507	1.5	503	1.4	501	0.9
NB English	485	0.0	483	0.0	492	0.0	493	0.0
Difference	13*		24*		11*		8*	
CAN French	534	2.6	544	2.3	512	1.9	541	1.9
NB French	525	0.0	538	0.0	503	0.0	541	0.0
Difference	9*		7*		9*		0	
NB English	485	0.0	483	0.0	492	0.0	493	0.0
NB French	525	0.0	538	0.0	503	0.0	541	0.0
Difference	-40*		-55*		-11*		-49*	

* Denotes significant difference

Table NB.2 compares mathematics achievement scores in New Brunswick and Canada overall in each of the subdomains by gender. It shows that both girls and boys in New Brunswick had lower scores than girls and boys in Canada overall in all subdomains; the only exception was for girls' scores in *data management and probability*, where results were similar to the Canadian mean. A gender gap favouring girls was found in New Brunswick in all four subdomains. This contrasts with the results at the pan-Canadian level, where there was no gender gap in three of the subdomains, while boys outperformed girls in *numbers and operations* (Appendix B.1.10).

Table NB.2 Canada–New Brunswick: mean scores in mathematics subdomains by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN female	504	1.7	514	1.5	504	1.3	508	1.0
NB female	497	0.0	501	0.0	497	0.0	508	0.0
Difference	7*		13*		7*		0	
CAN male	507	1.6	516	1.5	506	1.5	510	1.0
NB male	496	0.0	497	0.0	494	0.0	505	0.0
Difference	11*		19*		13*		5*	
NB female	497	0.0	501	0.0	497	0.0	508	0.0
NB male	496	0.0	497	0.0	494	0.0	505	0.0
Difference	1*		4*		3*		3*	

* Denotes significant difference

Comparison of results over time

In PCAP, changes over time are determined by comparing the current assessment year to the baseline year — that is, the first year in which the subject was the primary focus of the assessment. For PCAP mathematics, the baseline year was 2010. In the baseline year, a larger number of items are administered in the major domain, which allows a broader coverage of the PCAP framework.

Table NB.3 and Figure NB.4 present a summary of the changes over time in mathematics achievement scores in the province. Compared to the baseline year in 2010, a positive change in achievement was observed in overall mathematics, as well as in the four mathematics subdomains, in New Brunswick in 2019. This is consistent with the pattern found in Canada overall (Appendices B.1.11, B.1.14).

Results for both English- and French-language school systems in New Brunswick were stronger in 2019 than in 2010. These findings are consistent with results at the pan-Canadian level (Appendix B.1.12).

In New Brunswick, the mathematics results for both girls and boys improved in 2019 compared to 2010. This trend is consistent with the results for Canada overall (Appendix B.1.13).

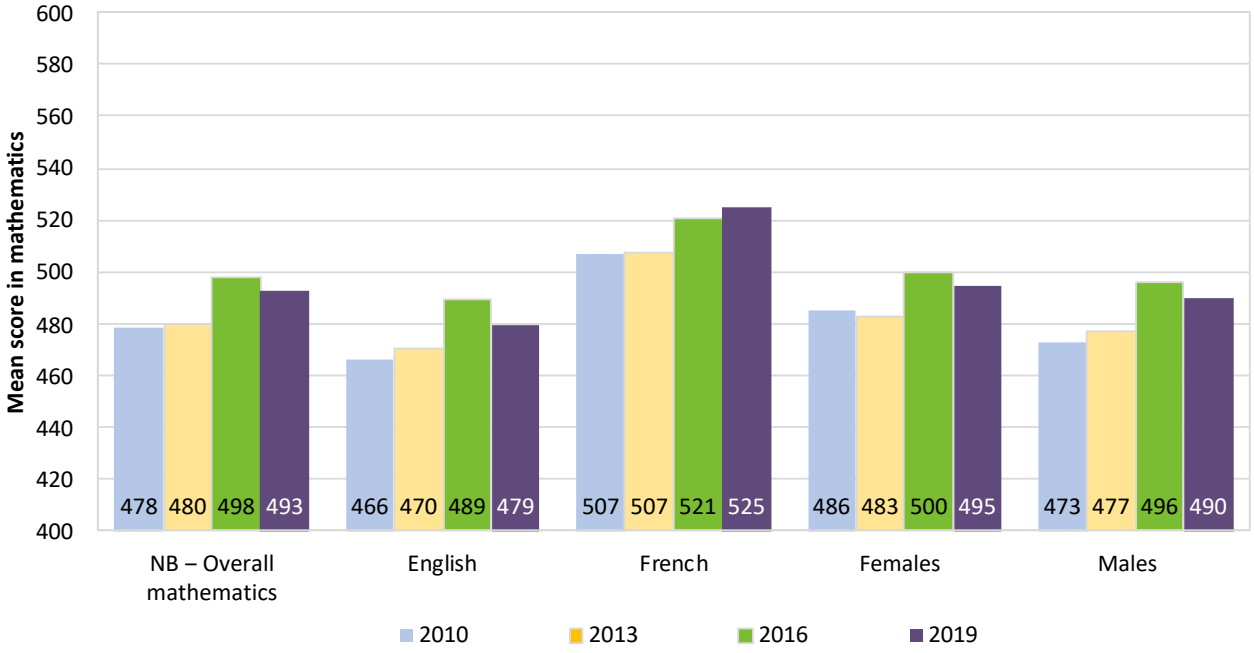
Data tables in Appendix B report results over time for the mathematics subdomains by language of the school system (Appendix B.1.15) and by gender (Appendix B.1.16).

Table NB.3 New Brunswick: summary of achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
NB - Overall mathematics	478	493	14*
Numbers and operations	487	496	10*
Geometry and measurement	472	499	27*
Patterns and relationships	476	495	19*
Data management and probability	489	507	18*
Anglophone school system	466	479	13*
Francophone school system	507	525	18*
Achievement gap (A - F)	-41	-46	
Females	486	495	9*
Males	473	490	17*
Achievement gap (F - M)	12	5	

* Denotes significant difference compared to the baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Figure NB.4 New Brunswick: mean scores in mathematics, 2010–2019



Note: Darker shades denote significant difference compared to the baseline year 2010

Results in reading and science

As noted in the Introduction, reading and science are both minor domains in PCAP 2019. Results for these domains are reported by mean scores only. This section presents reading and science scores for New Brunswick, compares them with pan-Canadian scores, reports results by language of the school system and by gender, and presents multiple comparisons over time.

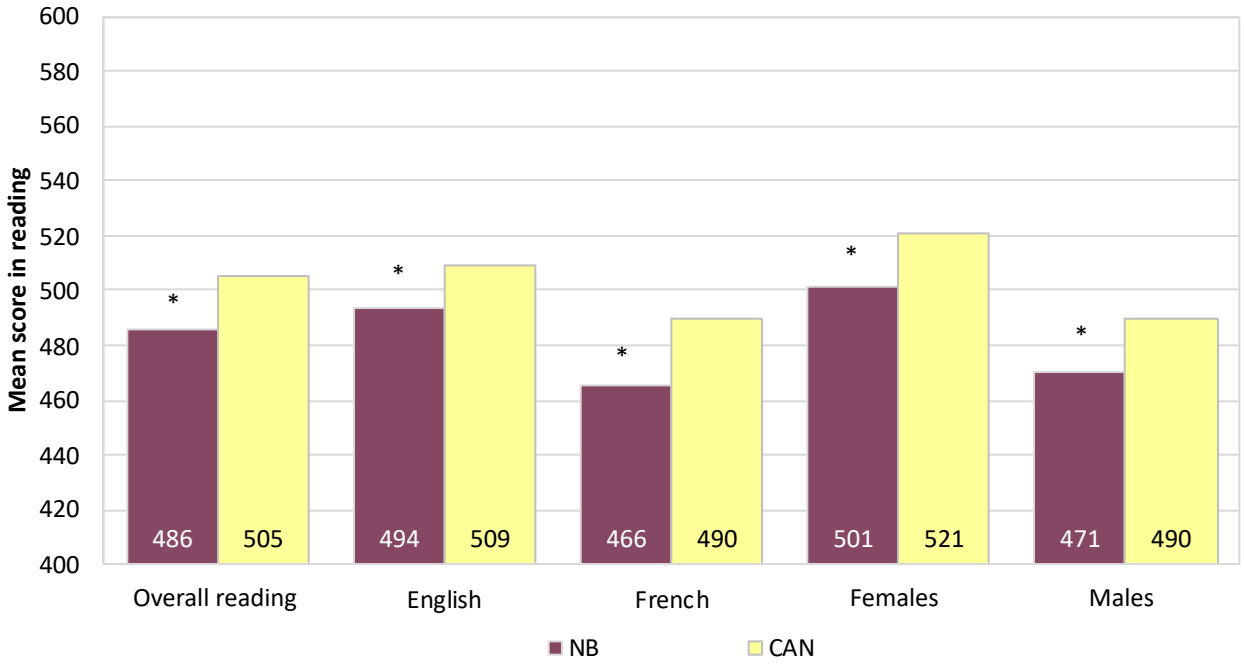
Results in reading

Figure NB.5 illustrates achievement scores for reading overall in New Brunswick and Canada, as well as by language of the school system and gender. It shows that New Brunswick students scored significantly below the Canadian mean in reading overall (Appendix B.2.1).

Students in both language groups in New Brunswick obtained scores in reading that were lower than the Canadian mean scores for the respective groups. Within the province, students in the English-language school system outperformed students in the French-language system, which is consistent with results at the pan-Canadian level (Appendix B.2.2).

In New Brunswick, the reading scores of both girls and boys were lower than the Canadian means by gender. Within the province, girls attained significantly higher scores than boys, which reflects the trend at the pan-Canadian level (Appendix B.2.3).

Figure NB.5 Canada–New Brunswick: mean scores in reading



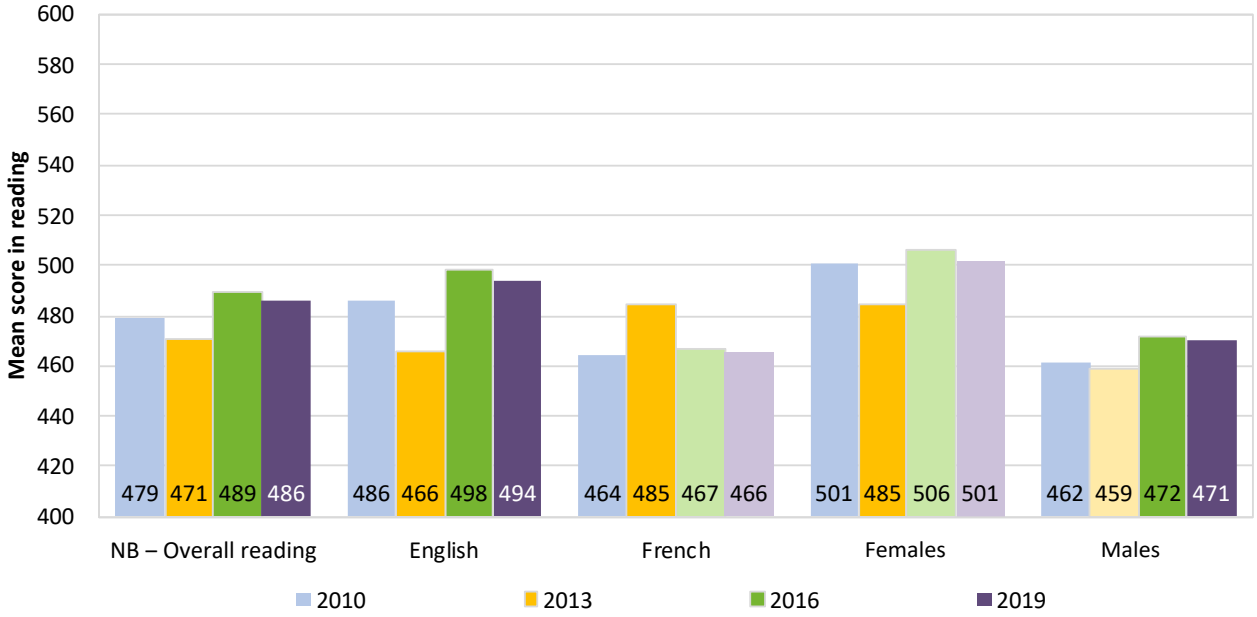
* Denotes significant difference compared to Canada

As explained in Chapter 2, although reading was the major domain in PCAP 2007, the baseline year for reading was adjusted to 2010, when the PCAP target group changed from 13-year-old students to Grade 8 students. New Brunswick students showed a significant improvement in reading scores in 2019 compared to 2010 (Figure NB.6, Appendix B.2.4).

Within New Brunswick, the reading results for anglophone students in 2019 were higher than in 2010, while the results for francophone students were the same. In contrast, in Canada as a whole, the results for English-language students were stable, while a positive change was found for French-language students (Figure NB.6, Appendix B.2.5).

When compared to the baseline year, reading achievement in 2019 remained stable for girls and increased for boys in New Brunswick. At the pan-Canadian level, the results for girls improved, and the results for boys were stable (Figure NB.6, Appendix B.2.6).

Figure NB.6 New Brunswick: mean scores in reading, 2010–2019



Note: Darker shades denote significant difference compared to the adjusted baseline year 2010

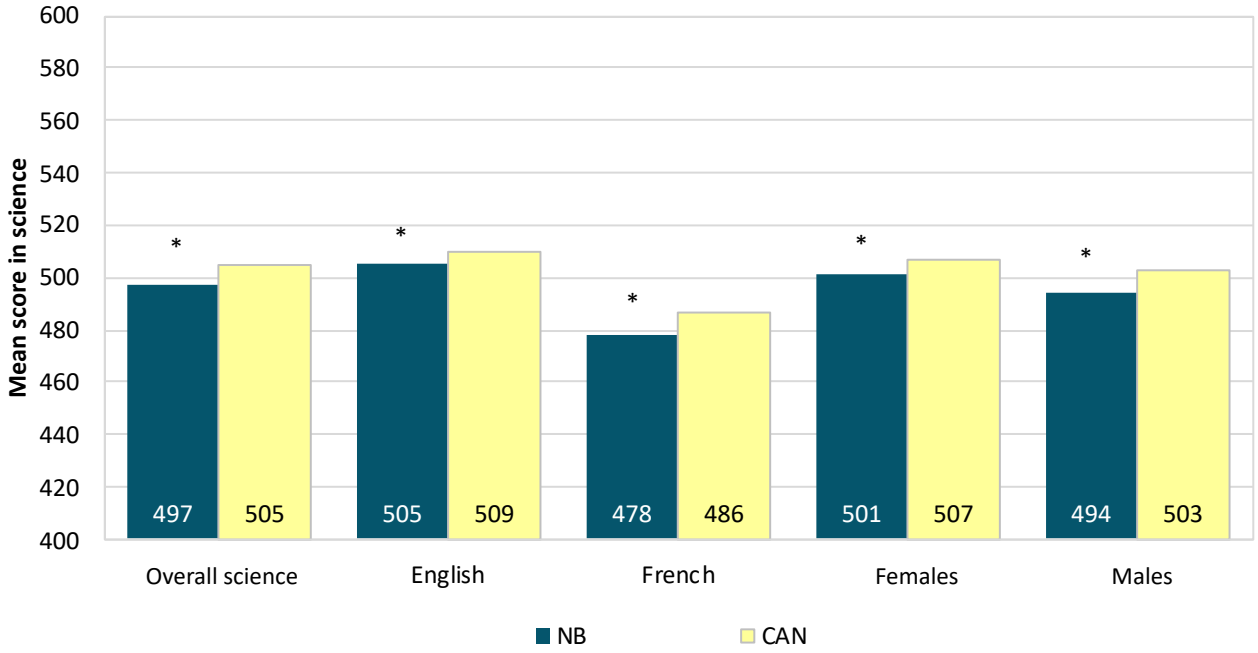
Results in science

Figure NB.7 summarizes the results by mean score of the PCAP science assessment for students in New Brunswick and Canada overall, including by language of the school system and by gender. Students in the province achieved scores below the Canadian mean in science overall (Appendix B.3.1).

The scores of students in both English- and French-language school systems in New Brunswick were lower than the Canadian mean scores in science for the respective language groups. Within New Brunswick, anglophone students outperformed their francophone peers, a finding similar to that in the pan-Canadian sample (Appendix B.3.2).

In New Brunswick, both girls and boys scored below the Canadian means in science for the corresponding cohorts. Within the province, as was the case at the pan-Canadian level, girls achieved higher scores than boys (Appendix B.3.3).

Figure NB.7 Canada–New Brunswick: mean scores in science



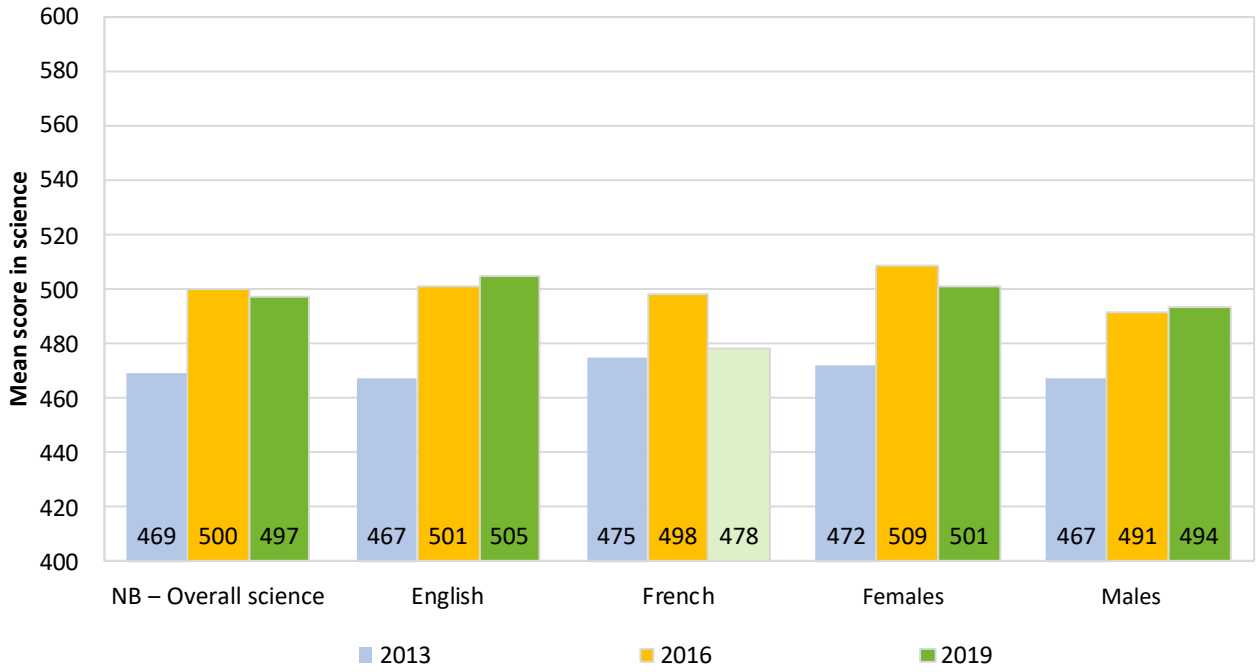
* Denotes significant difference compared to Canada

Figure NB.8 displays changes in science achievement over time for the province of New Brunswick. In PCAP 2019, students in New Brunswick showed positive improvement in science overall compared to the baseline year 2013, a finding that is consistent with the trend at the pan-Canadian level (Appendix B.3.4).

Within the province, the science scores for English-language schools in 2019 improved over those in 2013, while the results for French-language schools remained the same. These trends were consistent with the patterns in Canada as a whole (Appendix B.3.5).

Compared to the baseline year, both girls and boys in New Brunswick showed a positive change in science achievement in 2019. At the pan-Canadian level, girls' scores showed improvement while boys' results were stable (Appendix B.3.6).

Figure NB.8 New Brunswick: mean scores in science, 2013–2019



Note: Darker shades denote significant difference compared to the baseline year 2013

NOVA SCOTIA

Context statement

Social context

Nova Scotia has a population of 979,000, with a higher rural population than the Canadian average. The annual population growth rate is about 1 percent, and immigration rates have doubled since 2015. Almost 90 percent of Nova Scotians are anglophones. About 10 percent of the population speak both English and French or French only; less than 1 percent speak neither official language. Slightly under 4 percent of the total population are visible minorities. Unemployment rates in Nova Scotia are typically above the Canadian average.

Organization of the school system

There are seven anglophone regional centres (school boards) for education in Nova Scotia, which enrol almost 95 percent of all public school students. The provincial school board for Acadian/francophone students, the *Conseil scolaire acadien provincial*, is responsible for the remaining 5 percent of public school students. Nova Scotia's total public school population is about 123,239 students, from Grade Primary (P) to Grade 12. School enrolment has been increasing since 2015. Students who are entering Grade Primary must be five years old on or before December 31 of that school year. Students must attend school until they are 16 years old.

Mathematics teaching

The mathematics curriculum in Nova Scotia is shaped by a vision that fosters the development of mathematically literate students who can extend and apply their learning and who are successful participants in society. Nova Scotia develops learners who are curious, creative, full of potential, capable, and confident, and who have individual interests, abilities, and needs. The province's Inclusive Education Policy (2019) is committed to ensuring a high-quality, culturally and linguistically responsive, and equitable education to support the well-being and achievement of every student.

In 2013, Nova Scotia adapted *The Common Curriculum Framework for K–9 Mathematics: Western and Northern Canadian Protocol* (WNCP) for use in the province. The mathematics curriculum is offered in English for students in P–12, in French to French First Language students (P–12), and in French to French immersion students (P–10).

At each grade, the Nova Scotia curriculum emphasizes particular key concepts that will facilitate the development of greater depth of understanding and, ultimately, stronger student achievement. In the early grades, an emphasis on number sense and operations concepts helps ensure that students develop a solid foundation in numeracy.

The Common Curriculum Framework for Grades 10–12 Mathematics, on which the Nova Scotia mathematics curriculum for Grades 10–12 is based, includes sequences and topics rather than the strands used to organize *The Common Curriculum Framework for K–9 Mathematics*. Each topic area

requires that students develop a conceptual knowledge base and skill set. The topics covered are meant to build upon previous knowledge and to progress from simple to more complex conceptual understandings. Advanced Placement and International Baccalaureate courses are offered at a number of high schools across the province.

Shortly after the implementation of the WNCP, Nova Scotia implemented an online learning management platform. This platform allows educators and learners to access resources related to their respective mathematics course. In Nova Scotia, a coding strategy commits to providing all students with an introduction to the basics of coding, technology, and design. Students solve problems, design products, develop their creativity, and make connections to mathematics and digital literacy. The Nova Scotia Homework Hub is an online platform that offers resources and free tutoring for students enrolled in Grade 9–12 mathematics courses. Students can have a one-on-one session with a tutor, in French or English, via an online whiteboard or the phone. Students can also access additional digital learning resources and practice exercises and receive instant feedback.

Nova Scotia has implemented a mentoring/coaching framework that supports the development of a community of practitioners focused on improving instructional practices and student achievement in mathematics. In addition to mentoring and coaching, Nova Scotia recognizes the need for and importance of mathematics intervention for students. A mathematics intervention framework provides support and intervention to meet the needs of individual students to build on their knowledge, skills, and competencies.

Assessment

Provincial assessments in Grades 3, 6, and 8 in mathematics are administered as "assessments for learning." These assessments are used to identify student learning needs in order to provide focus for provincial improvement strategies. Assessment results are returned to each school in a timely manner so that schools can plan for the instructional needs of individual students. High school students enrolled in Mathematics 10 participate in a Grade 10 provincial examination in mathematics. The examination result counts as 20 percent of the student's final grade in mathematics.

Results in mathematics

This section presents PCAP 2019 results in mathematics for Nova Scotia and Canada overall by performance levels and mean scores. Student achievement is reported in mathematics overall, by language of the school system, and by gender. This section concludes with a comparison of changes over time in mathematics achievement.

Results in mathematics by performance level

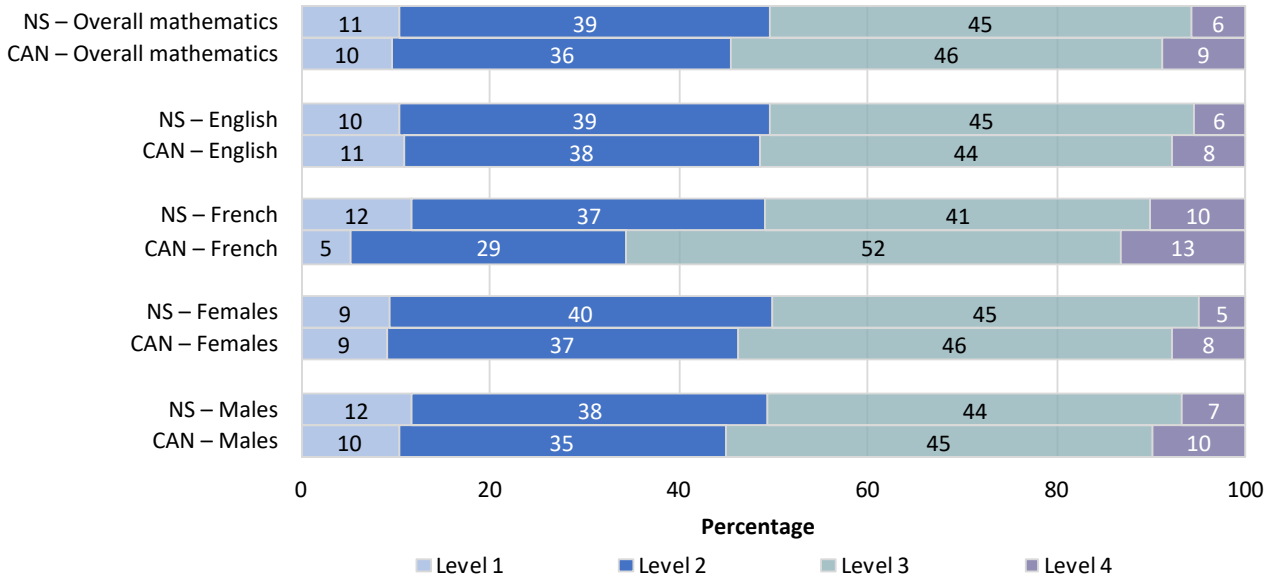
Figure NS.1 presents the results by performance level of students in Nova Scotia and Canada overall in the PCAP 2019 mathematics assessment. Eighty-nine percent of students in Nova Scotia performed at or above Level 2 in mathematics, which is a proportion similar to that of Canadian students overall (Level 2 is the baseline or expected level of mathematics proficiency for Grade 8 students). Six percent

of students in Nova Scotia achieved the highest level of performance (Level 4), which was lower than the Canadian average (Appendix B.1.1).

Ninety percent of students in the English-language school system in Nova Scotia achieved Level 2 or higher in mathematics, which was similar to the percentage in Canada overall. In French-language schools in the province, 88 percent of students achieved at or above Level 2, which was lower than the percentage at the pan-Canadian level (95 percent). Within the province, there was no significant difference between the two language groups. This result differs from that at the pan-Canadian level, where a higher proportion of francophone students achieved at these levels compared to their anglophone counterparts (Appendix B.1.4b).

In Nova Scotia, the proportions of girls and boys achieving at or above Level 2 were the same as those for the respective groups in Canada overall. Within the province, more girls than boys achieved at or above Level 2. In contrast, there was no significant difference by gender in the proportion of students at Level 2 or above in Canada overall (Appendix B.1.8b).

Figure NS.1 Canada–Nova Scotia: percentage of students at each performance level in mathematics



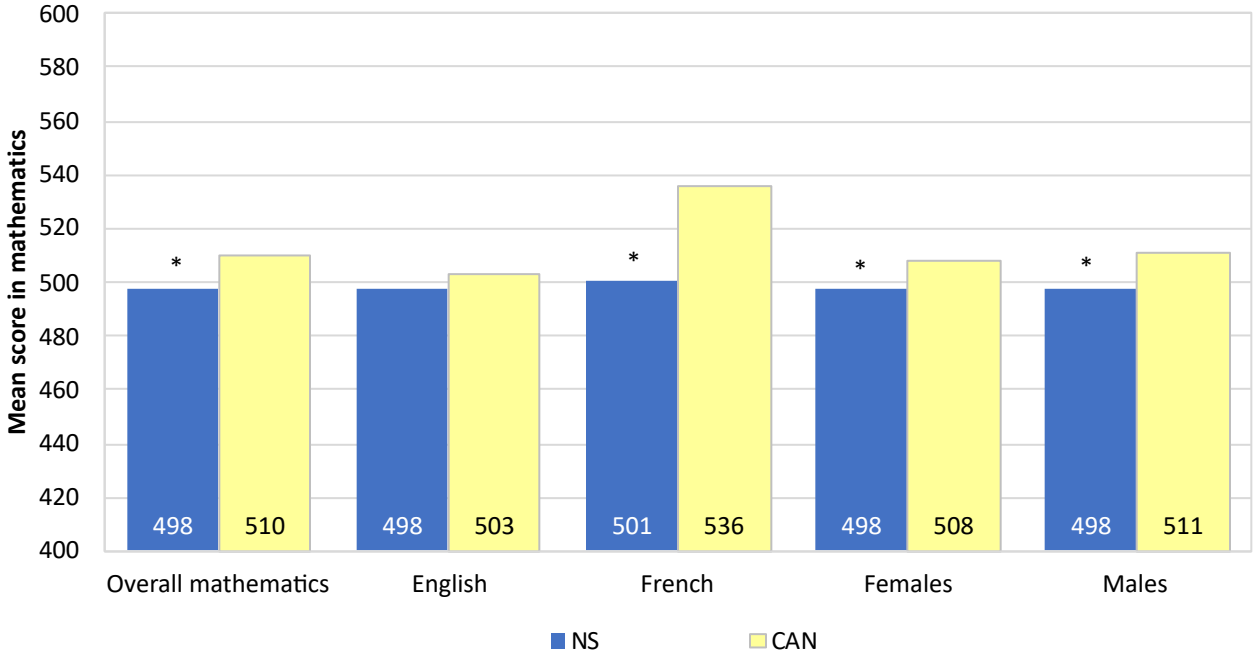
Results in mathematics by mean score

Figure NS.2 summarizes the results by mean score of the PCAP mathematics assessment for students in Nova Scotia and Canada overall and by language of the school system and gender. Students in Nova Scotia achieved scores below the Canadian mean in mathematics overall (Appendix B.1.2).

Students enrolled in Nova Scotia's English-language schools achieved scores similar to the Canadian English mean, while students in the province's French-language schools achieved scores that were lower than the Canadian French mean. Within Nova Scotia, the mathematics results were similar between the two language systems. This finding contrasts with the results at the pan-Canadian level, where francophone students obtained significantly higher scores than their anglophone counterparts (Appendix B.1.5).

Both girls and boys in Nova Scotia achieved scores in mathematics lower than those of girls and boys in the Canadian sample. As was the case for Canada overall, there was no gender gap in mathematics in the province (Appendix B.1.9).

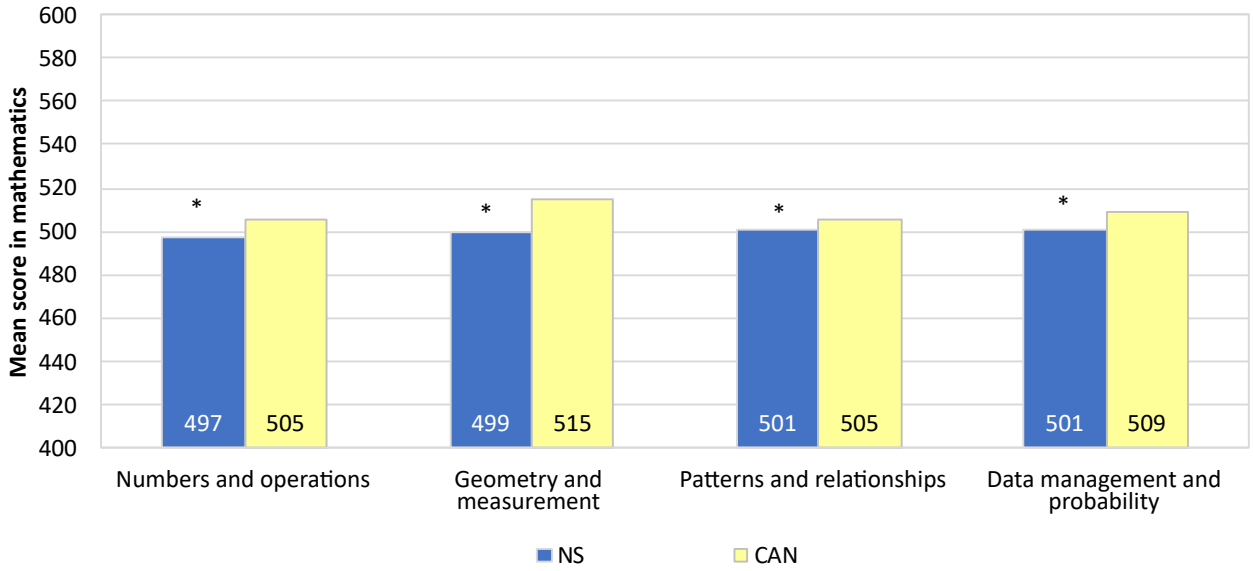
Figure NS.2 Canada–Nova Scotia: mean scores in mathematics



* Denotes significant difference compared to Canada

Figure NS.3 presents the mean scores in mathematics by subdomain for Nova Scotian and Canadian students. Students in the province achieved results below the respective Canadian means in each of the four subdomains. Within Nova Scotia, the strongest results were observed for the *patterns and relationships* and *data management and probability* subdomains (Appendix B.1.3).

Figure NS.3 Canada–Nova Scotia: mean scores in mathematics subdomains



* Denotes significant difference compared to Canada

Table NS.1 compares mathematics achievement scores in Nova Scotia and Canada in each of the subdomains by language of the school system. Students in English-language schools in Nova Scotia achieved results similar to the respective Canadian English means for all the subdomains except *geometry and measurement*, where results were lower than the Canadian mean. In French-language schools, results were lower than the Canadian French mean for all subdomains except *patterns and relationships*, in which the result was similar to that for francophones at the pan-Canadian level. Within the province, students in French-language schools outperformed those in English-language schools in *numbers and operations* and *data management and probability*, while the results were similar between the two language groups in the other two subdomains (Appendix B.1.6).

Table NS.1 Canada–Nova Scotia: mean scores in mathematics subdomains by language of the school system

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN English	497	1.7	507	1.5	503	1.4	501	0.9
NS English	496	0.3	499	0.3	501	0.3	499	0.2
Difference	1		8*		2		1	
CAN French	534	2.6	544	2.3	512	1.9	541	1.9
NS French	509	4.5	506	4.5	504	3.9	528	3.0
Difference	25*		39*		8		13*	
NS English	496	0.3	499	0.3	501	0.3	499	0.2
NS French	509	4.5	506	4.5	504	3.9	528	3.0
Difference	-13*		-7		-3		-29*	

* Denotes significant difference

Girls and boys in Nova Scotia achieved results below the respective Canadian means for all the subdomains, with the exception of girls in *patterns and relationships*, where the result was similar to that for girls at the pan-Canadian level. Within the province, girls outperformed boys in *patterns and relationships*, while boys outperformed girls in the remaining subdomains (Table NS.2, Appendix B.1.10).

Table NS.2 Canada–Nova Scotia: mean scores in mathematics subdomains by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN female	504	1.7	514	1.5	504	1.3	508	1.0
NS female	495	0.5	498	0.4	502	0.4	500	0.3
Difference	9*		17*		2		8*	
CAN male	507	1.6	516	1.5	506	1.5	510	1.0
NS male	499	0.4	500	0.5	500	0.4	501	0.4
Difference	7*		15*		6*		9*	
NS female	495	0.5	498	0.4	502	0.4	500	0.3
NS male	499	0.4	500	0.5	500	0.4	501	0.4
Difference	-4*		-3*		2*		-1*	

* Denotes significant difference

Comparison of results over time

In PCAP, changes over time are determined by comparing the current assessment year to the baseline year — that is, the first year in which the subject was the primary focus of the assessment. For PCAP mathematics, the baseline year was 2010. In the baseline year, a larger number of items are administered in the major domain, which allows a broader coverage of the PCAP framework.

Table NS.3 and Figure NS.4 present a summary of the changes over time in mathematics achievement scores in the province. Compared to the baseline year of 2010, a positive change in achievement was found in overall mathematics in 2019 (Appendix B.1.11), as well as in all the mathematics subdomains (Appendix B.1.14). This pattern was also observed at the pan-Canadian level.

Results for French-language schools in Nova Scotia in 2019 were similar to those in 2010, while a positive change was observed in the English-language school system. For Canada as a whole, both anglophone and francophone school systems had positive changes in mathematics scores (Appendix B.1.12).

The mathematics achievement of both girls and boys improved in Nova Scotia in 2019 compared to the baseline year, a pattern consistent with that at the pan-Canadian level (Appendix B.1.13).

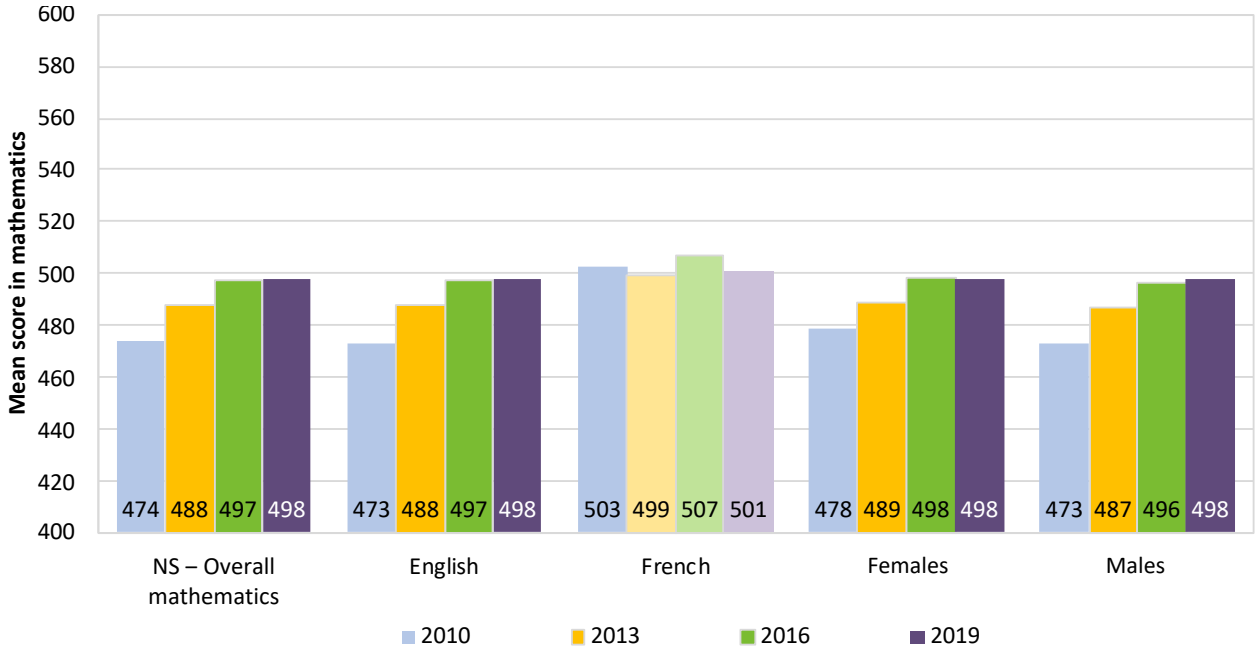
Data tables in Appendix B report results over time for the mathematics subdomains by language of the school system (Appendix B.1.15) and by gender (Appendix B.1.16).

Table NS.3 Nova Scotia: summary of achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
NS - Overall mathematics	474	498	24*
Numbers and operations	477	497	20*
Geometry and measurement	477	499	22*
Patterns and relationships	475	501	26*
Data management and probability	488	501	13*
Anglophone school system	473	498	25*
Francophone school system	503	501	-2
Achievement gap (A - F)	-30	-3	
Females	478	498	19*
Males	473	498	25*
Achievement gap (F - M)	5	0	

* Denotes significant difference compared to the baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Figure NS.4 Nova Scotia: mean scores in mathematics, 2010–2019



Note: Darker shades denote significant difference compared to the baseline year 2010

Results in reading and science

As noted in the Introduction, reading and science are both minor domains in PCAP 2019. Results for these domains are reported by mean scores only. This section presents reading and science scores for Nova Scotia, compares those scores with pan-Canadian results, reports results by language of the school system and by gender, and presents multiple comparisons over time.

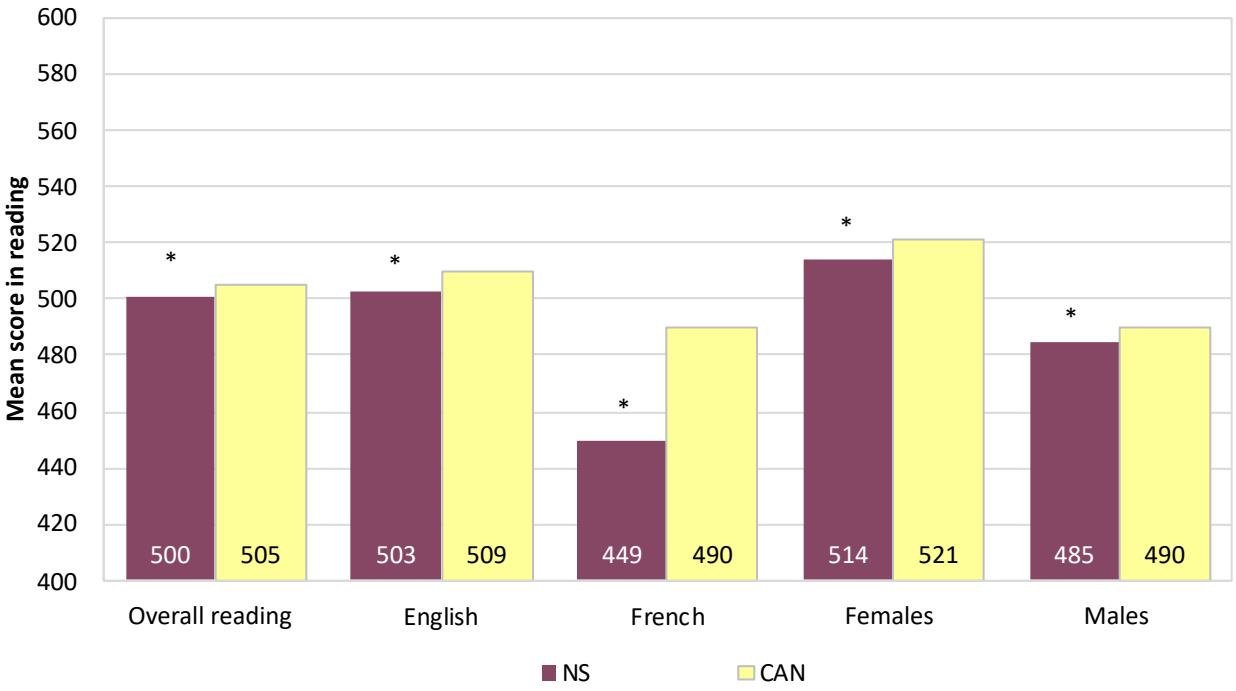
Results in reading

Figure NS.5 illustrates mean scores in reading overall in Nova Scotia and Canada, as well as by language of the school system and gender. The mean score for students in Nova Scotia was significantly lower than that for Canadian students in reading overall (Appendix B.2.1).

Students in English- and French-language schools in Nova Scotia obtained scores in reading that were below the Canadian mean scores for the respective groups. Within Nova Scotia, anglophone students outperformed their francophone counterparts, as was also the case at the pan-Canadian level (Appendix B.2.2).

The reading scores of both girls and boys in Nova Scotia were lower than the Canadian means by gender. Within the province, girls attained higher scores than boys, which reflects the trend at the pan-Canadian level (Appendix B.2.3).

Figure NS.5 Canada–Nova Scotia: mean scores in reading



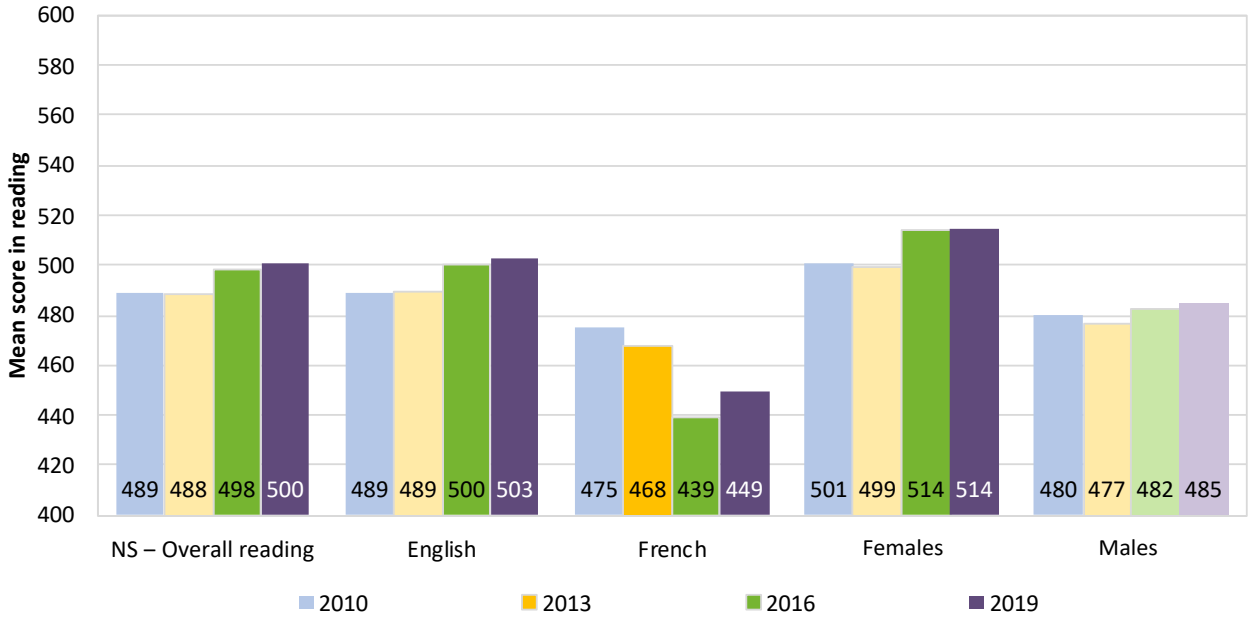
* Denotes significant difference compared to Canada

Figure NS.6 shows reading achievement over time for students in Nova Scotia. As explained in Chapter 2, although reading was the major domain in PCAP 2007, the baseline year for reading was adjusted to 2010, when the PCAP target group changed from 13-year-old students to Grade 8 students. Within the province, students showed significant improvement in overall reading scores in 2019 compared to 2010 (Appendix B.2.4).

Within Nova Scotia, students in English-language schools made significant gains in reading achievement in 2019 compared to 2010. In contrast, students in the French-language system had lower scores in reading. Across Canada, francophone school systems saw a positive change in reading achievement, and anglophone school systems had stable results (Appendix B.2.5).

In the province, girls showed a positive change in reading in 2019 compared to the 2010 baseline; boys' results were stable. These patterns are consistent with those for reading achievement by gender at the pan-Canadian level (Appendix B.2.6).

Figure NS.6 Nova Scotia: mean scores in reading, 2010–2019



Note: Darker shades denote significant difference compared to the adjusted baseline year 2010

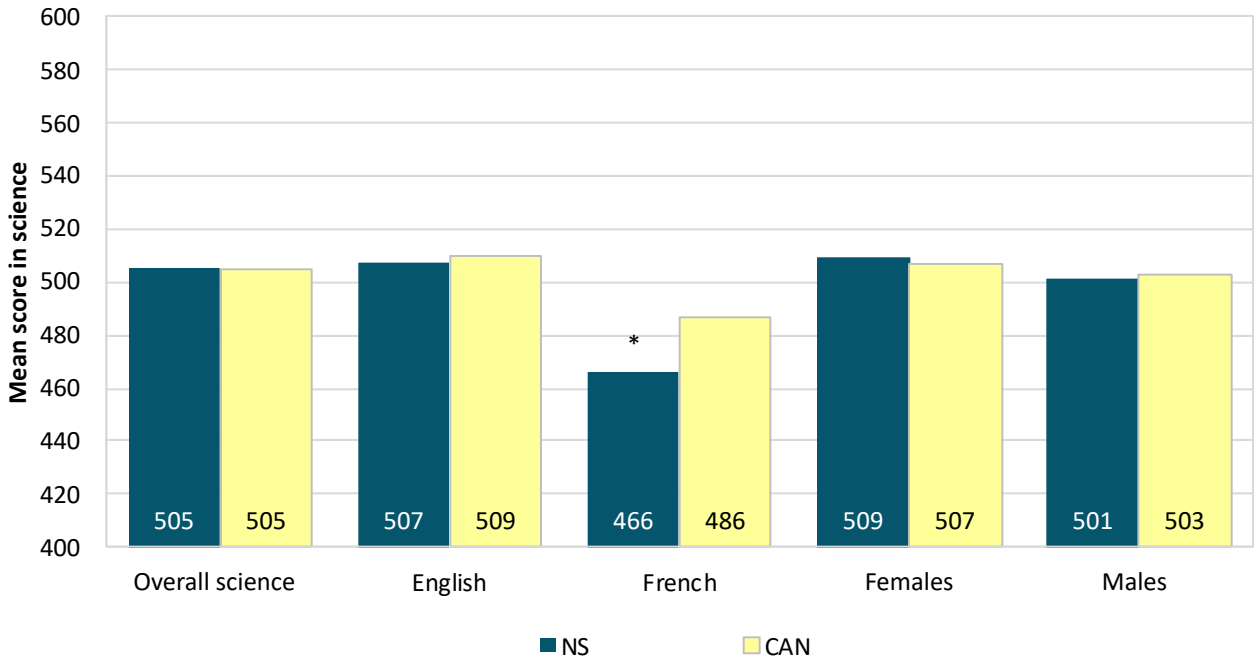
Results in science

Figure NS.7 shows mean scores in science overall for Nova Scotia and Canada, as well as by language of the school system and gender. In science overall in PCAP 2019, students in Nova Scotia achieved scores similar to the Canadian mean (Appendix B.3.1).

Students in the English-language school system in Nova Scotia obtained scores in science similar to the Canadian anglophone mean, while students in French-language schools scored below francophone students in Canada overall. Within the province, anglophone students outperformed francophone students, which is consistent with the trend for these language groups in Canada as a whole (Appendix B.3.2).

Girls and boys in Nova Scotia achieved science scores statistically similar to the respective Canadian means for gender. Within the province, and for Canada overall, girls achieved higher scores than boys in science (Appendix B.3.3).

Figure NS.7 Canada–Nova Scotia: mean scores in science



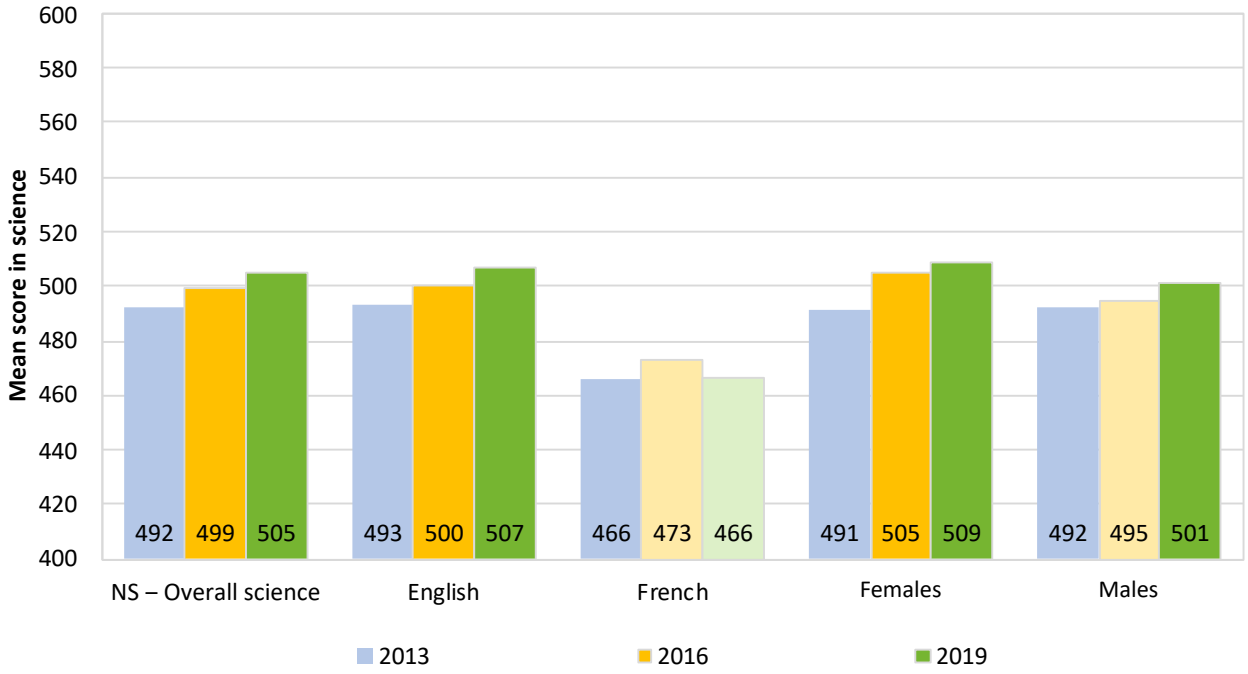
* Denotes significant difference compared to Canada

Figure NS.8 illustrates changes in science achievement over time in the province. In Nova Scotia, science scores were significantly higher in 2019 compared to the baseline year of 2013, which reflects the pattern found at the pan-Canadian level (Appendix B.3.4).

In PCAP 2019, the results for English-language students improved, while those for French-language students remained stable compared to 2010. A similar pattern was seen at the pan-Canadian level for the respective language groups (Appendix B.2.5).

In 2019, girls and boys in Nova Scotia both showed improvements in science scores compared to those obtained in 2010. At the pan-Canadian level, girls' science scores showed positive change, while boys' scores were stable (Appendix B.3.6).

Figure NS.8 Nova Scotia: mean scores in science, 2013–2019



Note: Darker shades denote significant difference compared to the baseline year 2013

PRINCE EDWARD ISLAND

Context statement

Social context

Prince Edward Island is the smallest province in Canada, in terms of both land (5,684 square kilometres) and population (159,625). Ninety-nine percent of the population speak English. Prince Edward Island has the third-highest rate of bilingualism in Canada, with 13 percent of the population self-identifying as speaking both English and French. Approximately 6,000 francophones live in Prince Edward Island. Fifty-six percent of the province's population is rural, with approximately 7 percent living on farms. The environment is predominately rural, with agriculture, tourism, fishing, and manufacturing constituting the major industries. However, the Island economy is diversifying, with growth industries such as aerospace, bioscience (including agriculture and fisheries), information technology, and renewable energy. The Confederation Bridge, the world's longest continuous multi-span bridge, opened in 1997, connecting Prince Edward Island to mainland New Brunswick.

Organization of the school system

During the 2015–16 school year, the part of Prince Edward Island's public school system responsible for English-language students was reorganized into the Public Schools Branch (the French school board was unchanged). In 2019, 20,734 students were enrolled in the province's 62 public schools. This figure includes approximately 1,044 students in six French schools, 25 percent of whom were in French immersion programs. In addition, there were four private schools, with an enrolment of 474 students, along with one First Nation–operated school. Prince Edward Island has approximately 1,750 teachers.

The school system consists of Kindergarten to Grade 12. High school is Grades 10–12. Students entering Kindergarten must be five years of age by the end of December of their first school year. Prince Edward Island's students are accommodated within facilities that contain a number of grade configurations, including K–3, K–4, K–6, K–8, K–12, 4–6, 5–8, 7–9, 9–12, and 10–12. This diversity results from the realities of enrolments and existing facilities as well as demands placed on the schools by local communities.

Mathematics teaching

The province uses a foundational outcome approach in its instructional delivery design. In this approach, teachers are guided to introduce all foundational outcomes in the first half of the academic year, in order to facilitate ongoing reach-back of these outcomes throughout the instructional spiral of the full year.

Island students follow the PEI mathematics curriculum, which is based on the *Common Curriculum Framework for K–9 Mathematics: Western and Northern Canadian Protocol* (2006). *The Common Curriculum Framework* was developed by the seven western and northern ministries of education (British Columbia, Alberta, Saskatchewan, Manitoba, Yukon, Northwest Territories, and Nunavut) in collaboration with teachers, administrators, parents, business representatives, postsecondary educators,

and others. The framework identifies beliefs about mathematics, general and specific student outcomes, and achievement indicators agreed upon by the seven jurisdictions. This document is based on both national and international research by the Western and Northern Canadian Protocol for Collaboration in Education and *Principles and Standards for School Mathematics* (2000), published by the National Council of Teachers of Mathematics.

In Prince Edward Island, essential graduation learnings (EGLs) serve as the framework for the curriculum development process. EGLs are statements describing the knowledge, skills, and attitudes expected of all students who graduate from high school. Achievement of the EGLs will prepare students to continue to learn throughout their lives. These learnings describe expectations not in terms of individual school subjects but in terms of knowledge, skills, and attitudes developed throughout the curriculum. They confirm that students need to make connections and develop abilities across subject boundaries if they are to be ready to meet the shifting and ongoing demands of life, work, and study today and in the future. Essential graduation learnings are cross-curricular, and curriculum in all subject areas is focused to enable students to achieve these learnings. Specifically, graduates from the public schools of Prince Edward Island will be able to demonstrate the knowledge, skills, and attitudes associated with the following EGLs:

- responding with critical awareness to various forms of the arts and being able to express themselves through the arts;
- assessing social, cultural, economic, and environmental interdependence in a local and global context;
- using the listening, viewing, speaking, and writing modes of language(s), and mathematical and scientific concepts and symbols, to think, learn, and communicate effectively;
- continuing to learn and to pursue an active, healthy lifestyle;
- using the strategies and processes needed to solve a wide variety of problems, including those requiring language and mathematical and scientific concepts; and
- using a variety of technologies, demonstrating an understanding of technological applications, and applying appropriate technologies for solving problems.

More specifically, curriculum outcome statements articulate what students are expected to know and be able to do in particular subject areas. Through the achievement of curriculum outcomes, students demonstrate the essential graduation learnings.

The Prince Edward Island mathematics curriculum for Grades 10–12 includes pathways with corresponding topics rather than the strands that are found in the K–9 mathematics curriculum. Three pathways are available: Apprenticeship and Workplace Mathematics, Foundations of Mathematics, and Pre-Calculus. A common Grade 10 course (Foundations of Mathematics and Pre-Calculus) is the starting point for the Foundations of Mathematics pathway and the Pre-Calculus pathway. Each topic area requires that students develop a conceptual knowledge base and skill set that will be useful in whatever pathway they have chosen. The topics covered within a pathway are meant to build upon previous knowledge and to progress from simple to more complex conceptual understandings. The

goals of all three pathways are to provide the prerequisite knowledge, skills, understandings, and attitudes for specific postsecondary programs or direct entry into the workforce. All three pathways provide students with mathematical understandings and critical-thinking skills — it is the choice of topics through which those understandings and skills are developed that varies among pathways. Each pathway is designed to provide students with the mathematical understandings, rigor, and critical-thinking skills that have been identified for specific postsecondary programs of study or for direct entry into the workforce.

Assessment

Teachers use a variety of assessment strategies as part of a systematic process of gathering information on student learning. To determine how well students are learning, assessment strategies have to be designed to systematically gather information on the achievement of the curriculum outcomes. Teacher-developed assessments (and teacher-developed common assessments) have a wide variety of uses, such as:

- providing on-going and targeted feedback to improve student learning;
- determining whether or not the learning of curriculum outcomes has been achieved;
- ensuring that students have achieved certain levels of performance;
- setting goals for future student learning;
- communicating with parents about their children's learning; and
- providing information to teachers on the effectiveness of their teaching, the program, and the learning environment.

Results in mathematics

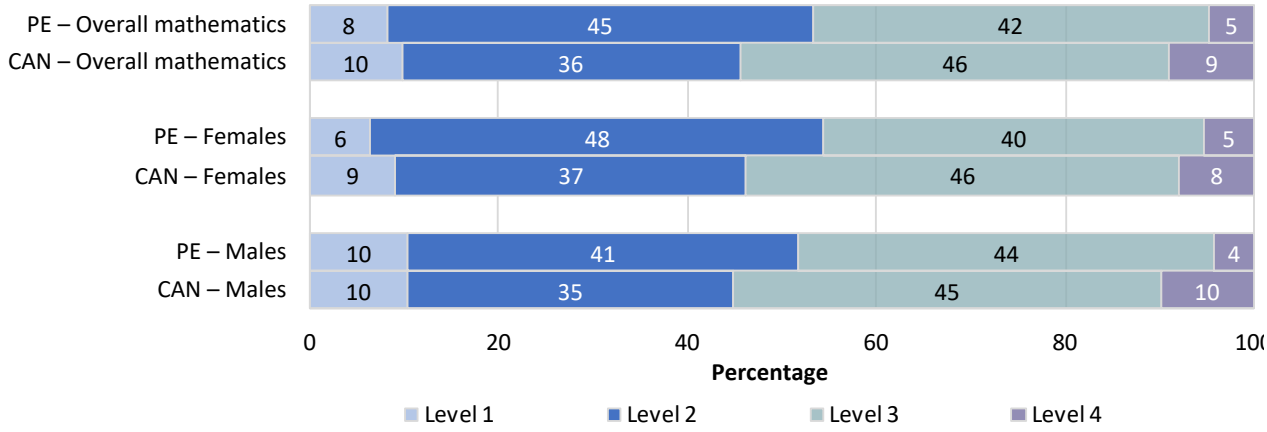
This section presents PCAP 2019 results in mathematics for Prince Edward Island and Canada overall by performance levels and mean scores. Student achievement is reported in mathematics overall and by gender. This section concludes with a comparison of changes over time in mathematics achievement.

Results in mathematics by performance level

Figure PE.1 presents the results by performance level of students in Prince Edward Island and Canada overall in the PCAP 2019 mathematics assessment. Within the province, 92 percent of students performed at or above Level 2 in mathematics, higher than the proportion for Canada overall (Level 2 is the baseline or expected level of mathematics proficiency for Grade 8 students). Five percent of students in Prince Edward Island achieved the highest level of performance (Level 4), which was lower than the Canadian average (Appendix B.1.1).

A significantly higher proportion of girls in Prince Edward Island achieved at or above the expected level of performance in mathematics compared to the Canadian average for girls, while the percentage of boys at or above Level 2 in the province was statistically the same as the Canadian average for boys. Within Prince Edward Island, a larger proportion of girls than boys achieved Level 2 or above, while no gender gap for achievement at these levels was found for Canada overall (Appendix B.1.8b).

Figure PE.1 Canada–Prince Edward Island: percentage of students at each performance level in mathematics

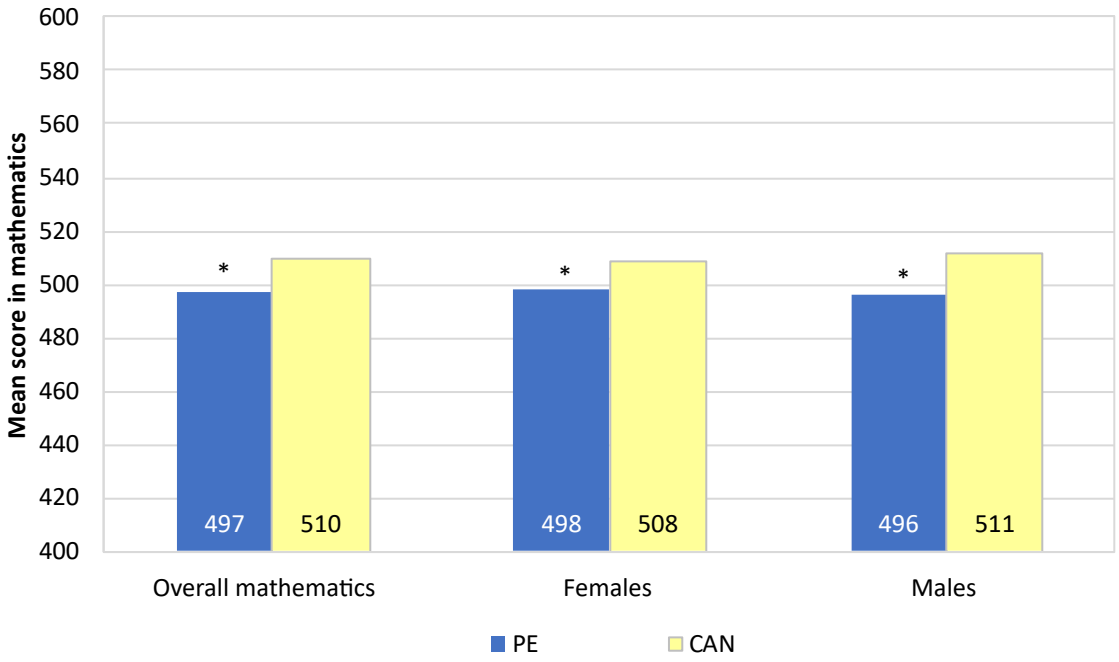


Results in mathematics by mean score

Figure PE.2 summarizes the results by mean score of the PCAP mathematics assessment for students in Prince Edward Island and Canada overall and by gender. It shows that Prince Edward Island students achieved below the Canadian mean in mathematics overall (Appendix B.1.2).

Both girls and boys in Prince Edward Island achieved scores in mathematics below those of girls and boys in the Canadian sample. Within the province, girls outperformed boys, while there was no gender gap in mathematics at the pan-Canadian level (Appendix B.1.9).

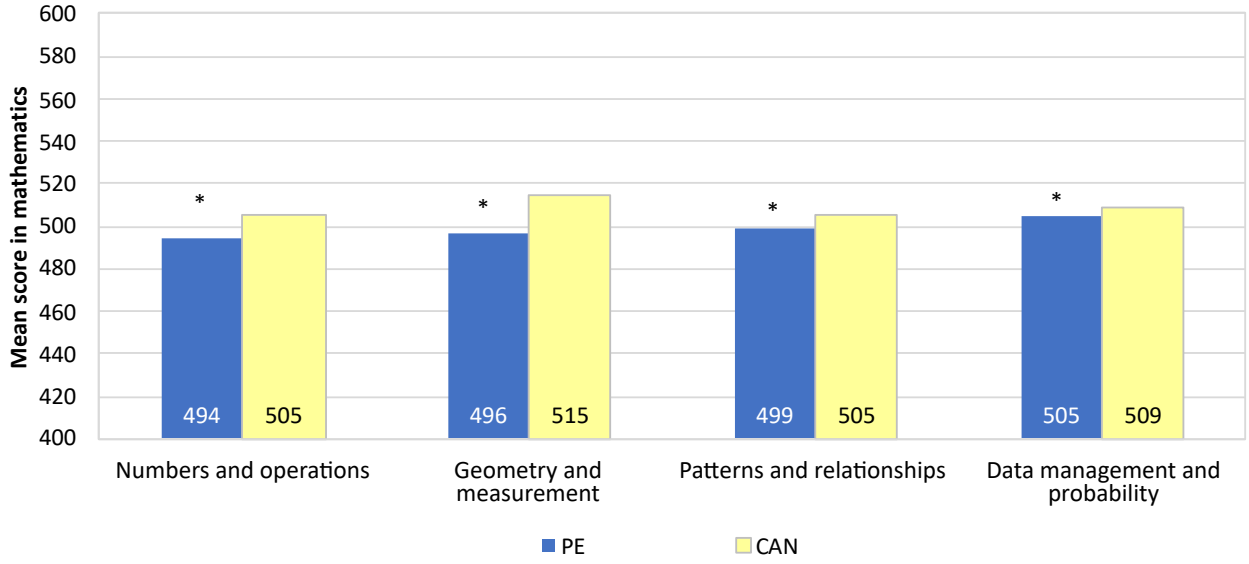
Figure PE.2 Canada–Prince Edward Island: mean scores in mathematics



* Denotes significant difference compared to Canada

Figure PE.3 presents achievement scores in mathematics by subdomain for Prince Edward Island and Canadian students. Students in the province achieved results below the respective Canadian means in each of the four subdomains in mathematics. Within the province, the strongest results were in the *data management and probability* subdomain (Appendix B.1.3).

Figure PE.3 Canada–Prince Edward Island: mean scores in mathematics subdomains



* Denotes significant difference compared to Canada

Both girls and boys in Prince Edward Island achieved scores below the respective Canadian means for all subdomains with the exception of boys in *data management and probability*, where results were similar to the Canadian mean. Within the province, there was a gender gap in all of the subdomains. In *geometry and measurement*, the gap favoured girls; in the other three subdomains, it favoured boys (Table PE.1). At the pan-Canadian level, boys outperformed girls in *numbers and operations*, while there was no gender gap in the three other subdomains (Appendix B.1.10).

Table PE.1 Canada–Prince Edward Island: mean scores in mathematics subdomains by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN female	504	1.7	514	1.5	504	1.3	508	1.0
PE female	494	0.0	498	0.0	498	0.0	502	0.0
Difference	9*		17*		6*		6*	
CAN male	507	1.6	516	1.5	506	1.5	510	1.0
PE male	495	0.0	494	0.0	500	0.0	509	0.0
Difference	12*		21*		6*		2	
PE female	494	0.0	498	0.0	498	0.0	502	0.0
PE male	495	0.0	494	0.0	500	0.0	509	0.0
Difference	-1*		3*		-2*		-7*	

* Denotes significant difference

Comparison of results over time

In PCAP, changes over time are determined by comparing the current assessment year to the baseline year — that is, the first year in which the subject was the primary focus of the assessment. For PCAP mathematics, the baseline year was 2010. In the baseline year, a larger number of items are administered in the major domain, which allows a broader coverage of the PCAP framework.

Table PE.2 and Figure PE.4 present a summary of the changes over time for mathematics achievement scores in the province. Compared to the baseline year of 2010, a positive change in achievement can be seen in overall mathematics (Appendix B.1.11), as well as in all the subdomains (Appendix B.1.14). This is consistent with the pattern seen at the pan-Canadian level.

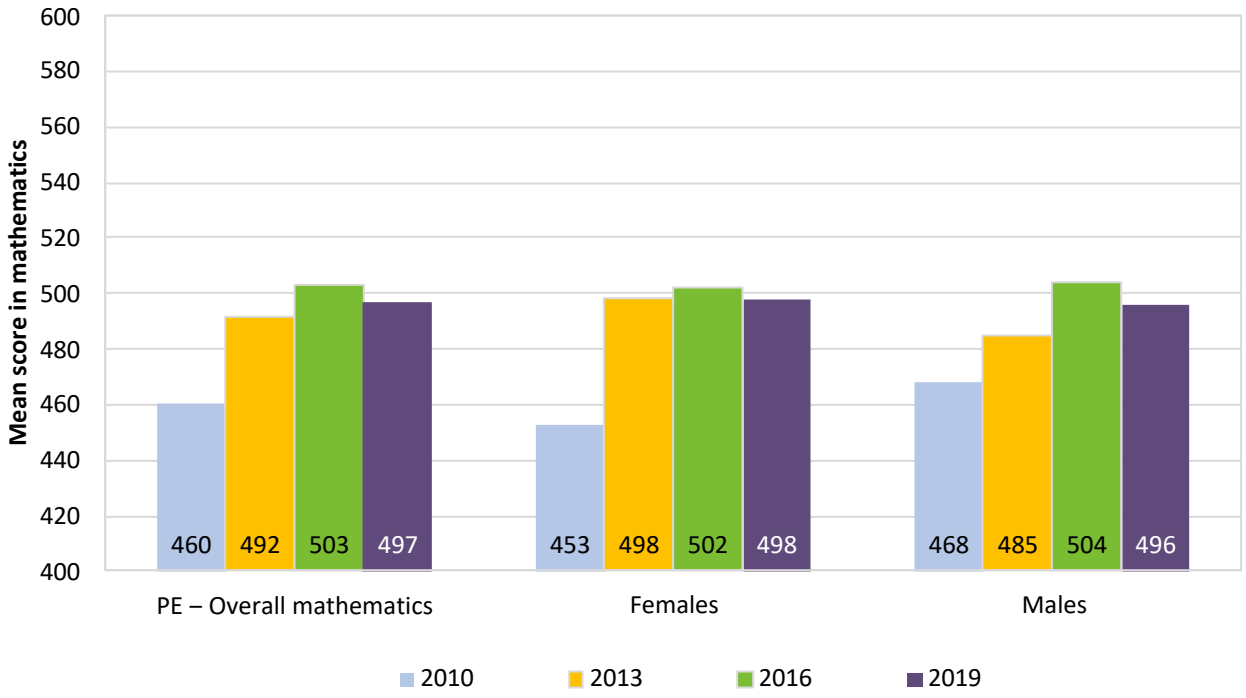
In PCAP 2019, the mathematics results for both girls and boys improved compared to 2010, which is consistent with results at the pan-Canadian level (Appendix B.1.13). Results over time are reported for the mathematics subdomains by gender in Appendix B.1.16.

Table PE.2 Prince Edward Island: summary of achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
PE - Overall mathematics	460	497	37*
Numbers and operations	472	494	23*
Geometry and measurement	449	496	47*
Patterns and relationships	463	499	36*
Data management and probability	469	505	36*
Females	453	498	45*
Males	468	496	28*
Achievement gap (F - M)	-15	2	

* Denotes significant difference compared to the baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Figure PE.4 Prince Edward Island: mean scores in mathematics, 2010–2019



Note: Compared to the baseline year, there was a positive change in Prince Edward Island in each year in all categories.

Results in reading and science

As noted in the Introduction, reading and science are both minor domains in PCAP 2019. Results for these domains are reported by mean scores only. This section presents reading and science scores for Prince Edward Island, compares those scores with pan-Canadian results, reports results by gender, and presents multiple comparisons over time.

Results in reading

Figure PE.5 displays mean scores in Prince Edward Island and Canada in reading overall and by gender. In PCAP 2019, the mean score in reading for Prince Edward Island students is the same as that of Canadian students overall (Appendix B.2.1).

Boys and girls in Prince Edward Island achieved scores in reading that were statistically similar to the Canadian means for their respective cohorts. Within the province, girls outperformed boys in reading, which is consistent with the pattern found at the pan-Canadian level (Appendix B.2.3).

Figure PE.5 Canada–Prince Edward Island: mean scores in reading

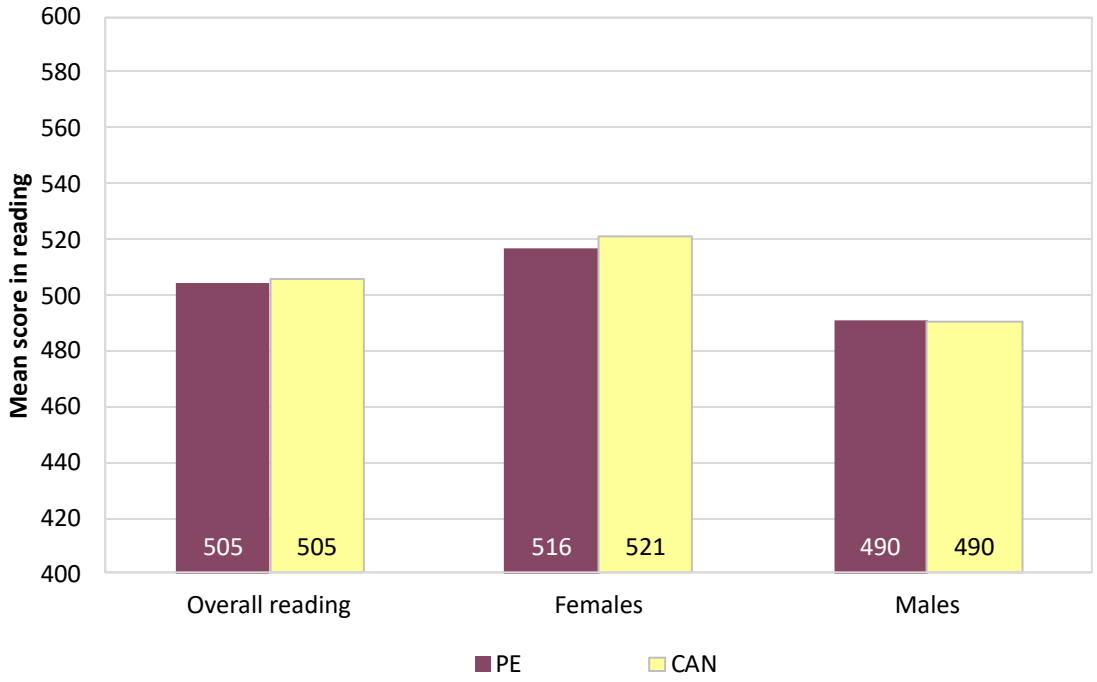
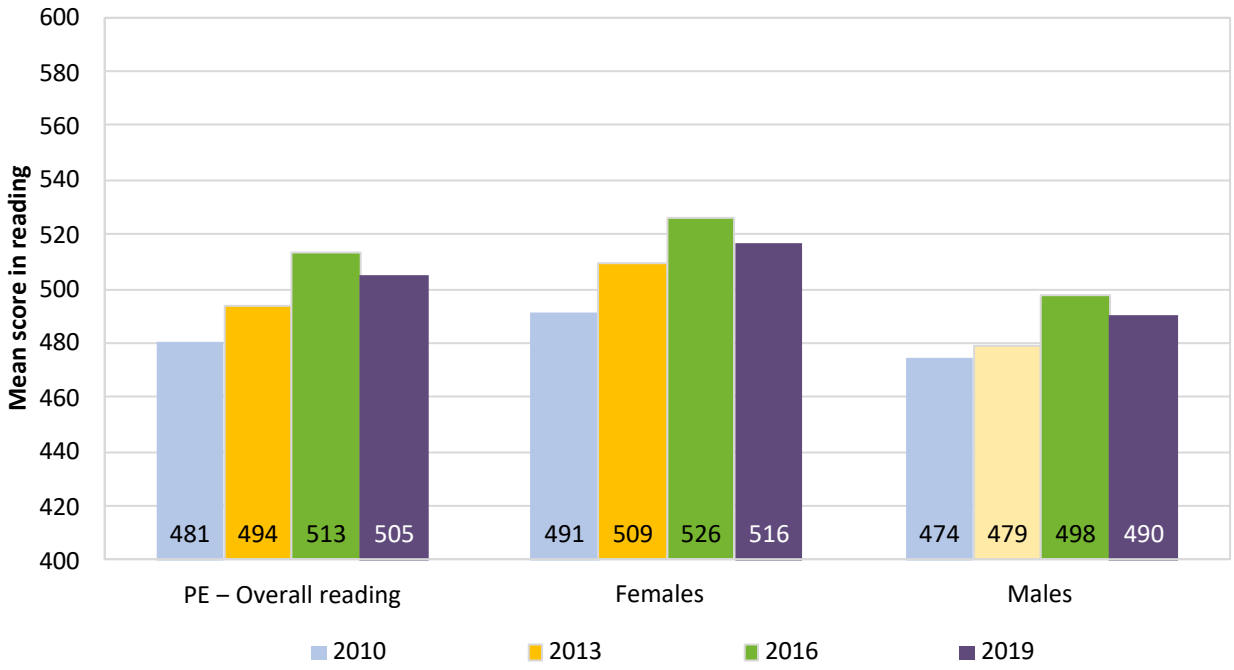


Figure PE.6 displays reading achievement over time for students in Prince Edward Island. As explained in Chapter 2, although reading was the major domain in PCAP 2007, the baseline year for reading was adjusted to 2010, when the PCAP target group changed from 13-year-old students to Grade 8 students. Students in the province attained improved scores in reading overall in 2019 compared to 2010 (Appendix B.2.4).

In the province, reading achievement improved in 2019 compared to 2010 for both girls and boys. For Canada overall, reading achievement improved for girls and was stable for boys (Appendix B.2.6).

Figure PE.6 Prince Edward Island: mean scores in reading, 2010–2019



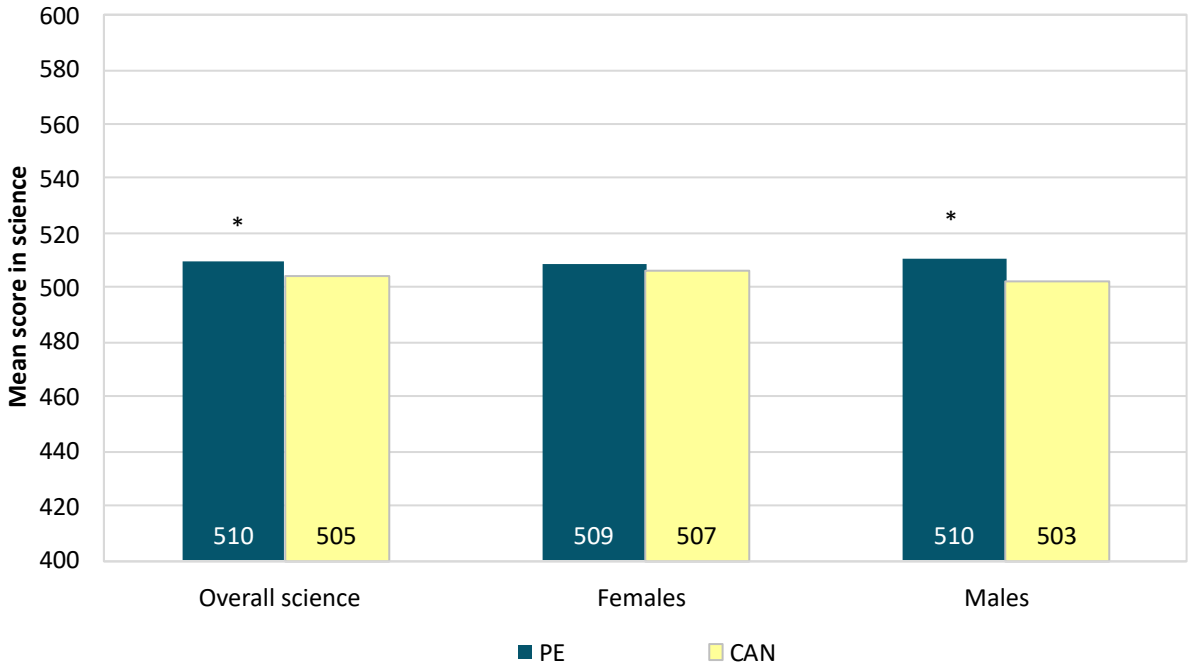
Note: Darker shades denote significant difference compared to the adjusted baseline year 2010

Results in science

Figure PE.7 shows mean scores in Prince Edward Island and Canada in science overall and by gender. In the PCAP 2019 science assessment, Prince Edward Island students achieved scores above the Canadian mean (Appendix B.3.1).

Girls in Prince Edward Island achieved science scores similar to the Canadian mean for girls, while boys achieved significantly higher scores than those of boys in Canada as a whole. Within the province, boys outperformed girls in science, which is in contrast to the results at the pan-Canadian level, where girls outperformed boys (Appendix B.3.3).

Figure PE.7 Canada–Prince Edward Island: mean scores in science

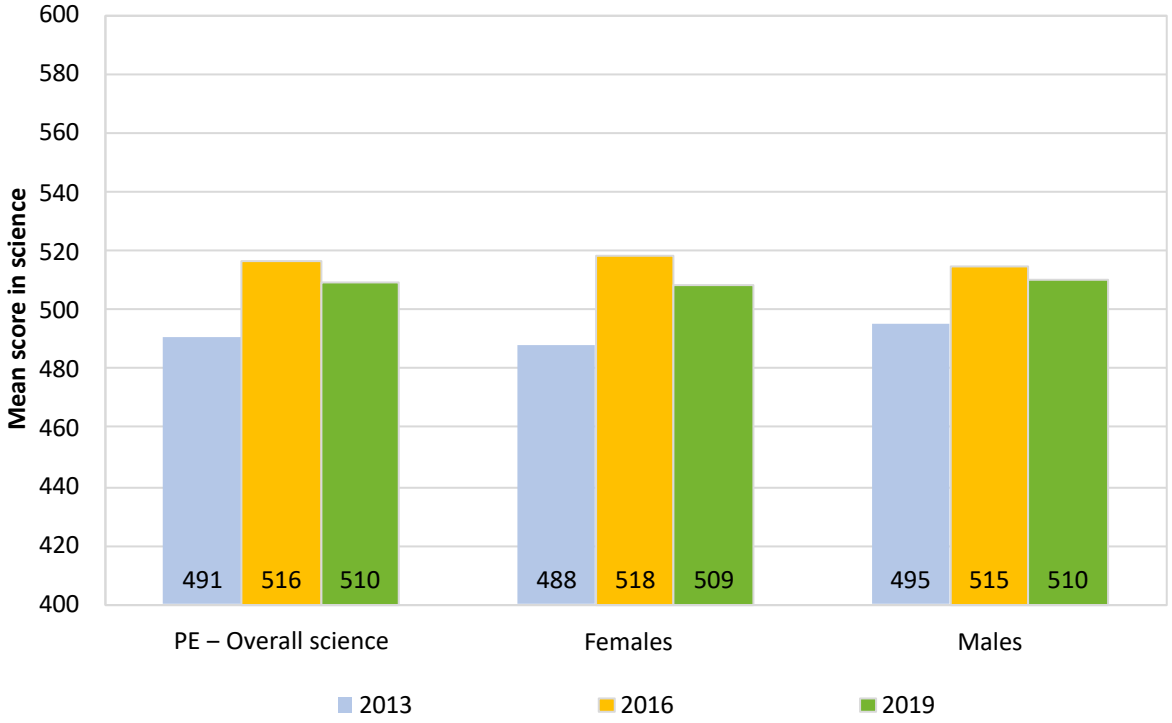


* Denotes significant difference compared to Canada

Figure PE.8 presents changes over time in science achievement in the province. A positive change in science achievement was found in 2019 compared to the baseline year of 2013, which is consistent with the pattern at the pan-Canadian level (Appendix B.3.4).

The scores of both girls and boys in Prince Edward Island showed positive improvement in 2019 compared to 2013. In Canada overall, girls achieved higher scores, and boys' scores were stable (Appendix B.3.6).

Figure PE.8 Prince Edward Island: mean scores in science, 2013–2019



Note: Compared to the baseline year, there was a positive change in Prince Edward Island in each year in all categories.

NEWFOUNDLAND AND LABRADOR

Context statement

Social context

Newfoundland and Labrador's population of approximately 521,542 people is spread over a large geographical area. The population of rural areas has been declining, while that of urban areas has been rising: currently, the capital city of St. John's is home to 39 percent of the total population of the province. The decline in the size of rural communities, along with the large geographic area of the province, presents many challenges for the delivery of educational programs and services. To add to this challenge, over the past few years, the provincial economy has declined and employment rates have decreased.

Organization of the school system

The province's education system is organized into two public school districts — one English and one French — and includes seven private schools. The districts contain 261 schools, with a total enrolment of approximately 63,721 students along with 5,300 school-based educators. Fifty-five percent of provincial student enrolment is concentrated on the Avalon Peninsula, in the eastern part of the province. Early French immersion (K–12) and late French immersion (7–12) programs are offered in the anglophone public school district. Approximately 15 percent of the total student population is enrolled in either early or late French immersion. School entry is compulsory for children who are six years of age by December 31 of the school year; however, most children enter Kindergarten at the age of five. Typically, Grade 8 students are 13 years old.

More information about the Newfoundland and Labrador K–12 education system may be found on the Department of Education and Early Childhood Development website at **https://www.gov.nl.ca/eecd/.**

Mathematics teaching

Mathematics curriculum in Newfoundland and Labrador from Kindergarten to Level III (Grade 12) is based on *The Common Curriculum Framework for K–9 Mathematics: Western and Northern Canadian Protocol* (May 2006) and *The Common Curriculum Framework for 10–12 Mathematics: Western and Northern Canadian Protocol* (January 2008). The curriculum is guided by the awareness that all students come to classrooms with varying knowledge, life experiences, and backgrounds. A key component in developing mathematical literacy is making connections to students' backgrounds and experiences.

The curriculum is organized around seven mathematical processes and seven components of the nature of mathematics. The mathematical processes are communication, connections, mental mathematics and estimation, problem solving, reasoning, technology, and visualization. The components of the nature of mathematics are change, constancy, number sense, patterns, relationships, spatial sense, and

uncertainty. General outcomes, specific outcomes, and achievement indicators for each grade are based on, and incorporate, these mathematical processes and components of the nature of mathematics.

Generally, there is a common curriculum for all students in K–9. In Grade 10, courses are offered in applied and academic mathematics. In Grades 11 and 12, courses are offered in applied, academic, and advanced mathematics, including an introductory calculus course.

Assessment

Newfoundland and Labrador mathematics educators use a variety of formative and summative assessments for learning, as learning, and of learning. Teachers are encouraged to be flexible in assessing the learning success of all students and to seek diverse ways in which students might demonstrate what they know and are able to do.

Newfoundland and Labrador has recently revised its provincial assessment program. The first administration of the new Provincial Reading and Mathematics Assessment (PRMA) is due to take place in spring 2021, with reading and mathematics alternating each year. Results will be reported at the provincial level. In addition, Grade 12 public exams are administered in science, social studies, language arts, and mathematics. These exams are marked by a panel of teachers at the end of the semester and are worth 40 percent of a student's final grade.

Results in mathematics

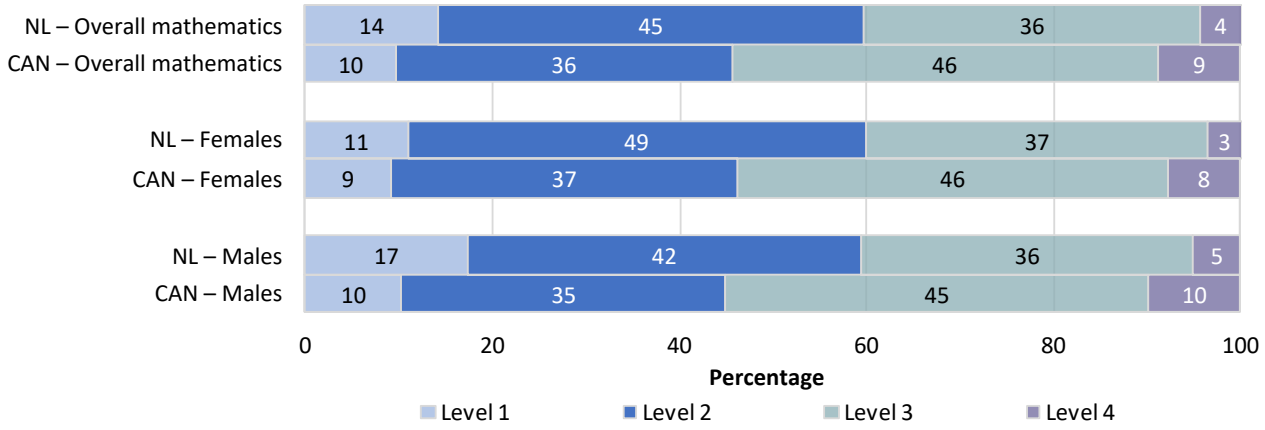
This section presents PCAP 2019 results in mathematics for Newfoundland and Labrador and Canada overall by performance levels and mean scores. Student achievement is reported in mathematics overall and by gender. This section concludes with a comparison of changes over time in mathematics achievement.

Results in mathematics by performance level

Figure NL.1 presents the results by performance level of students in Newfoundland and Labrador and Canada overall in the PCAP 2019 mathematics assessment. Eighty-six percent of students in Newfoundland and Labrador achieved Level 2 or higher in mathematics (Level 2 is the baseline or expected level of mathematics proficiency for Grade 8 students). Four percent of students in Newfoundland and Labrador achieved the highest level of performance (Level 4), which was lower than the proportion at the pan-Canadian level (Appendix B.1.1).

The proportion of girls achieving at or above the expected level of performance in mathematics was similar in Newfoundland and Labrador and Canada overall. The percentage of boys at or above Level 2 was lower in the province than in Canada as a whole. Within the province, a larger proportion of girls than boys achieved Level 2 or above, while no gender gap for achievement at these levels was found at the pan-Canadian level (Appendix B.1.8b).

Figure NL.1 Canada–Newfoundland and Labrador: percentage of students at each performance level in mathematics

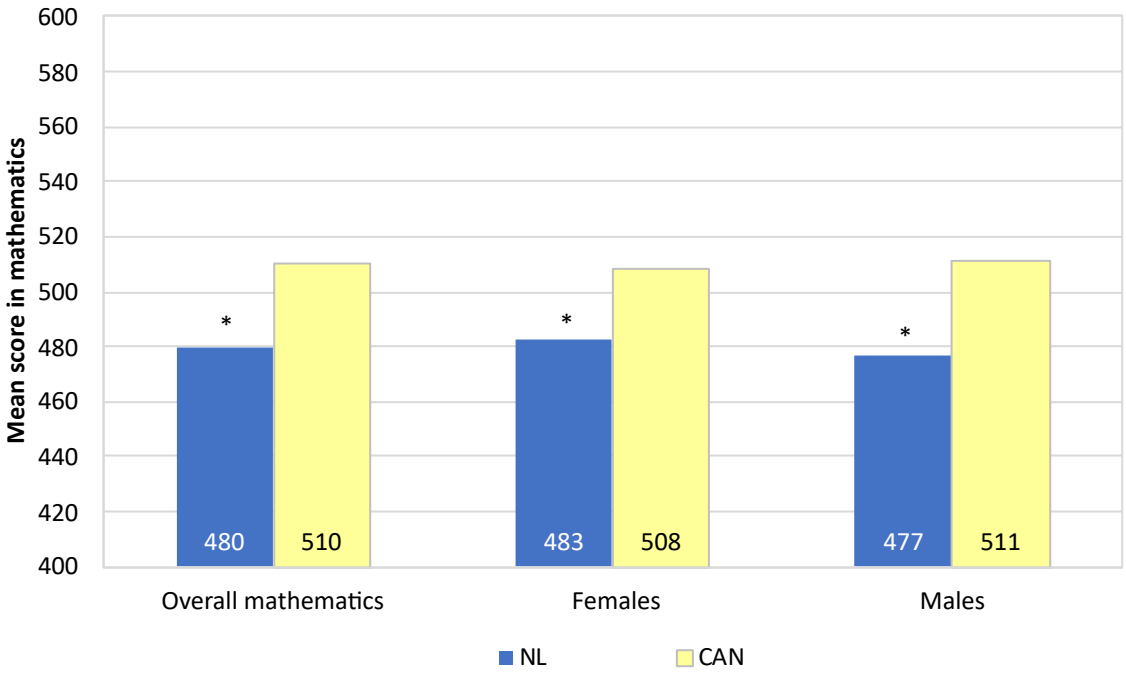


Results in mathematics by mean score

Figure NL.2 summarizes the results by mean score of the PCAP mathematics assessment for students in Newfoundland and Labrador and Canada overall and by gender. Newfoundland and Labrador students achieved scores that were lower than the Canadian mean for mathematics in PCAP 2019 (Appendix B.1.2).

Both girls and boys in Newfoundland and Labrador scored below the respective Canadian means in mathematics. Within the province, girls outperformed boys in mathematics, whereas no gender gap was found at the pan-Canadian level (Appendix B.1.9).

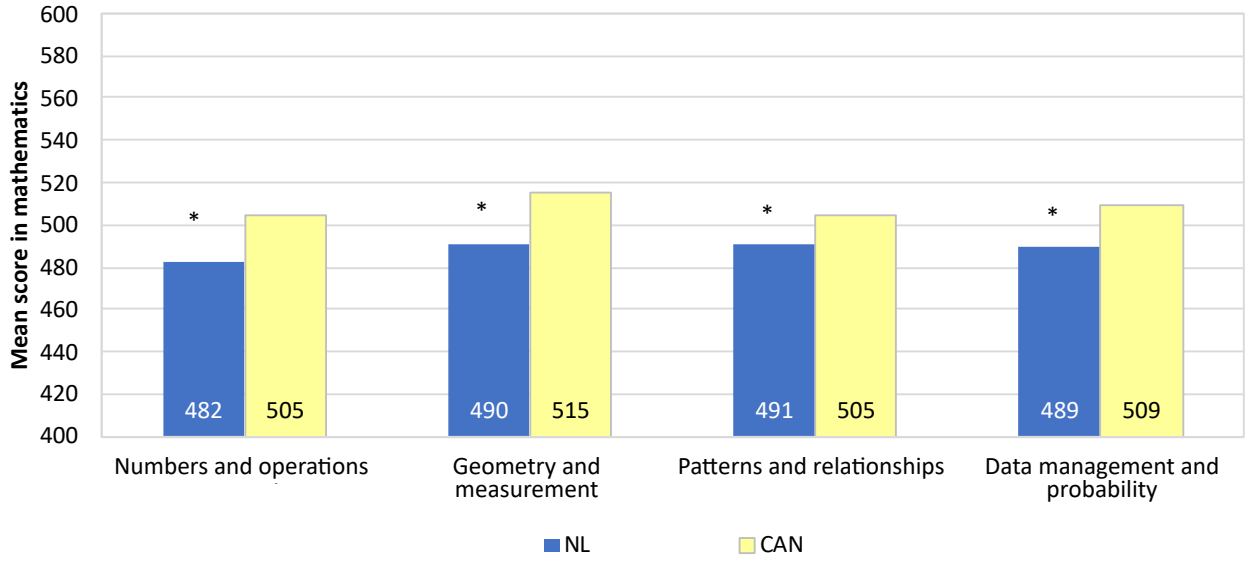
Figure NL.2 Canada–Newfoundland and Labrador: mean scores in mathematics



* Denotes significant difference compared to Canada

Students in Newfoundland and Labrador scored below the respective Canadian means in each of the four subdomains in mathematics. Within Newfoundland and Labrador, the highest results were achieved in the *patterns and relationships* subdomain (Figure NL.3, Appendix B.1.3).

Figure NL.3 Canada–Newfoundland and Labrador: mean scores in mathematics subdomains



* Denotes significant difference compared to Canada

Both girls and boys in Newfoundland and Labrador achieved scores lower than the respective Canadian means in all mathematics subdomains. Within the province, girls outperformed boys in *numbers and operations* and *geometry and measurement*; there was no gender gap in the two other subdomains (Table NL.1, Appendix B.1.10).

Table NL.1 Canada–Newfoundland and Labrador: mean scores in mathematics subdomains by gender

	Numbers and operations		Geometry and measurement		Patterns and relationships		Data management and probability	
	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error	Mean score	Standard error
CAN female	504	1.7	514	1.5	504	1.3	508	1.0
NL female	484	1.1	494	0.9	491	0.8	490	0.8
Difference	20*		20*		13*		18*	
CAN male	507	1.6	516	1.5	506	1.5	510	1.0
NL male	481	1.3	487	1.0	491	1.2	489	1.0
Difference	26*		29*		15*		21*	
NL female	484	1.1	494	0.9	491	0.8	490	0.8
NL male	481	1.3	487	1.0	491	1.2	489	1.0
Difference	3*		7*		0		1	

* Denotes significant difference

Comparison of results over time

In PCAP, changes over time are determined by comparing the current assessment year to the baseline year — that is, the first year in which the subject was the primary focus of the assessment. For PCAP mathematics, the baseline year was 2010. In the baseline year, a larger number of items are administered in the major domain, which allows a broader coverage of the PCAP framework.

Changes in mathematics results in the province over time are presented in Table NL.2 and Figure NL.4. Compared to 2010, a positive change was found in 2019 for mathematics overall as well as all subdomains except *data management and probability*, where results were stable (Appendix B.1.13). At the pan-Canadian level, a positive change in achievement was found for mathematics overall and in each of the subdomains (Appendices B.1.11, B.1.14).

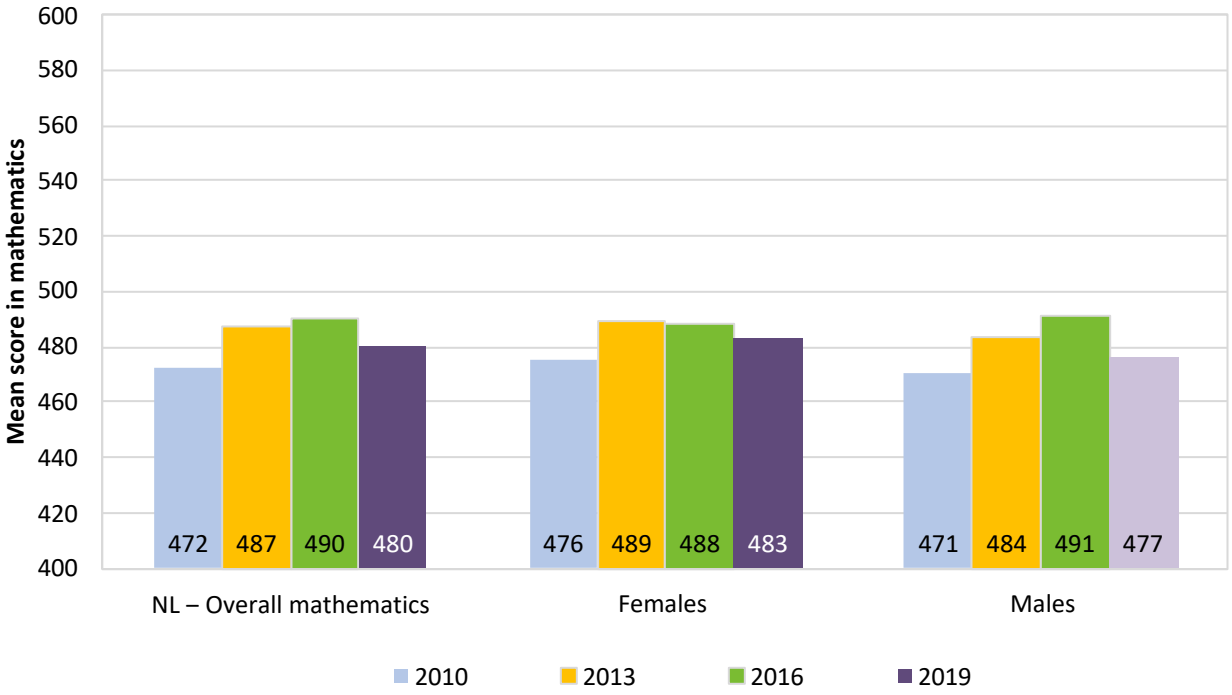
In PCAP 2019, the mathematics results for boys in Newfoundland and Labrador were stable compared to 2010, while for girls there was a positive change. By contrast, at the pan-Canadian level, change in mathematics was positive for both girls and boys (Appendix B.1.13). Results over time are reported for the mathematics subdomains by gender in Appendix B.1.16.

Table NL.2 Newfoundland and Labrador: summary of achievement scores in mathematics, 2010 and 2019

	2010	2019	Change over time
NL - Overall mathematics	472	480	8*
Numbers and operations	475	482	7*
Geometry and measurement	467	490	23*
Patterns and relationships	479	491	13*
Data management and probability	490	489	0
Females	476	483	7*
Males	471	477	6
Achievement gap (F - M)	5	7	

* Denotes significant difference compared to the baseline year 2010
Note: Test for significance cannot be calculated for change over time for achievement gaps

Figure NL.4 Newfoundland and Labrador: mean scores in mathematics, 2010–2019



Note: Darker shades denote significant difference compared to the baseline year 2010

Results in reading and science

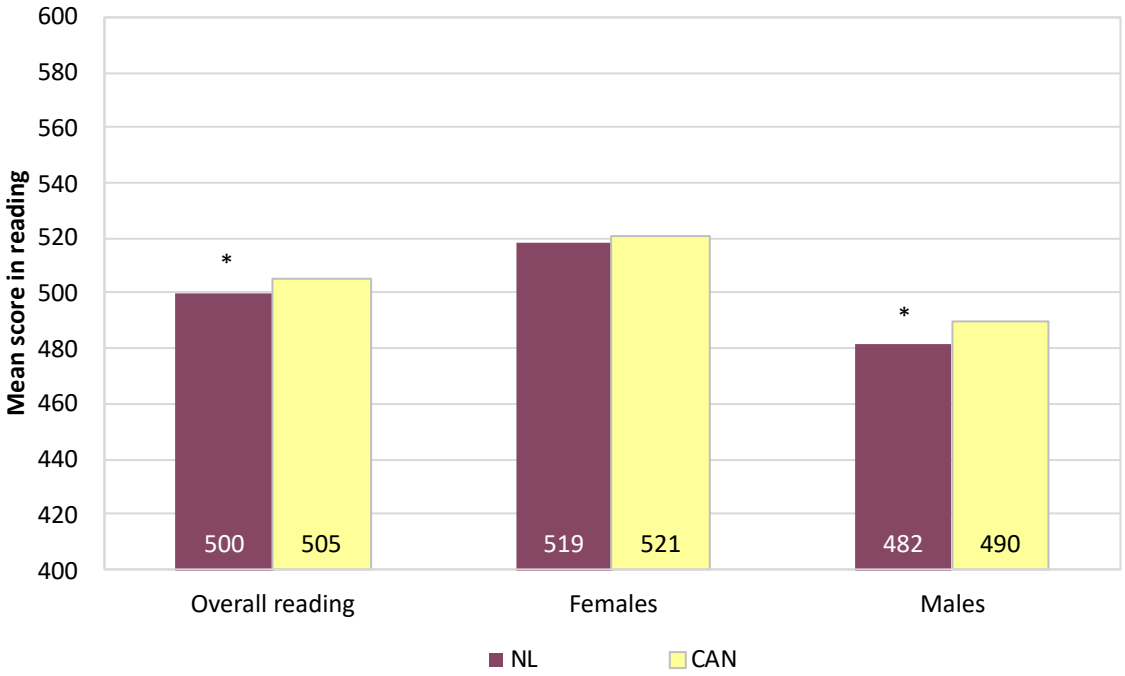
As noted in the Introduction, reading and science are both minor domains in PCAP 2019. Results for these domains are reported by mean scores only. This section presents reading and science scores for Newfoundland and Labrador, compares those scores with the pan-Canadian results, reports results by gender, and presents multiple comparisons over time.

Results in reading

In PCAP 2019, students in Newfoundland and Labrador achieved overall reading scores that were below the Canadian mean (Figure NL.5, Appendix B.2.1).

Girls in Newfoundland and Labrador achieved scores at the Canadian mean for girls, while the scores for boys were below this cohort at the pan-Canadian level. Within the province, girls significantly outperformed boys in reading, which is consistent with the results in Canada overall (Figure NL.5, Appendix B.2.3).

Figure NL.5 Canada–Newfoundland and Labrador: mean scores in reading

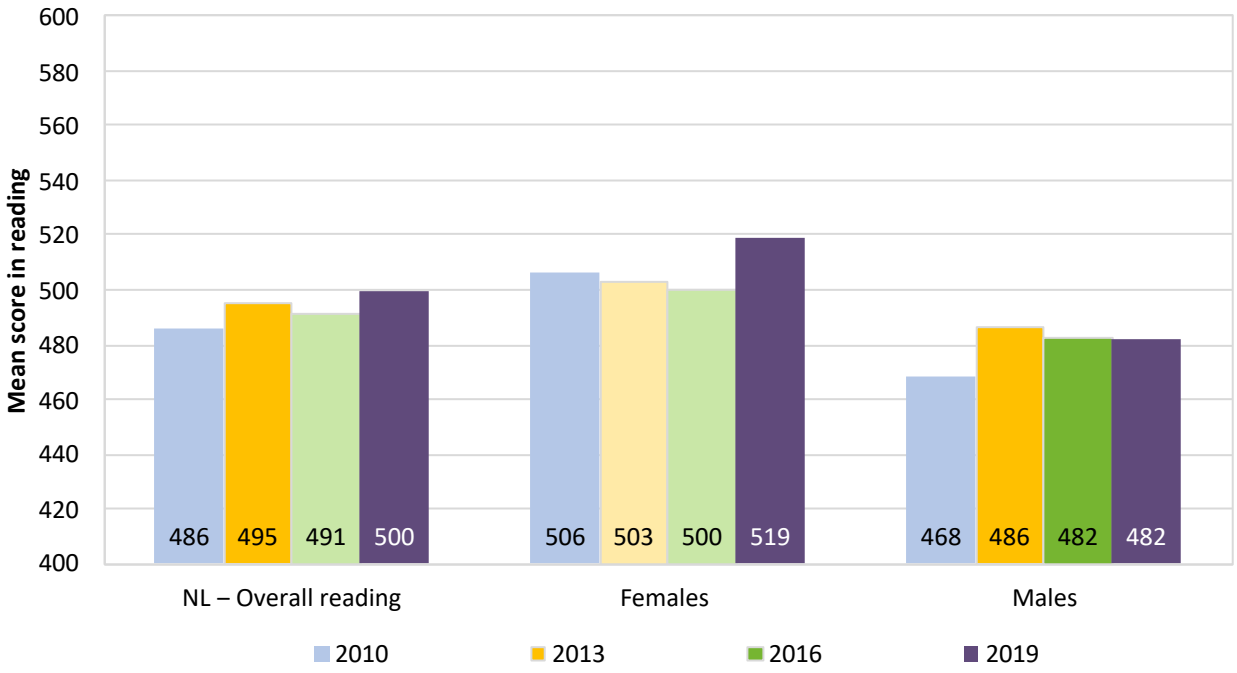


* Denotes significant difference compared to Canada

Figure NL.6 illustrates reading achievement in the province over time. As explained in Chapter 2, although reading was the major domain in PCAP 2007, the baseline year for reading was adjusted to 2010, when the PCAP target group changed from 13-year-old students to Grade 8 students. In Newfoundland and Labrador, positive change in reading achievement was found in 2019 compared to 2010 in reading overall (Appendix B.2.4).

Both boys and girls in Newfoundland and Labrador showed positive change in reading achievement in 2019 compared to 2010. At the pan-Canadian level, change in reading was positive for girls and stable for boys (Appendix B.2.6).

Figure NL.6 Newfoundland and Labrador: mean scores in reading, 2010–2019



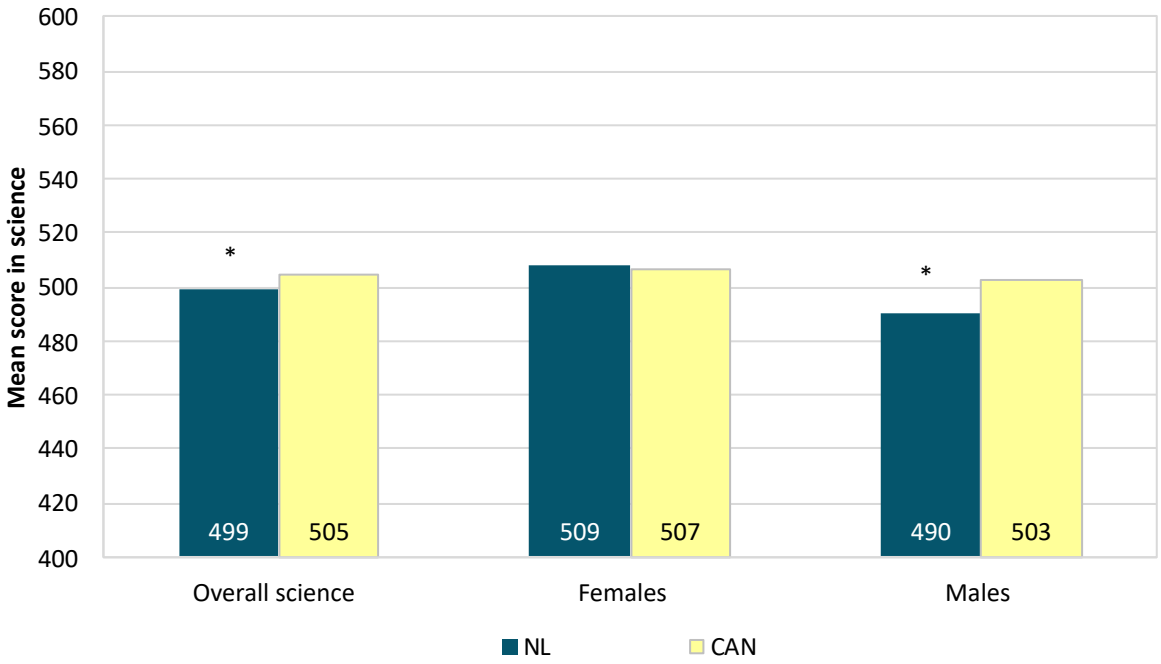
Note: Darker shades denote significant difference compared to the adjusted baseline year 2010

Results in science

Figure NL.7 shows mean scores in Newfoundland and Labrador and Canada in science overall and by gender in PCAP 2019. The results of students in the province were below the Canadian average (Appendix B.3.1).

Girls in Newfoundland and Labrador achieved science scores similar to those of girls in Canada overall. Science scores of boys in the province were significantly lower than those of boys at the pan-Canadian level. Within the province, girls outperformed boys in science, which reflects the pattern in Canada overall (Appendix B.3.3).

Figure NL.7 Canada–Newfoundland and Labrador: mean scores in science



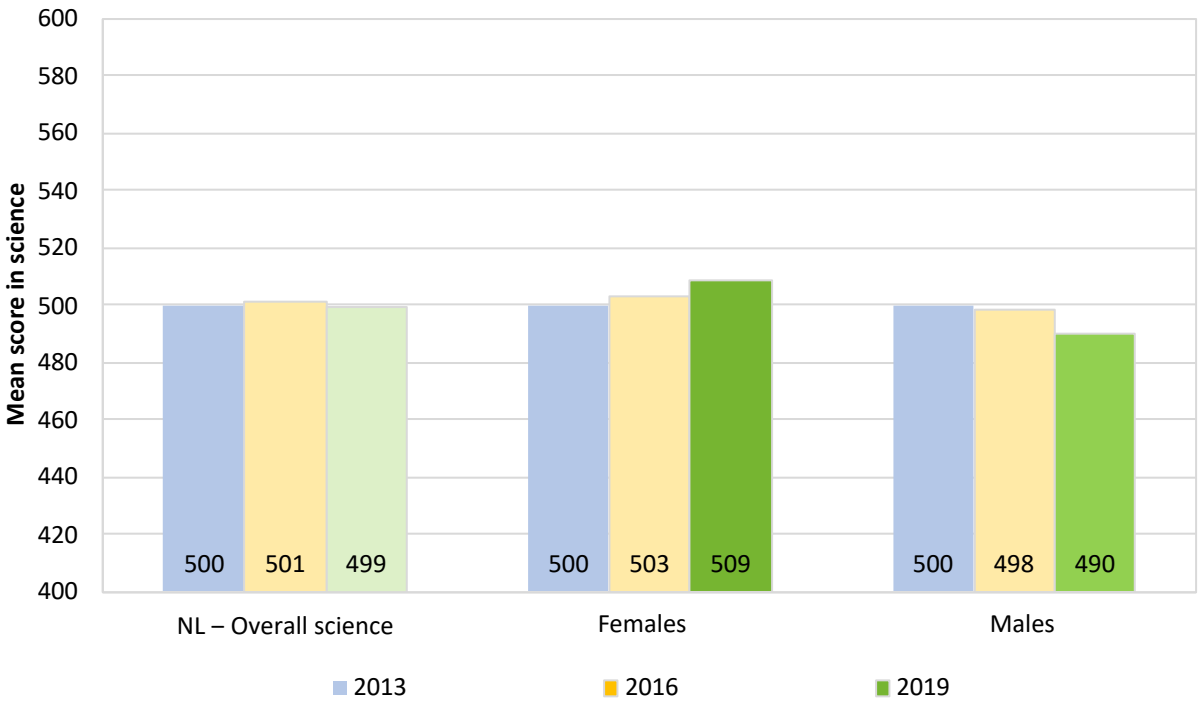
* Denotes significant difference compared to Canada

Figure NL.8, which presents changes over time, shows that science achievement in Newfoundland and Labrador was similar in 2019 to that in the baseline year 2013. At the pan-Canadian level, mean scores in science improved (Appendix B.3.4).

Change in science achievement was positive for girls and negative for boys in 2019 compared to 2013. At the Canadian level, change in science was positive for girls and stable for boys (Appendix B.3.6).

GO BACK

Figure NL.8 Canada–Newfoundland and Labrador: mean scores in science, 2013–2019



Note: Darker shades denote significant difference compared to the baseline year 2013

CONCLUSION

The Pan-Canadian Assessment Program (PCAP) reflects CMEC's ongoing commitment to inform Canadians about how well their education systems are meeting the needs of students and society. The information gained from this pan-Canadian assessment provides ministers of education with a basis for monitoring and evaluating the curriculum and other aspects of their school systems.

This report has described the performance of Grade 8/Secondary II students in the fifth administration of PCAP. In this assessment, the major domain was mathematics, and the minor domains were reading and science. As the major domain, the mathematics component of PCAP 2019 encompassed more of the curricula of all Canadian provinces. The components of reading and science, assessed as minor domains, maintained a focus on the same subdomains as in baseline year (reading in 2007 and science in 2013), but fewer items were assessed.

Participation in the testing process can be a demanding exercise. PCAP does not provide student results on an individual or a school basis, which means that the testing process can appear to be of no immediate consequence to the participants at those levels. Therefore, it is a tribute to the students, the teachers, and the school principals who participated in the administration process that they so readily and thoroughly applied themselves to the tasks demanded of them.

Overview of results

Mathematics

In 2019, 90 percent of students in Canada overall reached or exceeded the expected level of performance (Level 2) for Grade 8/Secondary II students in mathematics, while close to 10 percent reached the highest level of performance (Level 4). In terms of achievement scores, the Canadian average for mathematics overall was 510 in 2019, and provincial scores ranged from a low of 475 to a high of 537.

Mathematics achievement in Canada increased by 10 points in 2019 compared to the baseline year of 2010. With the exception of Saskatchewan and Ontario, which saw no change in their mean scores, all provinces had improved achievement in 2019 compared to the baseline year. Given that PCAP 2019 marks the second time that mathematics has been the primary focus of the assessment, changes over time for the subdomains of mathematics were also reported. Although the results showed generally positive changes, there was much variability among the provinces.

Reading

Results in reading were reported by mean scores only. Ontario students had the highest achievement in reading overall, with an average score significantly above the Canadian mean. Students in British Columbia, Alberta, and Prince Edward Island achieved results that were statistically similar to the

Canadian mean, while students in Saskatchewan, Manitoba, Quebec, New Brunswick, Nova Scotia, and Newfoundland and Labrador achieved results below the Canadian average.

Compared to the adjusted baseline year of 2010, reading achievement in Canada overall in PCAP 2019 showed an increase of 5 points. A positive change over time was also found in Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Reading results were stable in the remaining provinces.

Science

Results in science were reported by mean scores only. Students in Alberta, Ontario, and Prince Edward Island had the highest achievement in science, with average scores above the Canadian mean, while students in British Columbia, Saskatchewan, and Nova Scotia achieved results that were similar to the Canadian mean. All other provinces had scores below the Canadian mean. Compared to 2013, the baseline year for the PCAP science assessment, a positive change in achievement was found in 2019 in Canada overall, and in Saskatchewan, Manitoba, New Brunswick, Nova Scotia, and Prince Edward Island. Science results were stable for the remaining provinces.

Achievement by language of the school system

A greater proportion of francophone students reached or exceeded the expected level of performance (Level 2) in mathematics compared to their anglophone counterparts in Canada overall, as well as in British Columbia, Saskatchewan, Manitoba, and New Brunswick. In the remaining provinces for which data are available by language of the school system, similar proportions of students from both language systems reached Level 2 or above. When results are examined by achievement scores, students in francophone schools outperformed their peers in anglophone schools in mathematics in Canada overall and in British Columbia, Saskatchewan, Quebec, and New Brunswick. No difference was found in the remaining provinces that oversampled to obtain results by language group.

At the pan-Canadian level, a positive change in mathematics achievement occurred in PCAP 2019 compared to the baseline year 2010; however, this change was found to be greater in francophone school systems (21 points) than in anglophone school systems (8 points). In most provinces, a positive change in mathematics achievement was found in both anglophone and francophone school systems.

In reading, English-language school systems outperformed French-language system in Canada overall in 2019. In anglophone school systems in 2019, the highest achievement in reading was in Ontario; for francophone school systems, the highest result was in Quebec. Significant differences by language of the school system were found in seven provinces. Compared to French-language schools, higher reading achievement was found in English-language schools in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, and Nova Scotia.

In science in Canada overall, students in English-language school systems outperformed those in French-language school systems; this was also the case in 2013, the baseline year for the PCAP science assessment. For anglophone schools, the highest achievement in science was found in Alberta; for francophone schools, the highest result was found in Quebec. Students in English-language systems performed better than their counterparts in French-language systems in all provinces except

Quebec, where equity was found between the two language systems. Saskatchewan and Manitoba saw improvement in science results in both language systems in 2019 compared to 2013. Higher achievement scores over time were also found in anglophone schools in New Brunswick, Nova Scotia, and Prince Edward Island, and in francophone schools in Ontario.

Achievement by gender

In 2019, there was no gender gap in mathematics at the Grade 8/Secondary II level in Canada overall; this is consistent with the results from PCAP 2010. Boys had higher scores than girls in British Columbia and Manitoba, while girls outperformed boys in New Brunswick, Prince Edward Island, and Newfoundland and Labrador. There was no gender gap in the remaining provinces.

A gender difference in reading was evident in PCAP 2019 in Canada and in all provinces; this is consistent with the results from the adjusted baseline year of 2010. This gender gap is also reflected in the international studies in which Canada participates.

In science, girls achieved higher scores than boys in Canada as a whole and in Saskatchewan, Quebec, New Brunswick, Nova Scotia, and Newfoundland and Labrador, while boys outperformed girls in Prince Edward Island. No gender gap in science achievement was apparent in British Columbia, Alberta, Manitoba, or Ontario. In Canada overall, there was a positive change in girls' achievement in 2019 compared to the 2013 baseline, while the achievement results for boys were stable. For girls, science results remained stable over time in British Columbia, Alberta, and Ontario, while all other provinces saw an improvement in achievement in 2019 compared to the baseline year. The results for boys in Manitoba, New Brunswick, Nova Scotia, and Prince Edward Island improved in 2019 compared to 2013, while the results for boys in Newfoundland and Labrador declined. No significant change was found in the remaining provinces.

Final statement

The results of PCAP 2019 reveal that, in Canada, a majority of students have attained the expected level of achievement or higher in mathematics. Nevertheless, a persistent achievement gap favouring students in francophone schools continues to exist, and there are still numerous students who perform at lower levels of proficiency and for whom mathematics is a challenge.

Although there are differences in achievement among the provinces, the approach taken in this report does not lend itself to developing explanations for these differences. Secondary analysis undertaken as part of the forthcoming *PCAP 2019: Contextual Report on Student Achievement in Mathematics* will explore how resources and school and classroom conditions, as well as the characteristics of students and their families, may affect achievement among Grade 8/Secondary II students. Further reports on such secondary analysis will be available in forthcoming issues of *Assessment Matters!*, a series of articles available on the CMEC website **https://cmec.ca/459/Overview.html**.

PCAP is designed to determine whether students across Canada are reaching similar levels of performance in the core disciplines of mathematics, reading, and science at about the same age. It complements existing assessments in each province, generating comparative Canada-wide data

on the achievement attained by Grade 8/Secondary II students across the country. The assessment provides information for ministries and departments of education as well as for education partners, contributing to their ability to validate current education policies, learning outcomes, and teaching approaches and strategies, as well as to allocate resources to ensure that they continue meeting the needs of students and of our society. Further comparative evidence can be obtained from international assessments such as PIRLS, which tests Grade 4 students in reading; TIMMS, which tests Grade 4 and Grade 8 students in mathematics and science; and PISA, which will test the same cohort of students as PCAP in reading, mathematics, and science, but two years later.

Overall, PCAP testing reaffirms that CMEC's large-scale assessment projects offer innovative direction on education policy, curriculum, and classroom practices in Canada. Although Canadian students are performing well in mathematics, reading, and science, this report, and the upcoming contextual report, helps identify areas that could be improved. Over the coming months, CMEC, in collaboration with ministries and departments of education, will continue to analyze the results from PCAP in conjunction with other education indicators to better inform teaching and learning in the three core domains as well as related educational policies.

Today's teenagers will eventually become adults responsible for the success of our economy, so it is important to both celebrate the successes and address the challenges highlighted in this report. It is essential that our education systems contribute significantly to preparing Canadian youth for full participation in our modern society for generations to come.

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APPENDIX A: SAMPLING PROCEDURES AND RESPONSE RATES

The accuracy of PCAP survey results depends on the quality of the information on which the sample is based, as well as the sampling procedures. The PCAP 2019 sample for Canada was based on a two-stage stratified sample. The first stage consisted of sampling individual schools in which Grade 8/Secondary II students were enrolled. Schools were sampled systematically, with probabilities proportional to size, the measure of size being a function of the estimated number of eligible (Grade 8/Secondary II) students enrolled in the school. A minimum number of schools were required to be selected in each province in order to produce reliable estimates for anglophone school systems in all provinces and francophone school systems in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia. The second stage of the selection process sampled classes within the schools. Once schools were selected, one or more intact classes were selected, and then a list of all Grade 8/Secondary II students in each was prepared. Sampled students who were to be exempted by the school still had to be included in the sampling documentation, and a list drawn up stating the reason for their exemption.

In order to minimize the potential for response bias, data quality standards in PCAP require minimum participation rates for schools and students. PCAP 2019 required a minimum student participation rate of 80 percent within all participating students and a minimum school participation rate of 85 percent within all participating schools at the national level.

Table A.1 shows the response rates for students. At the national level, there were over 32,000 eligible Grade 8/Secondary II students, of whom 29,706 (91 percent) participated in the PCAP 2019 assessment. All provinces met the required student participation rate: this rate ranged from 88 percent in the anglophone school systems in Alberta and Newfoundland and Labrador to 98 percent in the francophone school system in Manitoba.

A number of accommodations for the administration of PCAP were available for students who received such accommodations in a test situation in their regular school program. Alternative test formats included audio versions for the science and mathematics portions of the assessment, Braille test booklets, coloured background, and fonts in different sizes or colours. Other accommodations permitted were additional time, supervised breaks, an alternative setting, use of a scribe, and verbatim reading of instructions and occasional prompts or questions in the science and mathematics portions of the test. Table A.1 shows that, in Canada overall, 1.8 percent of students used accommodations in PCAP 2019.

Table A.1 Student participation rates

Canada and provinces	Language	Number of eligible students sampled (total)*	Non-participating students					Participating students			
			Non-participating students	Absent**		Other†		With accommodations††		Participation rates***	
				n	%	n	%	n	%	n	%
BC	English	3,780	419	334	8.8	85	2.2	27	0.8	3,361	88.9
	French	286	23	17	5.9	6	2.1	1	0.4	263	92.0
AB	English	3,391	399	348	10.3	51	1.5	101	3.4	2,992	88.2
	French	224	20	18	8.0	2	0.9	6	2.9	204	91.1
SK	English	3,031	268	195	6.4	73	2.4	44	1.6	2,763	91.2
	French	96	5	4	4.2	1	1.0	0	0.0	91	94.8
MB	English	2,937	253	218	7.4	35	1.2	28	1.0	2,684	91.4
	French	325	8	7	2.2	1	0.3	1	0.3	317	97.5
ON	English	4,365	389	302	6.9	87	2.0	6	0.2	3,976	91.1
	French	2,024	178	139	6.9	39	1.9	0	0.0	1,846	91.2
QC	English	1,301	146	120	9.2	26	2.0	30	2.6	1,155	88.8
	French	3,844	325	282	7.3	43	1.1	63	1.8	3,519	91.5
NB	English	1,521	105	86	5.7	19	1.2	24	1.7	1,416	93.1
	French	1,070	78	70	6.5	8	0.7	117	11.8	992	92.7
NS	English	2,179	206	154	7.1	52	2.4	40	2.0	1,973	90.5
	French	186	15	14	7.5	1	0.5	7	4.1	171	91.9
PE	English	406	22	18	4.4	4	1.0	4	1.0	384	94.6
	French	63	5	4	6.3	1	1.6	0	0.0	58	92.1
NL	English	1,737	207	187	10.8	20	1.2	48	3.1	1,530	88.1
	French	11	0	0	-	0	-	0	-	11	-
CAN	**Total**	**32,777**	**3,071**	**2,517**	**7.7**	**554**	**1.7**	**547**	**1.8**	**29,706**	**90.6**
	English	**24,648**	**2,414**	**1,962**	**8.0**	**452**	**1.8**	**352**	**1.6**	**22,234**	**90.2**
	French	**8,129**	**657**	**555**	**6.8**	**102**	**1.3**	**195**	**2.6**	**7,472**	**91.9**

* The number of eligible students does not include exempted students.
** Absent students do not include the number of exempted students in Table A.2.
*** The overall students' participation rate was calculated the following way: number of participating students/number of eligible students (participating students + non-participating students).
† "Other" = included students (1) exempted by the school; (2) exempted because appropriate modifications could not be made; (3) no longer enrolled in selected school/class; (4) who do not wish to participate; and (5) for whom no data were available. It does not include the number of exempted students in Table A.2.
†† Proportion of students using alternative formats and accommodations
Note: Numbers presented in this table do not represent the total number in the final dataset because they do not reflect invalid data removed before analysis.

Table A.2 displays the total number of exempted students, who are then further described and classified into specific categories in accordance with the national standards. Students could be exempted based on three categories:

i) students with a functional disability: student has a moderate-to-severe permanent physical disability such that he/she cannot perform in the PCAP testing situation;

ii) students with an intellectual disability: student has a mental or emotional disability and is cognitively delayed such that he/she cannot perform in the PCAP testing situation; or

iii) students with a limited proficiency in the assessment language: student is unable to read or speak in either of the two languages of the assessment (English and French) and would be unable to overcome the language barrier in the testing situation — typically a student who has received less than one year of instruction in the language of the assessment.

The student exemption rate for Canada overall was 3 percent. Provincially, this proportion ranged from less than 1 percent in both language systems in Ontario and the francophone systems in Saskatchewan, Quebec, and Prince Edward Island to 6 percent in the anglophone school system in Nova Scotia. For Canada as a whole, the majority of exemptions (2 percent) were the result of intellectual disability.

Table A.2 Student exemption rates

Canada and provinces	Language	Number of eligible students sampled (total)	Eligible students*	Number of exempted students							
				Functional disabilities		Intellectual disabilities or socioemotional conditions		Language (non-native-language speakers)		Exemption rates**	
				n	%	n	%	n	%	n	%
BC	English	3,914	3,780	7	0.2	85	2.2	42	1.1	134	3.4
	French	294	286	0	0.0	3	1.0	5	1.7	8	2.7
AB	English	3,509	3,391	3	0.1	67	1.9	48	1.4	118	3.4
	French	227	224	0	0.0	3	1.3	0	0.0	3	1.3
SK	English	3,147	3,031	2	0.1	79	2.5	35	1.1	116	3.7
	French	96	96	0	0.0	0	0.0	0	0.0	0	0.0
MB	English	3,074	2,937	2	0.1	107	3.5	28	0.9	137	4.5
	French	334	325	0	0.0	9	2.7	0	0.0	9	2.7
ON	English	4,370	4,365	0	0.0	3	0.1	2	0.0	5	0.1
	French	2,026	2,024	0	0.0	1	0.0	1	0.0	2	0.1
QC	English	1,342	1,301	9	0.7	21	1.6	11	0.8	41	3.1
	French	3,875	3,844	0	0.0	30	0.8	1	0.0	31	0.8
NB	English	1,581	1,521	4	0.3	46	2.9	10	0.6	60	3.8
	French	1,129	1,070	9	0.8	40	3.5	10	0.9	59	5.2
NS	English	2,313	2,179	4	0.2	114	4.9	16	0.7	134	5.8
	French	190	186	0	0.0	4	2.1	0	0.0	4	2.1
PE	English	428	406	2	0.5	17	4.0	3	0.7	22	5.1
	French	63	63	0	0.0	0	0.0	0	0.0	0	0.0
NL	English	1,798	1,737	9	0.5	52	2.9	0	0.0	61	3.4
	French	11	11	-	-	-	-	-	-	-	-
CAN	**Total**	**33,721**	**32,777**	**51**	**0.2**	**681**	**2.0**	**212**	**0.6**	**944**	**2.8**
	English	**25,476**	**24648**	**42**	**0.2**	**591**	**2.3**	**195**	**0.8**	**828**	**3.3**
	French	**8,245**	**8,129**	**9**	**0.1**	**90**	**1.1**	**17**	**0.2**	**116**	**1.4**

* Eligible students = (total number of eligible students sampled - total number of exempted students)

** The students' exemption rate is calculated the following way: total number of exempted students/total number of eligible students sampled (participating students + non-participating students + exempted students)

Table A.3 presents the response rates for schools. The school participation rate for Canada overall was 91 percent. The school participation rate was 100 percent in both anglophone and francophone school systems in New Brunswick, Nova Scotia, and Prince Edward Island, and in the francophone school system in British Columbia, Saskatchewan, Manitoba, and Newfoundland and Labrador. Both the anglophone and francophone school systems in Alberta (75 and 72 percent, respectively) and Quebec (75 and 80 percent, respectively) did not meet the minimum school participation rate of 85 percent. The sample size of students in francophone schools in Newfoundland and Labrador was too small for reliable reporting in PCAP 2019.

Table A.3 School response rates

Canada and provinces	Language	Selected schools (participating and non-participating) (n)	Participating schools (after replacement) (n)	School participation rates* (%)
British Columbia	English	170	165	97.1
	French	13	13	100.0
Alberta	English	172	129	75.0
	French	18	13	72.2
Saskatchewan	English	158	156	98.7
	French	6	6	100.0
Manitoba	English	161	158	98.1
	French	16	16	100.0
Ontario	English	217	202	93.1
	French	134	121	90.3
Quebec	English	91	68	74.7
	French	183	146	79.8
New Brunswick	English	83	83	100.0
	French	61	61	100.0
Nova Scotia	English	114	114	100.0
	French	11	11	100.0
Prince Edward Island	English	22	22	100.0
	French	5	5	100.0
Newfoundland and Labrador	English	112	107	95.5
	French	1	1	100.0
Canada	**Total**	**1,748**	**1,597**	**91.4**
	English	**1,300**	**1,204**	**92.6**
	French	**448**	**393**	**87.7**

* School participation rate was calculated the following way: number of participating schools/number of selected schools (participating schools + non-participating schools).

Note: Data include both online and paper samples.

Table A.4 presents the response rates for Grade 8/Secondary II mathematics teachers whose classes were selected to participate in PCAP 2019. At the pan-Canadian level, 87 percent of mathematics teachers whose classes were selected responded to the online questionnaire, with approximately equal proportions of teachers responding in the anglophone and francophone school systems (88 and 87 percent, respectively). The participation rate for mathematics teachers whose classes were selected in participating schools ranged from 56 percent in francophone schools in British Columbia to 100 percent in francophone schools in Saskatchewan and Prince Edward Island.

Table A.4 Teacher response rates

Canada and provinces	Language	Data available (n)	No data* (n)	Total (n)	Teacher participation rates (%)
British Columbia	English	162	43	205	79.0
	French	9	7	16	56.3
Alberta	English	131	9	140	93.6
	French	12	3	15	80.0
Saskatchewan	English	145	21	166	87.3
	French	7	0	7	100.0
Manitoba	English	147	15	162	90.7
	French	18	1	19	94.7
Ontario	English	188	33	221	85.1
	French	113	10	123	91.9
Quebec	English	58	12	70	82.9
	French	127	20	147	86.4
New Brunswick	English	84	5	89	94.4
	French	52	10	62	83.9
Nova Scotia	English	107	9	116	92.2
	French	9	2	11	81.8
Prince Edward Island	English	19	4	23	82.6
	French	5	0	5	100.0
Newfoundland and Labrador	English	103	13	116	88.8
	French	1	0	1	100.0
Canada	**Total**	**1,497**	**217**	**1714**	**87.3**
	English	**1,144**	**164**	**1308**	**87.5**
	French	**353**	**53**	**406**	**86.9**

* The online questionnaire was not submitted by the mathematics teacher in the selected school.

APPENDIX B: DATA TABLES

Rounding numbers

Because of rounding, some numbers in tables may not add up exactly to the totals shown. Percentages, mean scores, and differences are always calculated on the basis of the exact numbers and are rounded only after calculation.

All Standard errors in the preceding chapters have been rounded to one decimal place. Where the value 0.0 is shown, this does not necessarily imply that the Standard error is zero, but that it is smaller than 0.05. Standard errors are rounded to two decimal places in this appendix.

Table B.1.1 Percentage of students at each level of performance in mathematics by province

Canada and provinces	Level 1		Level 2		Level 3		Level 4		Level 2 or above	
	%	SE	%	SE	%	SE	%	SE	%	SE
BC	12	0.70	43*	1.13	40*	1.23	5*	0.53	88	0.70
AB	10	1.09	36	1.26	46	1.36	8	0.76	90	1.09
SK	15*	0.99	43*	1.11	38*	1.27	4*	0.39	85*	0.99
MB	17*	0.88	45*	0.89	35*	1.05	4*	0.51	83*	0.88
ON	10	0.81	35	1.26	46	1.33	10	0.91	90	0.81
QC	5*	0.59	29*	1.32	53*	1.18	13*	0.94	95*	0.59
NB	12*	0.00	41*	0.00	40*	0.00	6*	0.00	88*	0.00
NS	11	0.12	39*	0.18	45	0.21	6*	0.10	89	0.12
PE	8*	0.00	45*	0.00	42*	0.00	5*‡	0.00	92*	0.00
NL	14*	0.46	45*	0.49	36*	0.54	4*	0.19	86*	0.46
CAN	**10**	**0.39**	**36**	**0.61**	**46**	**0.65**	**9**	**0.42**	**90**	**0.39**

* Significant difference compared to Canada

‡ Fewer than 30 observations

Table B.1.2 Achievement scores in mathematics by province

Canada and provinces	Mean score	SE	Difference
British Columbia	490	2.8	-20*
Alberta	507	4.0	-3
Saskatchewan	481	3.0	-29*
Manitoba	475	2.8	-35*
Ontario	512	3.9	2
Quebec	537	3.5	27*
New Brunswick	493	0.0	-17*
Nova Scotia	498	0.5	-12*
Prince Edward Island	497	0.0	-13*
Newfoundland and Labrador	480	1.2	-30*
Canada	**510**	**1.8**	

* Significant difference compared to Canada

Table B.1.3 Achievement scores in mathematics by subdomain

Canada and provinces	Mean score	SE	Difference
Numbers and operations			
British Columbia	493	2.28	-12*
Alberta	500	3.11	-5
Saskatchewan	484	2.59	-21*
Manitoba	481	2.26	-24*
Ontario	502	3.02	-3
Quebec	535	2.70	30*
New Brunswick	496	0.00	-9*
Nova Scotia	497	0.40	-8*
Prince Edward Island	494	0.00	-11*
Newfoundland and Labrador	482	1.04	-23*
Canada	**505**	**1.44**	
Geometry and measurement			
British Columbia	491	2.09	-24*
Alberta	504	2.75	-11*
Saskatchewan	486	1.94	-29*
Manitoba	482	1.96	-33*
Ontario	519	2.69	4
Quebec	544	2.37	29*
New Brunswick	499	0.00	-16*
Nova Scotia	499	0.36	-16*
Prince Edward Island	496	0.00	-19*
Newfoundland and Labrador	490	0.79	-25*
Canada	**515**	**1.28**	

Table B.1.3 (cont'd)
Achievement scores in mathematics by subdomain

Canada and provinces	Mean score	SE	Difference
Patterns and relationships			
British Columbia	493	1.89	-12*
Alberta	508	2.66	3
Saskatchewan	492	1.90	-13*
Manitoba	489	1.81	-17*
Ontario	508	2.63	3
Quebec	513	2.03	8*
New Brunswick	495	0.00	-10*
Nova Scotia	501	0.34	-4*
Prince Edward Island	499	0.00	-6*
Newfoundland and Labrador	491	0.84	-14*
Canada	**505**	**1.19**	

Data management and probability	Mean score	SE	Difference
British Columbia	499	1.20	-10*
Alberta	504	2.00	-6*
Saskatchewan	495	1.62	-15*
Manitoba	489	1.46	-20*
Ontario	504	1.64	-5*
Quebec	540	2.00	30*
New Brunswick	507	0.00	-3*
Nova Scotia	501	0.31	-9*
Prince Edward Island	505	0.00	-4*
Newfoundland and Labrador	489	0.81	-20*
Canada	**509**	**0.86**	

* Significant difference compared to Canada

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Table B.1.4a Percentage of students at each level of performance in mathematics by language of the school system

Canada and provinces	Anglophone school system									
	Level 1		Level 2		Level 3		Level 4		Level 2 or above	
	%	SE	%	SE	%	SE	%	SE	%	SE
BC	12	0.7	43*	1.1	40*	1.2	5*	0.5	88	0.7
AB	10	1.1	36	1.3	46	1.4	8	0.8	90	1.1
SK	15*	1.0	43*	1.1	38*	1.3	4*	0.4	85*	1.0
MB	17*	0.9	45*	0.9	34*	1.1	4*	0.5	83*	0.9
ON	10	0.8	35*	1.3	45	1.4	10*	1.0	90	0.8
QC	6*	0.7	34	1.8	53*	2.2	7	0.7	94*	0.7
NB	14*	0.0	45*	0.0	37*	0.0	4*	0.0	86*	0.0
NS	10	0.1	39	0.2	45	0.2	6*	0.1	90	0.1
PE	8*	0.0	45*	0.0	42	0.0	5*‡	0.0	92*	0.0
NL	14*	0.5	45*	0.5	36*	0.5	4*	0.2	86*	0.5
CAN	**11**	**0.5**	**38**	**0.7**	**44**	**0.8**	**8**	**0.5**	**89**	**0.5**

* Significant difference compared to Canada

‡ Fewer than 30 observations

Canada and provinces	Francophone school system									
	Level 1		Level 2		Level 3		Level 4		Level 2 or above	
	%	SE	%	SE	%	SE	%	SE	%	SE
BC	8*‡	0.0	32	0.0	50	0.0	10*‡	0.0	92*	0.0
AB	8‡	1.0	34	3.1	48	2.6	10‡	1.2	92	1.0
SK	11*‡	0.0	40*	0.0	38*	0.0	11‡	0.0	89*	0.0
MB	14*	0.0	45*		38*	0.0	3*‡	0.0	86*	0.0
ON	9*	0.7	34*	0.9	47*	1.0	10*	0.8	91*	0.7
QC	5*	0.6	28*	1.5	53*	1.3	14*	1.0	95*	0.6
NB	8*	0.0	32	0.0	47*	0.0	13	0.0	92*	0.0
NS	12*‡	1.1	37*	1.9	41*	2.5	10‡	1.6	88*	1.1
PE	--	--	--	--	--	--	--	--	--	--
NL	--	--	--	--	--	--	--	--	--	--
CAN	**5**	**0.6**	**29**	**1.2**	**52**	**1.1**	**13**	**0.9**	**95**	**0.6**

* Significant difference compared to Canada

‡ Fewer than 30 observations

Table B.1.4b Comparison of levels of performance in mathematics between anglophone and francophone school systems

Canada and provinces	Level 1	Level 2	Level 3	Level 4	Level 2 or above
British Columbia	**	**	**	**	**
Alberta					
Saskatchewan	**	**		**	**
Manitoba	**		**		**
Ontario					
Quebec		**		**	
New Brunswick	**Δ	**Δ	**Δ	**Δ	**Δ
Nova Scotia				**	
Canada	**	**	**	**	**

** Significant difference within Canada or within province

Δ Despite the lack of sampling variance at the school level, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student is selected within each school.

Table B.1.5 Achievement scores in mathematics by language of the school system

Canada and provinces	Anglophone school system		Francophone school system		Difference (A - F)
	Mean score	SE	Mean score	SE	
British Columbia	489*	2.8	523*	0.0	-34**
Alberta	506	4.1	515*	3.6	-8
Saskatchewan	481*	3.0	509*	0.0	-29**
Manitoba	474*	2.9	480*	0.0	-5
Ontario	512*	4.1	516*	3.4	-5
Quebec	518*	4.4	540*	3.9	-22**
New Brunswick	479*	0.0	525*	0.0	-46**Δ
Nova Scotia	498	0.4	501*	6.2	-3
Prince Edward Island	497*	0.0	--	--	--
Newfoundland and Labrador	480*	1.2	--	--	--
Canada	**503**	**2.1**	**536**	**3.4**	**-33****

* Significant difference compared to Canada

** Significant difference within Canada or within province

Δ Despite the lack of sampling variance at the school level, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student is selected within each school.

Table B.1.6 Achievement scores in mathematics by subdomain and language of the school system

Canada and provinces	Anglophone school system		Francophone school system		Difference (A - F)
	Mean score	SE	Mean score	SE	
Numbers and operations					
British Columbia	492	2.29	532	0.00	-40**
Alberta	500	3.15	518*	3.05	-18**
Saskatchewan	484*	2.61	519*	0.00	-35**
Manitoba	480*	2.32	504*	0.00	-23**
Ontario	501	3.18	512*	2.13	-11**
Quebec	509*	3.31	538*	2.98	-29**
New Brunswick	485*	0.00	525*	0.00	-40**Δ
Nova Scotia	496	0.35	509*	4.52	-13**
Prince Edward Island	494	0.00	--	--	--
Newfoundland and Labrador	482*	1.05	--	--	--
Canada	**497**	**1.65**	**534**	**2.58**	**-37****
Geometry and measurement					
British Columbia	491*	2.10	531*	0.00	-40**
Alberta	504	2.79	519*	3.72	-15**
Saskatchewan	486*	1.95	508*	0.00	-22**
Manitoba	481*	2.01	487*	0.00	-6**
Ontario	519*	2.81	533*	2.60	-15**
Quebec	523*	3.12	547*	2.63	-23**
New Brunswick	483*	0.00	538*	0.00	-55**Δ
Nova Scotia	499*	0.30	506*	4.48	-7
Prince Edward Island	495*	0.00	--	--	--
Newfoundland and Labrador	490*	0.79	--	--	--
Canada	**507**	**1.47**	**544**	**2.26**	**-37****

Table B.1.6 (con't)
Achievement scores in mathematics by subdomain and language of the school system

Canada and provinces	Anglophone school system		Francophone school system		Difference (A - F)
	Mean score	SE	Mean score	SE	
Patterns and relationships					
British Columbia	493*	1.90	504*	0.00	-11**
Alberta	508	2.70	511	3.05	-2
Saskatchewan	492*	1.92	505*	0.00	-13**
Manitoba	489*	1.86	486*	0.00	2
Ontario	508*	2.76	508	2.19	-1
Quebec	511	2.82	513	2.25	-2
New Brunswick	492*	0.00	503*	0.00	-11**Δ
Nova Scotia	501	0.31	504	3.88	-3
Prince Edward Island	499*	0.00	--	--	--
Newfoundland and Labrador	491*	0.84	--	--	--
Canada	**503**	**1.43**	**512**	**1.94**	**-9**
Data management and probability					
British Columbia	499	1.21	529*	0.00	-30**
Alberta	503	2.02	532*	2.79	-29**
Saskatchewan	494*	1.63	534*	0.00	-40**
Manitoba	488*	1.50	520*	0.00	-32**
Ontario	503	1.71	530*	1.84	-27**
Quebec	509*	2.75	543*	2.17	-34**
New Brunswick	493*	0.00	541	0.00	-49**Δ
Nova Scotia	499	0.24	528*	2.97	-29**
Prince Edward Island	504*	0.00	--	--	--
Newfoundland and Labrador	489*	0.81	--	--	--
Canada	**501**	**0.92**	**541**	**1.85**	**-40****

* Significant difference compared to Canada

** Significant difference within Canada or within province

Δ Despite the lack of sampling variance at the school level, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student is selected within each school.

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Table B.1.7 Percentage of students by gender self-identification

Canada and provinces	Female		Male		I identify myself in another way		I prefer not to say	
	%	SE	%	SE	%	SE	%	SE
British Columbia	48	0.7	48	0.7	2	0.2	2	0.3
Alberta	50	0.9	46	0.9	3	0.4	1	0.2
Saskatchewan	50	0.9	47	0.9	2	0.2	1	0.2
Manitoba	49	0.9	47	0.9	2	0.2	2	0.3
Ontario	49	1.0	49	1.0	1	0.3	2	0.3
Quebec	46	1.3	50	1.4	2	0.3	2	0.3
New Brunswick	49	0.0	49	0.0	1	0.0	1	0.0
Nova Scotia	46	0.1	50	0.1	2	0.0	2	0.0
Prince Edward Island	44	0.0	51	0.0	1	0.0	3	0.0
Newfoundland and Labrador	48	0.5	47	0.4	2	0.1	2	0.2
Canada	**48**	**0.5**	**48**	**0.5**	**2**	**0.1**	**2**	**0.1**

Table B.1.8a Percentage of students at each level of performance in mathematics by gender

Canada and provinces	Females									
	Level 1		Level 2		Level 3		Level 4		Level 2 or above	
	%	SE	%	SE	%	SE	%	SE	%	SE
BC	11	0.9	46*	1.3	39*	1.4	4*	0.5	89	0.9
AB	10	1.2	39	1.4	45	1.4	6	0.8	90	1.2
SK	15*	1.1	44*	1.4	37*	1.5	3*	0.5	85*	1.1
MB	17*	1.0	46*	1.1	34*	1.3	3*	0.4	83*	1.0
ON	9	1.0	36	1.7	47	1.8	8	0.9	91	1.0
QC	4*	0.6	29*	1.6	54*	1.4	13*	1.1	96*	0.6
NB	11*	0.0	42*	0.0	41*	0.0	6*	0.0	89*	0.0
NS	9	0.1	40*	0.2	45	0.3	5*	0.1	91	0.1
PE	6*‡	0.0	48*	0.0	40*	0.0	5*‡	0.0	94*	0.0
NL	11	0.5	49*	0.7	37*	0.6	3*‡	0.2	89	0.5
CAN	**9**	**0.5**	**37**	**0.8**	**46**	**0.8**	**8**	**0.5**	**91**	**0.5**

* Significant difference compared to Canada

‡ Fewer than 30 observations

Canada and provinces	Males									
	Level 1		Level 2		Level 3		Level 4		Level 2 or above	
	%	SE	%	SE	%	SE	%	SE	%	SE
BC	12	0.9	41*	1.5	40*	1.5	6*	0.7	88	0.9
AB	11	1.2	34	1.6	46	2.0	9	1.0	89	1.2
SK	15*	1.2	41*	1.4	39*	1.6	5*	0.6	85*	1.2
MB	17*	1.1	44*	1.2	35*	1.2	4*	0.8	83*	1.1
ON	11	1.1	34	1.5	45	1.4	11	1.2	89	1.1
QC	5*	0.8	28*	1.5	53*	1.5	13*	1.1	95*	0.8
NB	14*	0.0	40*	0.0	40*	0.0	7*	0.0	86*	0.0
NS	12	0.2	38*	0.2	44	0.2	7*	0.1	88	0.2
PE	10‡	0.0	41*	0.0	44	0.0	4*‡	0.0	90	0.0
NL	17*	0.6	42*	0.5	36*	0.7	5*	0.3	83*	0.6
CAN	**10**	**0.5**	**35**	**0.7**	**45**	**0.8**	**10**	**0.5**	**90**	**0.5**

* Significant difference compared to Canada

‡ Fewer than 30 observations

Table B.1.8b Comparison of levels of performance in mathematics between girls and boys

Canada and provinces	Level 1	Level 2	Level 3	Level 4	Level 2 or above
British Columbia		**		**	
Alberta		**		**	
Saskatchewan				**	
Manitoba					
Ontario				**	
Quebec					
New Brunswick	**Δ	**Δ	**Δ	**Δ	**Δ
Nova Scotia	**	**	**	**	**
Prince Edward Island	**Δ	**Δ	**Δ	**Δ	**Δ
Newfoundland and Labrador	**	**		**	**
Canada		**		**	

** Significant difference within Canada or within province

Δ Despite the lack of sampling variance at the school level, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student is selected within each school.

Table B.1.9 Achievement scores in mathematics by gender

Canada and provinces	Females		Males		Difference (F - M)
	Mean score	SE	Mean score	SE	
British Columbia	487*	2.9	493*	3.2	-6**
Alberta	504	4.3	509	4.4	-5
Saskatchewan	478*	3.1	484*	3.6	-6
Manitoba	470*	2.9	478*	3.6	-8**
Ontario	510	4.2	514	4.4	-4
Quebec	537*	4.0	537*	4.0	0
New Brunswick	495*	0.0	490*	0.0	5**Δ
Nova Scotia	498*	0.6	498*	0.6	0
Prince Edward Island	498*	0.0	496*	0.0	2**Δ
Newfoundland and Labrador	483*	1.3	477*	1.6	7**
Canada	**508**	**2.0**	**511**	**2.1**	-3

* Significant difference compared to Canada

** Significant difference within Canada or within province

Δ Despite the lack of sampling variance at the school level, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student is selected within each school.

Table B.1.10 Achievement scores in mathematics by subdomain and gender

Canada and provinces	Females		Males		Difference (A - F)
	Mean score	SE	Mean score	SE	
Numbers and operations					
British Columbia	490*	2.4	495*	2.7	-5**
Alberta	500	3.4	501	3.6	-1
Saskatchewan	482*	2.7	487*	3.2	-5
Manitoba	479*	2.3	483*	2.9	-5
Ontario	498	3.4	505	3.5	-7**
Quebec	536*	3.2	534*	3.1	2
New Brunswick	497*	0.0	496*	0.0	1**Δ
Nova Scotia	495*	0.5	499*	0.4	-4**
Prince Edward Island	494*	0.0	495*	0.0	-1**Δ
Newfoundland and Labrador	484*	1.1	481*	1.3	3**
Canada	**504**	**1.7**	**507**	**1.6**	**-3****
Geometry and measurement					
British Columbia	488*	2.3	494*	2.4	-7**
Alberta	503*	2.9	505*	3.3	-2
Saskatchewan	483*	2.1	489*	2.4	-6**
Manitoba	478*	2.0	485*	2.6	-7**
Ontario	520	3.0	519	3.1	1
Quebec	543*	2.7	546*	2.8	-3
New Brunswick	501*	0.0	497*	0.0	4**Δ
Nova Scotia	498*	0.4	500*	0.5	-3**
Prince Edward Island	498*	0.0	494*	0.0	3**Δ
Newfoundland and Labrador	494*	0.9	487*	1.0	7**
Canada	**514**	**1.5**	**516**	**1.5**	**-1**

Table B.1.10 (con't)
Achievement scores in mathematics by subdomain and gender

Canada and provinces	Females		Males		Difference (A - F)
	Mean score	SE	Mean score	SE	
Patterns and relationships					
British Columbia	490*	2.2	496*	2.1	-6**
Alberta	505	3.0	512	2.9	-7**
Saskatchewan	490*	2.2	493*	2.4	-3
Manitoba	486*	2.2	491*	2.2	-5
Ontario	507	2.9	508	3.2	-1
Quebec	513*	2.4	513	2.5	0
New Brunswick	497*	0.0	494*	0.0	3**Δ
Nova Scotia	502	0.4	500*	0.4	2**
Prince Edward Island	498*	0.0	500*	0.0	-2**Δ
Newfoundland and Labrador	491*	0.8	491*	1.2	0
Canada	**504**	**1.3**	**506**	**1.5**	**-2**
Data management and probability					
British Columbia	499*	1.5	499*	1.6	-1
Alberta	502*	2.4	505	2.2	-4
Saskatchewan	492*	1.8	497*	2.1	-5**
Manitoba	486*	1.5	492*	2.0	-6**
Ontario	502*	2.0	506*	2.0	-4**
Quebec	540*	2.2	539*	2.5	2
New Brunswick	508	0.0	505*	0.0	3**Δ
Nova Scotia	500*	0.3	501*	0.4	-1**
Prince Edward Island	502*	0.0	509	0.0	-7**Δ
Newfoundland and Labrador	490*	0.8	489*	1.0	1
Canada	**508**	**1.0**	**510**	**1.0**	**-2**

* Significant difference compared to Canada

** Significant difference within Canada or within province

Δ Despite the lack of sampling variance at the school level, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student is selected within each school.

Table B.1.11 Comparisons of mathematics achievement scores: 2019, 2016, 2013, and 2010

Canada and provinces	2019		2016		2013		2010		Difference (2019 - 2010)	Difference (2016 - 2010)	Difference (2013 - 2010)
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE			
BC	490	2.8	494	1.7	489	1.6	481	1.8	8*	13*	8*
AB	507	4.0	505	1.7	502	2.0	495	2.0	11*	10*	7*
SK	481	3.0	483	1.5	488	2.0	474	1.9	7	9*	14*
MB	475	2.8	479	2.2	471	1.7	468	2.1	7*	11*	3
ON	512	3.9	508	1.9	512	1.8	507	2.0	5	1	5
QC	537	3.5	541	1.9	527	1.5	515	2.0	22*	26*	12*
NB	493	0.0	498	1.7	480	1.8	478	2.0	14*	20*	2
NS	498	0.5	497	1.4	488	1.7	474	2.0	24*	23*	14*
PE	497	0.0	503	3.4	492	1.9	460	4.2	37*	43*	32*
NL	480	1.2	490	2.1	487	2.4	472	2.7	8*	18*	15*
CAN	**510**	**1.8**	**511**	**1.1**	**507**	**1.0**	**500**	**1.1**	**10***	**11***	**7***

* Significant difference compared to the baseline year 2010

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Table B.1.12 Comparisons of mathematics achievement scores by language of the school system: 2019, 2016, 2013, and 2010

Canada and provinces	Language	2019		2016		2013		2010		Difference (2019 - 2010)	Difference (2016 - 2010)	Difference (2013 - 2010)
		Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE			
BC	English	489	2.8	494	2.0	489	1.7	481	1.9	8*	13*	8*
	French	523	0.0	516	1.3	513	3.1	504	2.6	19*	12*	9*
AB	English	506	4.1	505	1.6	502	2.0	495	2.0	11*	10*	7*
	French	515	3.6	506	3.7	502	1.8	504	2.7	10*	2	-2
SK	English	481	3.0	483	1.6	487	1.7	474	2.0	7	9*	13*
	French	509	0.0	501	0.0	518	1.1	498	3.6	11*	3	20*
MB	English	474	2.9	479	1.7	470	1.3	467	2.2	7*	12*	3
	French	480	0.0	474	2.8	476	1.5	480	1.8	-1	-6	-4
ON	English	512	4.1	507	1.9	512	1.5	507	2.4	5	0	5
	French	516	3.4	528	1.9	500	2.0	511	1.9	5	17*	-11*
QC	English	518	4.4	522	2.4	509	2.0	507	3.4	11*	15*	2
	French	540	3.9	543	2.2	529	1.8	516	1.8	23*	27*	13*
NB	English	479	0.0	489	2.3	470	2.0	466	2.5	13*	23*	4
	French	525	0.0	521	2.3	507	2.9	507	2.7	18*	14*	0
NS	English	498	0.4	497	1.6	488	2.1	473	2.2	25*	24*	15*
	French	501	6.2	507	4.8	499	1.9	503	1.6	-2	4	-4
PE	English	497	0.0	503	4.0	492	2.2	460	5.2	37*	43*	32*
NL	English	480	1.2	490	2.5	487	2.4	472	2.7	8*	18*	15*
CAN	**English**	**503**	**1.9**	**502**	**1.2**	**501**	**1.0**	**495**	**1.2**	**8***	**7***	**6***
	French	**536**	**2.5**	**540**	**1.5**	**526**	**1.5**	**515**	**1.9**	**21***	**25***	**11***

* Significant difference compared to the baseline year 2010

Table B.1.13 Comparisons of mathematics achievement scores by gender: 2019, 2016, 2013, and 2010

Canada and provinces	Gender	2019		2016		2013		2010		Difference (2019 - 2010)	Difference (2016 - 2010)	Difference (2013 - 2010)
		Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE			
BC	Female	487	2.9	497	2.4	491	2.2	475	2.5	11*	22*	16*
	Male	493	3.2	492	3.2	487	2.2	490	2.8	2	2	-3
AB	Female	504	4.3	507	2.1	504	2.6	491	2.5	13*	16*	13*
	Male	509	4.4	504	2.7	499	2.7	500	2.5	8	4	-1
SK	Female	478	3.1	478	2.1	487	2.4	475	2.7	3	3	12*
	Male	484	3.6	488	2.4	488	3.3	477	2.5	7	11*	11*
MB	Female	470	2.9	478	2.7	470	1.9	468	2.6	3	10*	2
	Male	478	3.6	480	2.3	471	2.1	470	3.0	8	10*	1
ON	Female	510	4.2	508	2.6	511	2.7	509	3.1	1	-1	2
	Male	514	4.4	508	2.6	514	2.9	508	2.9	6	0	6
QC	Female	537	4.0	539	2.8	528	2.5	513	2.4	24*	26*	15*
	Male	537	4.0	543	3.0	526	1.7	523	2.8	15*	20*	3
NB	Female	495	0.0	500	2.1	483	2.2	486	3.0	9*	14*	-3
	Male	490	0.0	496	2.5	477	2.6	473	2.7	17*	23*	4
NS	Female	498	0.6	498	2.3	489	2.0	478	2.4	19*	20*	11*
	Male	498	0.6	496	2.2	487	2.2	473	3.0	25*	23*	14*
PE	Female	498	0.0	502	6.2	498	3.0	453	5.7	45*	49*	45*
	Male	496	0.0	504	6.0	485	3.7	468	6.0	28*	36*	17*
NL	Female	483	1.3	488	2.6	489	2.5	476	3.3	7*	12*	13*
	Male	477	1.6	491	2.8	484	3.4	471	4.1	6	20*	13*
CAN	**Female**	**508**	**2.0**	**511**	**1.4**	**507**	**1.0**	**499**	**1.5**	**9***	**12***	**8***
	Male	**511**	**2.1**	**512**	**1.5**	**507**	**1.5**	**504**	**1.5**	**7***	**8***	**3**

* Significant difference compared to the baseline year 2010

Table B.1.14 Comparisons of mathematics achievement scores by subdomain: 2019 and 2010

Canada and provinces	2019		2010		Difference (2019 - 2010)
	Mean score	SE	Mean score	SE	
Numbers and operations					
British Columbia	493	2.3	488	1.9	4
Alberta	500	3.1	501	2.2	-1
Saskatchewan	484	2.6	488	1.9	-3
Manitoba	481	2.3	476	2.3	5
Ontario	502	3.0	498	2.0	4
Quebec	535	2.7	520	1.9	15*
New Brunswick	496	0.0	487	1.9	10*
Nova Scotia	497	0.4	477	1.9	20*
Prince Edward Island	494	0.0	472	4.2	23*
Newfoundland and Labrador	482	1.0	475	2.9	7*
Canada	**505**	**1.4**	**500**	**1.1**	**5***
Geometry and measurement					
British Columbia	491	2.1	472	1.7	19*
Alberta	504	2.8	485	2.0	20*
Saskatchewan	486	1.9	464	1.9	22*
Manitoba	482	2.0	459	1.7	23*
Ontario	519	2.7	513	2.1	6
Quebec	544	2.4	517	2.0	27*
New Brunswick	499	0.0	472	2.0	27*
Nova Scotia	499	0.4	477	1.9	22*
Prince Edward Island	496	0.0	449	4.1	47*
Newfoundland and Labrador	490	0.8	467	2.3	23*
Canada	**515**	**1.3**	**500**	**1.0**	**15***

Table B.1.14 (con't)
Comparisons of mathematics achievement scores by subdomain: 2019 and 2010

Canada and provinces	2019		2010		Difference (2019 - 2010)
	Mean score	SE	Mean score	SE	
Patterns and relationships					
British Columbia	493	1.9	487	1.9	6*
Alberta	508	2.7	495	2.0	14*
Saskatchewan	492	1.9	473	2.1	19*
Manitoba	489	1.8	478	2.2	11*
Ontario	508	2.6	511	2.2	-4
Quebec	513	2.0	504	2.0	9*
New Brunswick	495	0.0	476	2.2	19*
Nova Scotia	501	0.3	475	2.0	26*
Prince Edward Island	499	0.0	463	4.4	36*
Newfoundland and Labrador	491	0.8	479	2.6	13*
Canada	**505**	**1.2**	**500**	**1.1**	**5***
Data management and probability					
British Columbia	499	1.2	489	2.3	10*
Alberta	504	2.0	496	2.8	8*
Saskatchewan	495	1.6	477	2.5	17*
Manitoba	489	1.5	473	2.9	16*
Ontario	504	1.6	505	3.1	0
Quebec	540	2.0	510	2.7	29*
New Brunswick	507	0.0	489	2.8	18*
Nova Scotia	501	0.3	488	2.6	13*
Prince Edward Island	505	0.0	469	5.1	36*
Newfoundland and Labrador	489	0.8	490	3.4	0
Canada	**509**	**0.9**	**500**	**1.6**	**9***

* Significant difference compared to the baseline year 2010

Table B.1.15 Comparisons of mathematics achievement scores by subdomain and language of the school system: 2019 and 2010

Anglophone school system					
Canada and provinces	2019		2010		Difference (2019 - 2010)
	Mean score	SE	Mean score	SE	
Numbers and operations					
British Columbia	492	2.3	488	1.9	4
Alberta	500	3.2	501	2.4	-1
Saskatchewan	484	2.6	488	2.0	-4
Manitoba	480	2.3	476	2.1	5
Ontario	501	3.2	498	2.2	3
Quebec	509	3.3	511	3.1	-2
New Brunswick	485	0.0	479	2.7	6*
Nova Scotia	496	0.3	476	2.2	21*
Prince Edward Island	494	0.0	471	5.6	22*
Newfoundland and Labrador	482	1.0	475	2.8	7*
Canada	**497**	**1.7**	**494**	**1.2**	**3**
Geometry and measurement					
British Columbia	491	2.1	472	1.7	18*
Alberta	504	2.8	485	1.8	20*
Saskatchewan	486	2.0	464	1.7	22*
Manitoba	481	2.0	458	1.9	23*
Ontario	519	2.8	513	2.6	6
Quebec	523	3.1	506	3.3	18*
New Brunswick	483	0.0	457	2.2	26*
Nova Scotia	499	0.3	476	2.3	23*
Prince Edward Island	495	0.0	449	5.0	46*
Newfoundland and Labrador	490	0.8	467	2.5	23*
Canada	**507**	**1.5**	**494**	**1.3**	**13***

Table B.1.15 (con't)
Comparisons of mathematics achievement scores by subdomain and language of the school system: 2019 and 2010

Anglophone school system					
Patterns and relationships	**2019**		**2010**		**Difference (2019 - 2010)**
	Mean score	**SE**	**Mean score**	**SE**	
British Columbia	493	1.9	487	2.0	6*
Alberta	508	2.7	495	2.1	14*
Saskatchewan	492	1.9	473	2.0	19*
Manitoba	489	1.9	478	2.0	11*
Ontario	508	2.8	511	2.4	-4
Quebec	511	2.8	500	3.3	11*
New Brunswick	492	0.0	465	2.4	27*
Nova Scotia	501	0.3	475	2.1	26*
Prince Edward Island	499	0.0	463	5.4	36*
Newfoundland and Labrador	491	0.8	479	2.4	13*
Canada	**503**	**1.4**	**499**	**1.3**	**5***
Data management and probability					
British Columbia	499	1.2	489	2.8	9*
Alberta	503	2.0	496	3.5	8
Saskatchewan	494	1.6	477	3.0	17*
Manitoba	488	1.5	473	2.9	16*
Ontario	503	1.7	505	2.9	-2
Quebec	509	2.8	501	4.7	8
New Brunswick	493	0.0	479	4.2	14*
Nova Scotia	499	0.2	487	3.0	13*
Prince Edward Island	504	0.0	470	6.9	35*
Newfoundland and Labrador	489	0.8	490	4.2	0
Canada	**501**	**0.9**	**496**	**1.9**	**4***

Table B.1.15 (con't)
Comparisons of mathematics achievement scores by subdomain and language of the school system: 2019 and 2010

Francophone school system					
Canada and provinces	**2019**		**2010**		**Difference (2019 - 2010)**
	Mean score	**SE**	**Mean score**	**SE**	
Numbers and operations					
British Columbia	532	0.0	513	2.6	19*
Alberta	518	3.0	509	3.1	10*
Saskatchewan	519	0.0	522	3.9	-4
Manitoba	504	0.0	492	1.8	12*
Ontario	512	2.1	502	2.0	10*
Quebec	538	3.0	521	1.8	17*
New Brunswick	525	0.0	507	2.7	18*
Nova Scotia	509	4.5	499	1.7	10*
Prince Edward Island	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--
Canada	**534**	**2.6**	**519**	**1.8**	**15***
Geometry and measurement					
British Columbia	531	0.0	497	2.4	34*
Alberta	519	3.7	486	2.7	33*
Saskatchewan	508	0.0	481	3.6	27*
Manitoba	487	0.0	468	1.8	20*
Ontario	533	2.6	519	1.8	14*
Quebec	547	2.6	518	1.8	28*
New Brunswick	538	0.0	508	2.6	30*
Nova Scotia	506	4.5	514	1.6	-9
Prince Edward Island	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--
Canada	**544**	**2.3**	**518**	**1.8**	**27***

Table B.1.15 (con't)
Comparisons of mathematics achievement scores by subdomain and language of the school system: 2019 and 2010

Francophone school system					
Patterns and relationships	**2019**		**2010**		**Difference (2019 - 2010)**
	Mean score	**SE**	**Mean score**	**SE**	
British Columbia	504	0.0	498	2.7	6*
Alberta	511	3.1	505	3.0	5
Saskatchewan	505	0.0	481	3.7	24*
Manitoba	486	0.0	482	2.1	4
Ontario	508	2.2	513	1.9	-5
Quebec	513	2.3	504	1.7	9*
New Brunswick	503	0.0	503	2.7	0
Nova Scotia	504	3.9	494	1.7	10*
Prince Edward Island	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--
Canada	**512**	**1.9**	**504**	**1.9**	**8***
Data management and probability					
British Columbia	529	0.0	498	7.5	31*
Alberta	532	2.8	509	6.9	23*
Saskatchewan	534	0.0	487	11.6	47*
Manitoba	520	0.0	479	5.9	41*
Ontario	530	1.8	505	3.0	25*
Quebec	543	2.2	511	2.8	32*
New Brunswick	541	0.0	513	4.3	28*
Nova Scotia	528	3.0	514	6.5	14*
Prince Edward Island	--	--	--	--	--
Newfoundland and Labrador	--	--	--	--	--
Canada	**541**	**1.9**	**511**	**2.8**	**31***

* Significant difference compared to the baseline year 2010

Table B.1.16 Comparisons of mathematics achievement scores by subdomain and gender: 2019 and 2010

Females					
Canada and provinces	2019		2010		Difference (2019 - 2010)
	Mean score	SE	Mean score	SE	
Numbers and operations					
British Columbia	490	2.4	481	2.6	9*
Alberta	500	3.4	493	2.7	7
Saskatchewan	482	2.7	484	2.9	-2
Manitoba	479	2.3	472	2.6	7
Ontario	498	3.4	496	3.1	2
Quebec	536	3.2	514	2.3	22*
New Brunswick	497	0.0	489	3.2	8*
Nova Scotia	495	0.5	477	2.4	18*
Prince Edward Island	494	0.0	461	5.9	33*
Newfoundland and Labrador	484	1.1	473	3.1	11*
Canada	**504**	**1.7**	**496**	**1.4**	**8***
Geometry and measurement					
British Columbia	488	2.3	466	2.3	22*
Alberta	503	2.9	483	2.3	20*
Saskatchewan	483	2.1	464	2.6	19*
Manitoba	478	2.0	461	2.1	17*
Ontario	520	3.0	516	2.7	4
Quebec	543	2.7	514	2.6	29*
New Brunswick	501	0.0	477	2.7	24*
Nova Scotia	498	0.4	480	2.4	18*
Prince Edward Island	498	0.0	441	5.3	57*
Newfoundland and Labrador	494	0.9	468	3.4	26*
Canada	**514**	**1.5**	**499**	**1.7**	**15***

Table B.1.16 (con't)
Comparisons of mathematics achievement scores by subdomain and gender: 2019 and 2010

Females					
Patterns and relationships	**2019**		**2010**		**Difference (2019 - 2010)**
	Mean score	**SE**	**Mean score**	**SE**	
British Columbia	490	2.2	485	2.6	5
Alberta	505	3.0	493	2.9	12*
Saskatchewan	490	2.2	476	2.9	14*
Manitoba	486	2.2	481	3.0	5
Ontario	507	2.9	516	3.1	-9*
Quebec	513	2.4	505	2.4	8*
New Brunswick	497	0.0	487	3.1	10*
Nova Scotia	502	0.4	481	2.3	21*
Prince Edward Island	498	0.0	463	7.2	35*
Newfoundland and Labrador	491	0.8	484	3.7	7
Canada	**504**	**1.3**	**502**	**1.4**	**2**
Data management and probability					
British Columbia	499	1.5	485	4.0	14*
Alberta	502	2.4	498	3.8	4
Saskatchewan	492	1.8	480	4.2	12*
Manitoba	486	1.5	476	4.0	10*
Ontario	502	2.0	509	3.7	-7
Quebec	540	2.2	512	3.3	28*
New Brunswick	508	0.0	496	4.9	12*
Nova Scotia	500	0.3	498	4.3	2
Prince Edward Island	502	0.0	464	10.6	38*
Newfoundland and Labrador	490	0.8	499	5.8	-9
Canada	**508**	**1.0**	**502**	**2.4**	**6***

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Table B.1.16 (con't)
Comparisons of mathematics achievement scores by subdomain and gender: 2019 and 2010

Males					
Canada and provinces	2019		2010		Difference (2019 - 2010)
	Mean score	SE	Mean score	SE	
Numbers and operations					
British Columbia	495	2.7	498	2.8	-3
Alberta	501	3.6	509	2.7	-8
Saskatchewan	487	3.2	495	2.7	-8*
Manitoba	483	2.9	482	3.1	1
Ontario	505	3.5	502	2.8	3
Quebec	534	3.1	529	2.9	5
New Brunswick	496	0.0	486	2.6	10*
Nova Scotia	499	0.4	479	3.1	20*
Prince Edward Island	495	0.0	481	6.4	14*
Newfoundland and Labrador	481	1.3	478	4.3	3
Canada	**507**	**1.6**	**507**	**1.3**	**0**
Geometry and measurement					
British Columbia	494	2.4	482	2.4	12*
Alberta	505	3.3	487	2.5	18*
Saskatchewan	489	2.4	466	2.4	23*
Manitoba	485	2.6	459	2.8	26*
Ontario	519	3.1	513	2.9	6
Quebec	546	2.8	524	2.6	22*
New Brunswick	497	0.0	470	2.8	27*
Nova Scotia	500	0.5	476	2.8	24*
Prince Edward Island	494	0.0	456	6.4	38*
Newfoundland and Labrador	487	1.0	468	3.8	19*
Canada	**516**	**1.5**	**503**	**1.6**	**13***

Table B.1.16 (con't)
Comparisons of mathematics achievement scores by subdomain and gender: 2019 and 2010

Males					
Patterns and relationships	**2019**		**2010**		**Difference (2019 - 2010)**
	Mean score	**SE**	**Mean score**	**SE**	
British Columbia	496	2.1	491	2.9	5
Alberta	512	2.9	497	2.6	15*
Saskatchewan	493	2.4	473	2.9	20*
Manitoba	491	2.2	477	3.0	14*
Ontario	508	3.2	510	3.1	-2
Quebec	513	2.5	507	2.5	6
New Brunswick	494	0.0	468	2.7	26*
Nova Scotia	500	0.4	472	2.9	28*
Prince Edward Island	500	0.0	466	5.7	34*
Newfoundland and Labrador	491	1.2	475	3.8	16*
Canada	**506**	**1.5**	**501**	**1.5**	**5***
Data management and probability					
British Columbia	499	1.6	496	4.2	3
Alberta	505	2.2	495	3.7	10*
Saskatchewan	497	2.1	476	3.9	21*
Manitoba	492	2.0	472	4.2	20*
Ontario	506	2.0	502	4.1	4
Quebec	539	2.5	513	4.2	26*
New Brunswick	505	0.0	483	3.9	22*
Nova Scotia	501	0.4	480	4.1	21*
Prince Edward Island	509	0.0	474	7.4	35*
Newfoundland and Labrador	489	1.0	484	6.2	5
Canada	**510**	**1.0**	**500**	**2.1**	**10***

* Significant difference compared to the baseline year 2010

Table B.2.1 Achievement scores in reading

Canada and provinces	Mean score	SE	Difference
British Columbia	499	2.28	-6
Alberta	506	3.35	1
Saskatchewan	495	2.61	-11*
Manitoba	481	2.65	-24*
Ontario	517	2.99	11*
Quebec	494	2.85	-11*
New Brunswick	486	0.00	-19*
Nova Scotia	500	0.43	-5*
Prince Edward Island	505	0.00	-1
Newfoundland and Labrador	500	1.18	-6*
Canada	**505**	**1.40**	

* Significant difference compared to Canada

Table B.2.2 Achievement scores in reading by language of the school system

Canada and provinces	Anglophone school system		Francophone school system		Difference (A - F)
	Mean score	SE	Mean score	SE	
British Columbia	500*	2.3	477*	0.0	23**
Alberta	506	3.4	475*	3.5	31**
Saskatchewan	495*	2.6	473*	0.0	22**
Manitoba	482*	2.7	457*	0.0	24**
Ontario	519*	3.2	468*	3.0	51**
Quebec	493*	4.0	494*	3.1	-1
New Brunswick	494*	0.0	466*	0.0	28**Δ
Nova Scotia	503*	0.4	449*	3.3	53**
Prince Edward Island	507	0.0	--	--	--
Newfoundland and Labrador	500*	1.2	--	--	--
Canada	**509**	**1.6**	**490**	**2.7**	**19****

* Significant difference compared to Canada

** Significant difference within Canada or within province

Δ Despite the lack of sampling variance at the school level, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student is selected within each school.

Table B.2.3 Achievement scores in reading by gender

Canada and provinces	Females		Males		Difference (F - M)
	Mean score	SE	Mean score	SE	
British Columbia	515	2.5	484	2.9	31**
Alberta	521	4.0	493	3.6	28**
Saskatchewan	509*	3.3	482*	2.7	27**
Manitoba	494*	3.0	469*	2.9	25**
Ontario	533*	3.5	501*	3.3	32**
Quebec	509*	3.1	478*	3.3	31**
New Brunswick	501*	0.0	471*	0.0	31**Δ
Nova Scotia	514*	0.4	485*	0.5	29**
Prince Edward Island	516	0.0	490	0.0	26**Δ
Newfoundland and Labrador	519	1.1	482*	1.3	37**
Canada	**521**	**1.7**	**490**	**1.6**	**31****

* Significant difference compared to Canada

** Significant difference within Canada or within province

Δ Despite the lack of sampling variance at the school level, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student is selected within each school.

Table B.2.4 Comparison of reading achievement scores: 2019, 2016, 2013, and 2010

Canada and provinces	2019		2016		2013		2010		Difference (2019 - 2010)	Difference (2016 - 2010)	Difference (2013 - 2010)
	Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE			
BC	499	2.3	509	2.5	502	1.7	499	1.9	0	10*	3
AB	506	3.3	510	1.7	502	1.9	506	2.0	0	4	-4
SK	495	2.6	491	1.5	487	1.6	491	2.0	3	0	-4
MB	481	2.7	487	2.2	469	1.5	478	2.0	3	9*	-9*
ON	517	3.0	512	2.2	524	1.8	515	2.0	2	-3	9*
QC	494	2.9	503	2.1	503	1.3	481	1.8	13*	22*	22*
NB	486	0.0	489	1.8	471	1.5	479	2.0	7*	10*	-8*
NS	500	0.4	498	1.9	488	1.6	489	2.0	11*	9*	-1
PE	505	0.0	513	3.7	494	2.3	481	4.6	24*	32*	13*
NL	500	1.2	491	2.6	495	2.0	486	2.7	14*	5	9*
CAN	**505**	**1.4**	**507**	**1.1**	**508**	**1.0**	**500**	**1.1**	**5***	**7***	**8***

* Significant difference compared to the baseline year 2010

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Table B.2.5 Comparison of reading achievement scores by language of the school system: 2019, 2016, 2013, and 2010

Canada and provinces	Language	2019		2016		2013		2010		Difference (2019 - 2010)	Difference (2016 - 2010)	Difference (2013 - 2010)
		Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE			
BC	English	500	2.3	509	2.2	502	1.7	499	2.0	0	10*	3
	French	477	0.0	478	1.4	499	4.2	473	2.6	4	5	26*
AB	English	506	3.4	511	2.3	503	2.1	506	2.1	0	5	-3
	French	475	3.5	481	4.4	473	2.0	490	2.7	-15*	-9	-17*
SK	English	495	2.6	491	1.6	487	1.3	492	2.0	3	-1	-5
	French	473	0.0	476	0.0	478	1.2	468	4.1	4	8	10*
MB	English	482	2.7	488	1.8	469	1.4	478	2.0	3	10*	-9*
	French	457	0.0	450	2.5	471	1.6	468	2.0	-11*	-18*	3
ON	English	519	3.2	513	2.2	526	1.8	517	2.5	3	-4	9*
	French	468	3.0	485	2.2	481	1.6	481	1.9	-13*	4	0
QC	English	493	4.0	511	3.0	497	2.0	492	3.0	1	19*	5
	French	494	3.1	503	2.6	504	1.7	480	1.8	14*	23*	24*
NB	English	494	0.0	498	2.5	466	1.9	486	2.7	9*	12*	-20*
	French	466	0.0	467	2.5	485	2.4	464	2.3	2	3	21*
NS	English	503	0.4	500	1.7	489	2.0	489	1.8	13*	11*	0
	French	449	3.3	439	5.2	468	2.0	475	1.5	-25*	-36*	-7*
PE	English	507	0.0	514	4.4	496	2.8	482	5.3	25*	32*	14*
NL	English	500	1.2	491	3.1	495	2.3	486	2.6	14*	5	9*
CAN	**English**	**509**	**1.6**	**509**	**2.5**	**510**	**1.1**	**507**	**1.1**	**3**	**2**	**3***
	French	**490**	**2.7**	**500**	**2.2**	**501**	**1.1**	**480**	**1.8**	**11***	**20***	**21***

* Significant difference compared to the baseline year 2010

Table B.2.6 Comparison of reading achievement scores by gender: 2019, 2016, 2013, and 2010

Canada and provinces	Gender	2019		2016		2013		2010		Difference (2019 - 2010)	Difference (2016 - 2010)	Difference (2013 - 2010)
		Mean score	SE	Mean score	SE	Mean score	SE	Mean score	SE			
BC	Female	515	2.5	523	3.2	518	2.1	511	2.9	4	12*	7*
	Male	484	2.9	495	3.2	486	2.4	491	2.8	-7	4	-5
AB	Female	521	4.0	528	2.8	518	2.6	516	2.8	5	12*	2
	Male	493	3.6	496	3.2	485	2.6	497	2.3	-5	-1	-12*
SK	Female	509	3.3	500	2.3	498	2.0	504	3.0	5	-4	-6
	Male	482	2.7	482	2.2	476	2.7	482	2.6	0	0	-6
MB	Female	494	3.0	499	3.0	480	2.2	494	2.8	0	5	-14*
	Male	469	2.9	477	2.6	459	2.1	466	3.0	4	11*	-7
ON	Female	533	3.5	526	2.3	538	2.5	530	3.1	3	-4	8
	Male	501	3.3	499	2.7	510	2.8	503	2.9	-2	-4	7
QC	Female	509	3.1	516	3.7	514	2.3	498	2.3	11*	18*	16*
	Male	478	3.3	492	2.4	493	2.2	471	2.7	7	21*	22*
NB	Female	501	0.0	506	2.4	485	2.0	501	2.5	1	5	-16*
	Male	471	0.0	472	2.4	459	2.6	462	3.0	9*	10*	-3
NS	Female	514	0.4	514	2.9	499	2.7	501	2.5	13*	13*	-2
	Male	485	0.5	482	2.3	477	2.6	480	2.9	5	2	-3
PE	Female	516	0.0	526	4.8	509	3.0	491	6.9	26*	35*	18*
	Male	490	0.0	498	6.4	479	3.7	474	7.0	16*	24*	5
NL	Female	519	1.1	500	2.9	503	2.4	506	3.8	13*	-6	-3
	Male	482	1.3	482	3.2	486	4.0	468	3.7	13*	14*	18*
CAN	**Female**	**521**	**1.7**	**521**	**1.8**	**521**	**1.1**	**515**	**1.3**	**6***	**6***	**6***
	Male	**490**	**1.6**	**494**	**1.2**	**494**	**1.2**	**489**	**1.7**	**1**	**5***	**5***

* Significant difference compared to the baseline year 2010

Table B.3.1 Achievement scores in science

Canada and provinces	Mean score	SE	Difference
British Columbia	503	2.3	-1
Alberta	521	3.2	16*
Saskatchewan	500	2.5	-5
Manitoba	493	2.3	-12*
Ontario	509	2.3	5*
Quebec	488	2.2	-16*
New Brunswick	497	0.0	-7*
Nova Scotia	505	0.3	1
Prince Edward Island	510	0.0	5*
Newfoundland and Labrador	499	1.0	-6*
Canada	**505**	**1.1**	

* Significant difference compared to Canada

Table B.3.2 Achievement scores in science by language of the school system

Canada and provinces	Anglophone school system		Francophone school system		Difference (A - F)
	Mean score	SE	Mean score	SE	
British Columbia	503	2.3	491	0.0	12**Δ
Alberta	521*	3.3	485	3.7	36**
Saskatchewan	500*	2.5	482	0.0	18**Δ
Manitoba	493*	2.4	464*	0.0	29**Δ
Ontario	511	2.4	476*	1.9	35**
Quebec	487*	4.1	488*	2.4	-1
New Brunswick	505*	0.0	478*	0.0	27**Δ
Nova Scotia	507	0.3	466*	3.4	41**
Prince Edward Island	512	0.0	--	--	--
Newfoundland and Labrador	499*	1.0	--	--	--
Canada	**509**	**1.3**	**486**	**2.1**	**23****

* Significant difference compared to Canada

** Significant difference within Canada or within province

Δ Despite the lack of sampling variance at the school level, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student is selected within each school.

Table B.3.3 Achievement scores in science by gender

Canada and provinces	Females		Males		Difference (F - M)
	Mean score	SE	Mean score	SE	
British Columbia	504	2.5	503	3.0	1
Alberta	522*	3.8	520*	3.4	2
Saskatchewan	504	3.0	496	2.8	7**
Manitoba	494*	2.7	491*	2.8	3
Ontario	511*	2.4	508	3.0	3
Quebec	492*	2.2	484*	2.8	8**
New Brunswick	501*	0.0	494*	0.0	7**Δ
Nova Scotia	509	0.4	501	0.4	8**
Prince Edward Island	509	0.0	510*	0.0	-2**Δ
Newfoundland and Labrador	509	0.9	490*	1.5	19**
Canada	**507**	**1.2**	**503**	**1.5**	**4****

* Significant difference compared to Canada

** Significant difference within Canada or within province

Δ Despite the lack of sampling variance at the school level, caution is nonetheless advised when interpreting statistically significant differences of student-level results when such differences are small, as not every student is selected within each school.

Table B.3.4 Comparison of science achievement scores: 2019, 2016, and 2013

Canada and provinces	2019		2016		2013		Difference (2019 - 2013)	Difference (2016 - 2013)
	Mean score	SE	Mean score	SE	Mean score	SE		
British Columbia	503	2.3	505	2.1	501	2.1	2	4
Alberta	521	3.2	518	1.7	521	2.5	0	-3
Saskatchewan	500	2.5	491	2.0	486	2.2	14*	5
Manitoba	493	2.3	491	1.6	465	1.6	28*	26*
Ontario	509	2.3	510	2.0	511	2.3	-2	-1
Quebec	488	2.2	507	2.3	485	1.8	3	22*
New Brunswick	497	0.0	500	1.5	469	1.9	28*	31*
Nova Scotia	505	0.3	499	1.3	492	1.8	13*	7*
Prince Edward Island	510	0.0	516	3.8	491	2.6	19*	25*
Newfoundland and Labrador	499	1.0	501	2.6	500	2.2	-1	1
Canada	**505**	**1.1**	**508**	**1.0**	**500**	**1.0**	**4***	**8***

* Significant difference compared to the baseline year 2013

Table B.3.5 Comparison of science achievement scores by language of the school system: 2019, 2016, and 2013

Canada and provinces	Language	2019		2016		2013		Difference (2019 - 2013)	Difference (2016 - 2013)
		Mean score	SE	Mean score	SE	Mean score	SE		
British Columbia	English	503	2.3	505	1.9	501	2.2	2	4
	French	491	0.0	502	1.5	495	4.0	-4	7
Alberta	English	521	3.3	518	2.0	521	2.1	0	-3
	French	485	3.7	496	3.7	488	2.5	-3	8
Saskatchewan	English	500	2.5	491	1.6	486	2.3	14*	5
	French	482	0.0	498	0.0	474	0.8	8*	24*
Manitoba	English	493	2.4	492	1.7	465	1.8	28*	27*
	French	464	0.0	468	2.7	453	1.8	11*	15*
Ontario	English	511	2.4	510	1.6	513	2.6	-2	-3
	French	476	1.9	499	2.3	464	2.1	12*	35*
Quebec	English	487	4.1	499	2.8	484	2.6	3	15*
	French	488	2.4	507	2.2	485	1.9	3	22*
New Brunswick	English	505	0.0	501	2.8	467	1.9	38*	34*
	French	478	0.0	498	2.3	475	2.6	3	23*
Nova Scotia	English	507	0.3	500	1.4	493	2.1	14*	7*
	French	466	3.4	473	5.6	466	1.9	0	7
Prince Edward Island	English	512	0.0	517	4.1	492	2.6	20*	25*
Newfoundland and Labrador	English	499	1.0	501	2.7	500	2.4	-1	1
Canada	**English**	**509**	**1.3**	**508**	**1.0**	**505**	**1.2**	**4***	**3**
	French	**486**	**2.1**	**506**	**2.3**	**483**	**1.3**	**3**	**23***

* Significant difference compared to the baseline year 2013

Table B.3.6 Comparison of science achievement scores by gender: 2019, 2016, and 2013

Canada and provinces	Gender	2019		2016		2013		Difference (2019 - 2013)	Difference (2016 - 2013)
		Mean score	SE	Mean score	SE	Mean score	SE		
British Columbia	Female	504	2.5	507	2.5	503	2.8	1	4
	Male	503	3.0	503	2.8	498	2.5	5	5
Alberta	Female	522	3.8	526	2.6	525	3.2	-3	1
	Male	520	3.4	512	2.9	516	3.2	4	-4
Saskatchewan	Female	504	3.0	492	2.2	481	2.5	23*	11*
	Male	496	2.8	491	2.0	490	3.1	6	1
Manitoba	Female	494	2.7	497	2.6	463	2.3	31*	34*
	Male	491	2.8	487	2.2	467	2.4	24*	20*
Ontario	Female	511	2.4	511	2.3	511	2.9	0	0
	Male	508	3.0	508	2.2	511	2.9	-3	-3
Quebec	Female	492	2.2	509	2.6	485	2.5	7*	24*
	Male	484	2.8	504	2.8	485	2.3	-1	19*
New Brunswick	Female	501	0.0	509	2.2	472	2.8	29*	37*
	Male	494	0.0	491	2.1	467	2.7	27*	24*
Nova Scotia	Female	509	0.4	505	2.4	491	2.9	18*	14*
	Male	501	0.4	495	2.5	492	2.7	9*	3
Prince Edward Island	Female	509	0.0	518	4.5	488	3.7	21*	30*
	Male	510	0.0	515	5.9	495	2.8	15*	20*
Newfoundland and Labrador	Female	509	0.9	503	2.8	500	3.4	9*	3
	Male	490	1.5	498	3.3	500	3.9	-10*	-2
Canada	**Female**	**507**	**1.2**	**511**	**1.6**	**501**	**1.3**	**6***	**10***
	Male	**503**	**1.5**	**505**	**1.3**	**499**	**1.2**	**4**	**6***

* Significant difference compared to the baseline year 2013