BRITISH COLUMBIA | Ministry of Education

Introduction to Mathematics

Mathematics is integral to every aspect of daily life. Skills can be used to solve problems related to time, sports, travel, money management, science, and art, to name a few. Mathematics is part of the story of human history and is particularly relevant to the British Columbian story. First Peoples in British Columbia, like Indigenous people around the world, used and continue to use mathematical knowledge, skills, and attitudes to make sense of the world around them.

Mathematical values and habits of mind go beyond numbers and symbols: they help us connect, create, communicate, visualize, reason, and solve. Using mathematical thinking allows us to analyze novel and complex problems from a variety of perspectives, consider possible solutions, and evaluate the effectiveness of solutions. When developed early in life, these habits of mind engender generate confidence in our ability to solve everyday problems without doubt or fear of math.

Observing, learning, and engaging in mathematical thinking empower us to make sense of our world. Being a student of mathematics can foster a sense of wonder about the world, resulting in a self-motivated and confident learner with a unique mathematical perspective.

Features of the Mathematics curriculum

There is an eager expectation that the redesigned Mathematics curriculum will bridge the gap between students' mathematics knowledge and their ability to apply it in a broad range of situations that they will encounter in everyday life. This connection will be facilitated through fewer learning standards, a renewed focus on flexible teaching and learning, and an emphasis on building a strong foundation of mathematical understanding and skills.

Fewer learning standards

The redesigned curriculum has fewer learning standards, allowing teachers and students to spend more time on foundational skills and applying them to real-life situations. The curriculum is intentionally focused on "hands-on" experiential learning, using foundational skills to provide students with the opportunity to encounter math in a wide variety of experiences in everyday life. The goal of developing well-educated citizens is central to this feature of the curriculum.

Flexible teaching and learning

A renewed focus on flexible teaching and learning promotes confidence in teachers to choose the strategies, resources, and application best suited to the needs of students in the local setting (e.g., connecting mathematics to the local community and building a house for Habitat for Humanity). Mathematics should be viewed as an interdisciplinary set of skills.

A strong foundation of mathematical understanding and skills

As part of building a strong foundation of mathematical understanding and skills for every student, explicit financial components have been added to the redesigned curriculum, starting in

Kindergarten. In addition, the forthcoming Grades 10-12 curriculum proposal will ensure that, regardless of the pathway chosen by a student, there will be a common experience in Mathematics that includes financial literacy, mathematical reasoning, and probability/statistics.

Design of the Mathematics curriculum

The redesigned Mathematics curriculum has the same format as all other areas of learning. Four curriculum elements — the Big Ideas, Curricular Competencies, Content, and Elaborations — link the knowing, doing, and understanding of Mathematics learning. Connecting Mathematics knowledge with a hands-on approach to doing Mathematics will lead to a deep understanding of Mathematics concepts. More information about this model is available at www.curriculum.gov.bc.ca.

Big Ideas

The Big Ideas of the Mathematics curriculum reveal the progression of related skills and concepts. For each area of Mathematics — number, patterns and relations, spatial sense, and statistics and probability — important concepts are introduced in Kindergarten and evolve in both sophistication and degree of connection to the lives of students throughout the curriculum. The Big Ideas represent what students are expected to *understand* as a result of their learning. The examples below show how the Big Ideas progress as students advance through the curriculum.

	K	3	6	8	10
Big Ideas	Number represents and describes quantity: Numbers can be decomposed into smaller parts	Number represents and describes quantity: Parts and wholes can be represented by fractions	Number can be represented in many forms and reflect different relationships	Number can be represented in many forms and reflect different relationships	Number represents and describes quantity: Real numbers are either rational or irrational

Curricular Competencies

The Core Competencies — thinking, communication, and personal and social — are embedded in the Curricular Competencies. The Curricular Competencies introduced in Kindergarten have been expanded based on a developmental continuum throughout the grades focused on what students can do with Mathematics.

Content

The Content is concept-based and reflects what students should *know*. It identifies the concepts or topics that students will learn about at each grade level. The Content acts as both a supporting structure intended to assist students in demonstrating the Curricular Competencies and a foundational element leading students to the Big Ideas.

Elaborations

There are Elaborations (included as hyperlinks) for many of the Curricular Competencies and Content in the Mathematics curriculum. The Elaborations take the form of explanations, definitions, and clarifications. They provide additional information and support for both teachers and students and can serve as potential places to begin teaching and learning. Examples of Elaborations for a progression of Content learning statements are shown below.

	K	3	5
Content	number concepts to 10	number concepts to 1000	number concepts to 1 000 000
Elaborations	• Counting: – one-to-one correspondence – conservation – cardinality – stable order counting – sequencing 1 – 10 – linking sets to numerals – subitizing • Ways to make 5 • Perceptual subitizing (I see 5.) • Conceptual subitizing (I see 4 and 1.) • Compare quantities 1 – 10 • Use concrete materials to show ways to make 5	• Counting: – skip counting by any number from any starting point, increasing and decreasing (i.e., forwards and backwards) – skip counting is related to multiplication – counting patterns are related to place value (i.e., bridging over a century, 698, 699, 700, 701) • Numbers to 1000 can be arranged and recognized – compare and order numbers – estimate large quantities • Place value – 100s, 10s and 1s – understand the relationship of digit places and their values to 1000 (i.e., the digit 4 in 342 has the value of 40 or 4 tens) – the importance of 0 as a place holder (i.e., in the number 408 the zero indicates there are 0 tens)	• Counting: – multiples – flexible counting strategies – whole number benchmarks • Numbers to 1 000 000 can be arranged and recognized – compare and order numbers – estimate large quantities • Place value – 100 000s, 10 000s, 1000s, 100s, 10s and 1s – understand the relationship of digit places and their value to 1 000 000

Important Considerations

Inquiry in Mathematics

The redesigned Mathematics curriculum continues to support the application of foundational math skills to problem solving. It is important for students to be able to approach problem solving with confidence. A problem-solving model provides students with the necessary skills to read a problem, choose from a variety of appropriate strategies, apply a strategy to solve the problem, and then reflect on the efficiency and accuracy of the strategy to explain the answer.

Aboriginal perspectives

The Ministry of Education is dedicated to ensuring that the cultures and contributions of Aboriginal peoples in British Columbia are reflected in all provincial curricula. The First Peoples Principles of Learning consider important contexts and aspects of teaching and learning, such as the connection to place, the power of story, respect for Elders' knowledge, and the need for a strong identity of self. It is important for teachers to use these principles to guide the incorporation of Aboriginal mathematical content and knowledge in meaningful ways.

Local and traditional Indigenous Knowledge contributes to our understanding of place. Indigenous Knowledge is holistic and is embodied in experiential ways of learning, including the oral tradition. As Aboriginal communities are diverse in terms of language, culture, and available resources, each community will have its own unique protocol for sharing local knowledge and expertise with the school system. For examples of Teaching Mathematics in a First Peoples Context, see First Nations Education Steering Committee **http://www.fnesc.ca/**.

Mathematical habits of mind

Extensive research indicates that for students to develop mathematical habits of mind they must encounter and interact in intentional learning settings. Classroom design combined with active participation strategies will enhance student learning, increase achievement, and factor in the development of the well-educated citizen.

Students who have developed mathematics habits of mind exhibit expertise in:

- persevering and using mathematics to solve problems in everyday life
- recognizing there are multiple ways to solve a problem
- demonstrating respect for diversity in approaches to solving problems
- choosing and using appropriate strategies and tools
- pursuing accuracy in problem solving [1]

[1] Adapted from http://www.ocde.us/CommonCoreCA/Documents/HoMStrategies.pdf