Alberta's Program of Studies (Curriculum) - Mathematics - Number (Strand)

Note: These strands are not intended to be discrete units of instruction. The integration of outcomes across trands makes mathematical experiences meaningful. Students should make the connection between concepts both within and across strands.

PROGRESSION IS HIGHLIGHTED IN THE FOLLOWING DOCUMENT VIA **BOLDED TEXT**.

MATHEMATICAL PROCESSES

There 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.

MATHEMATICAL PROCESS	Communication [C]	Connections [CN]	Mental Mathematics and Estimation [ME]	Problem Solving [PS]	Reasoning [R]	Technology [T]	Visualization [V]
Students are expected to	communicate in order to learn and express their understanding	connect mathematical ideas to other concepts in mathematics, to everyday experiences and to other disciplines	demonstrate fluency with mental mathematics and estimation	develop and apply new mathematical knowledge through problem solving	develop mathematical reasoning	select and use technologies as tools for learning and for solving problems	develop visualization skills to assist in processing information, making connections and solving problems

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Specific Outcome *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*
1. Say the number sequence 1 to 10 by 1s, starting anywhere from 1 to 10 and from 10 to 1. [C, CN, V]	**1.** Say the number sequence **0** to **100** by: • 1s forward **between any two given numbers** • 1s backward from **20** to **0** • **2s forward from 0 to 20** • **5s and 10s forward from 0 to 100.** [C, CN, ME, V]	**1.** Say the number sequence 0 to 100 by: • 2s, 5s and 10s, forward **and** backward, **using starting points that are multiples of 2, 5 and 10 respectively** • 10s, **using starting points from 1 to 9** • 2s, starting from **1**. [C, CN, ME, R]	**1.** Say the number sequence 0 to **1000** forward and backward by: • 5s, 10s or **100s**, using **any** starting point • **3s**, using starting points that are multiples of **3** • **4s**, using starting points that are multiples of **4** • **25s**, using starting points that are multiples of **25**. [C, CN, ME]					**1.** Demonstrate an understanding of **perfect squares and square roots**, concretely, pictorially and symbolically (limited to whole numbers). [C, CN, R, V]	**5.** Determine the square root **of positive rational numbers** that **are** perfect squares. [C, CN, PS, R, T] [ICT: P2–3.4]
2. Subitize (recognize at a glance) and name familiar arrangements of 1 to 5 objects or dots. [C, CN, ME, V]	**2.** Subitize (recognize at a glance) and name familiar arrangements of 1 to **10** objects or dots. [C, CN, ME, V]	**2.** Demonstrate **if a number (up to 100) is even or odd**. [C, CN, PS, R]	**12.** Demonstrate an understanding of **division** (limited to **division related to multiplication facts up to 5 × 5**) by: • representing and explaining **division using equal sharing and equal grouping** • creating and solving problems in context that involve **equal sharing and equal grouping** • modelling **equal sharing and equal grouping** using concrete and visual representations, and recording the process symbolically • relating **division to repeated subtraction** • relating **division to multiplication**. [C, CN, PS, R]	**7.** Demonstrate an understanding of **division (1-digit divisor and up to 2-digit dividend)** to solve problems by: • using personal strategies for **dividing** with and without concrete materials • estimating **quotients** • relating **division to multiplication**. [C, CN, ME, PS, R, V]	**6.** Demonstrate, with and without concrete materials, an understanding of division (**3**-digit by 1-digit), and **interpret remainders** to solve problems. [C, CN, ME, PS, R, V]		**1.** Determine and explain **why** a number **is divisible by 2, 3, 4, 5, 6, 8, 9 or 10**, and why a number cannot be divided by 0. [C, R]		**3.** Demonstrate an understanding of **rational** numbers by: • comparing and ordering **rational** numbers • solving problems that involve arithmetic operations on **rational** numbers. [C, CN, PS, R, T, V] [ICT: P2–3.4]
			11. Demonstrate an understanding of **multiplication to 5 × 5** by: • representing and explaining **multiplication using equal grouping and arrays** • creating and solving problems in context that involve **multiplication** • modelling **multiplication** using concrete and visual representations, and recording the process symbolically • relating **multiplication to repeated addition** • relating **multiplication to division**. [C, CN, PS, R]						
3. Relate a numeral, 1 to 10, to its respective quantity. [CN, R, V]	**3.** **Demonstrate an understanding of counting by**: • **indicating that the last number said identifies "how many"** • **showing that any set has only one count** • **using the counting-on strategy** • **using parts or equal groups to count sets**. [C, CN, ME, R, V]	**3.** Describe **order or relative position, using ordinal numbers (up to tenth)**. [C, CN, R]	**7.** **Describe** and apply mental mathematics strategies for subtracting two 2-digit numerals, such as: • **taking the subtrahend to the nearest multiple of ten and then compensating** • **thinking of addition** • using doubles. [C, CN, ME, PS, R, V]	**6.** Demonstrate an understanding of **multiplication (2- or 3-digit by 1-digit)** to solve problems by: • using personal strategies **for multiplication** with and without concrete materials • using **arrays to represent multiplication** • **connecting concrete representations to symbolic representations** • estimating **products** • applying the **distributive** property. [C, CN, ME, PS, R, V]	**5.** Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by **2**-digit) to solve problems. [C, CN, PS, V]	**3.** Demonstrate an understanding of **factors** and multiples by: • determining **multiples and factors of numbers less than 100** • identifying **prime and composite** numbers • solving problems **using multiples and factors**. [CN, PS, R, V]		**2.** Determine the **approximate square root of numbers that are not perfect squares** (limited to whole numbers). [C, CN, ME, R, T] [ICT: P2–3.4]	**6.** Determine an approximate square root of **positive rational** numbers that are non-perfect squares. [C, CN, PS, R, T] [ICT: P2–3.4]

General Outcome: Develop number sense.

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Specific Outcome *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*	**Specific Outcome** *It is expected that students will:*
4. Represent and describe numbers 2 to 10, concretely and pictorially. [C, CN, ME, R, V]	**4.** Represent and describe numbers to **20**, concretely, pictorially and **symbolically**. [C, CN, V]	**4.** Represent and describe numbers to **100**, concretely, pictorially and symbolically. [C, CN, V]	**2.** Represent and describe numbers to **1000**, concretely, pictorially and symbolically. [C, CN, V]	**1.** Represent and describe whole numbers to **10 000**, pictorially and symbolically. [C, CN, V]	**1.** Represent and describe whole numbers to **1 000 000**. [C, CN, V, T] [ICT: C6–2.2]	**5.** Demonstrate an understanding of **ratio**, concretely, pictorially and symbolically. [C, CN, PS, R, V]		**4.** Demonstrate an understanding of ratio and **rate**. [C, CN, V]	
5. Compare quantities 1 to 10, using one-to-one correspondence. [C, CN, V]	**5.** Compare **sets containing up to 20 elements, using**: • **referents** • one-to-one correspondence **to solve problems**. [C, CN, ME, PS, R, V]	**5.** Compare and **order** numbers up to 100. [C, CN, ME, R, V]	**3.** Compare and order numbers to **1000**. [C, CN, R, V]	**2.** Compare and order numbers to **10000**. [C, CN, V]	**11.** Compare and order **decimals (to thousandths)** by using: • benchmarks • place value • equivalent decimals. [C, CN, R, V]		**7.** Compare and order **positive fractions**, **positive decimals** (to thousandths) and whole numbers by using: • benchmarks • place value • equivalent **fractions** and/or decimals. [CN, R, V]	**5.** Solve problems that involve **rates**, ratios and **proportional reasoning**. [C, CN, PS, R]	
	6. **Estimate quantities to 20 by using referents**. [C, CN, ME, PS, R, V]	**6.** Estimate quantities to **100**, using referents. [C, ME, PS, R]	**4.** Estimate quantities less than **1000**, using referents. [ME, PS, R, V]		**2.** Use estimation **strategies**, including: • **front-end rounding** • **compensation** • **compatible numbers** in problem-solving contexts. [C, CN, ME, PS, R, V]	**6.** Demonstrate an understanding of **percent (limited to whole numbers)**, concretely, pictorially and symbolically. [C, CN, PS, R, V]	**3.** Solve problems **involving percents from 1% to 100%**. [C, CN, PS, R, T] [ICT: P2–3.4]	**3.** Demonstrate an understanding of percents greater than or **equal to 0%**, including **greater than** 100%. [CN, PS, R, V]	
	7. **Demonstrate an understanding of conservation of** number. [C, R, V]	**7.** **Illustrate**, concretely and pictorially, **the meaning of place value for numerals to 100**. [C, CN, R, V]	**5.** Illustrate, concretely and pictorially, the meaning of place value for numerals to **1000**. [C, CN, R, V]			**1.** Demonstrate an understanding of place value, including numbers that are: • **greater than one million** • less than **one thousandth**. [C, CN, R, T]			**1.** Demonstrate an understanding of powers **with integral bases (excluding base 0)** and whole number **exponents** by: • representing repeated multiplication, using **powers** • using patterns to show that **a power with an exponent of zero is equal to one** • solving problems involving **powers**. [C, CN, PS, R]
	8. Identify **the number**, up to **20**, **that is**: • **one more** • **two more** • **one less** • **two less** **than a given number**. [C, CN, ME, R, V]	**8.** Demonstrate and **explain the effect of adding zero to, or subtracting zero from, any number**. [C, R]	**6.** **Describe** and apply mental mathematics strategies for adding two 2-digit numerals, such as: • **adding from left to right** • **taking one addend to the nearest multiple of ten and then compensating** • using doubles. [C, CN, ME, PS, R, V]	**4.** Apply the properties of **0 and 1 for multiplication and the property of 1 for division**. [C, CN, R]	**4.** Apply mental mathematics strategies for multiplication, such as: • **annexing then adding zero** • halving and doubling • using the distributive property. [C, CN, ME, R, V]	**9.** Explain and apply **the order of operations**, **excluding exponents**, with and without technology **(limited to whole numbers)**. [C, CN, ME, PS, T] [ICT: C6–2.4, C6–2.7]			**4.** Explain and apply the order of operations, **including** exponents, with and without technology. [PS, T] [ICT: P2–3.4]
	9. **Demonstrate an understanding of addition of numbers with answers to 20 and their corresponding subtraction facts**, concretely, pictorially and **symbolically**, by: • **using familiar mathematical language to describe additive and subtractive actions** • **creating and solving problems in context that involve addition and subtraction** • **modelling addition and subtraction, using a variety of concrete and visual representations, and recording the process symbolically**. [C, CN, ME, PS, R, V]	**9.** Demonstrate an understanding of addition (**limited to 1- and 2-digit numerals**) with answers to **100** and the corresponding subtraction by: • **using personal strategies for adding and subtracting with and without the support of manipulatives** • creating and solving problems that involve addition and subtraction • using **the commutative property of addition (the order in which numbers are added does not affect the sum)** • using **the associative property of addition (grouping a set of numbers in different ways does not affect the sum)** • explaining **that the order in which numbers are subtracted may affect the difference**. [C, CN, ME, PS, R, V]	**9.** Demonstrate an understanding of addition and subtraction of numbers with answers to **1000** (limited to 1-, 2- and **3**-digit numerals), concretely, pictorially and symbolically, by: • using personal strategies for adding and subtracting with and without the support of manipulatives • creating and solving problems that involve addition and subtraction of numbers. [C, CN, ME, PS, R, V]	**3.** Demonstrate an understanding of addition of numbers with answers to **10 000** and their corresponding subtraction**s** (limited to 3- and **4**-digit numerals) by: • using personal strategies for adding and subtracting • estimating **sums and differences** • solving problems involving addition and subtraction. [C, CN, ME, PS, R]				**2.** Demonstrate an understanding of operations **on powers with integral bases (excluding base 0)** and whole number **exponents**: • $(a^m)(a^n) = a^{m+n}$ • $a^m \div a^n = a^{m-n}, m > n$ • $(a^m)^n = a^{mn}$ • $(ab)^m = a^m b^m$ • $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}, b \neq 0.$ [C, CN, PS, R, T] [ICT: P2–3.4]
			8. Apply **estimation strategies to predict sums and differences of two 2-digit numerals** in a problem-solving context. [C, ME, PS, R]						

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	10. **Describe and use mental mathematics strategies (memorization not intended), such as:** • **counting on and counting back** • **making 10** • **using doubles** • **thinking addition for subtraction for basic addition facts and related subtraction facts to 18**. [C, CN, ME, PS, R, V]	**10.** **Apply** mental mathematics strategies, such as: • using doubles • making 10 • one more, one less • two more, two less • **building on a known** double • thinking addition for subtraction for basic addition facts and related subtraction facts to 18. [C, CN, ME, PS, R, V]	**10.** Apply mental mathematics strategies and **number properties**, such as: • using doubles • making 10 • using the commutative property • using the property of zero • thinking addition for subtraction for basic addition facts and related subtraction facts to 18. [C, CN, ME, PS, R, V]	**5.** Describe and apply mental mathematics strategies, such as: • **skip counting from a known fact** • using doubling or **halving** • using doubling or **halving and adding or subtracting one more group** • using patterns in the **9s** facts • using **repeated** doubling **to determine basic multiplication facts to 9 × 9 and related division facts**. [C, CN, ME, R]	**3.** Apply mental mathematics strategies and number properties, such as: • skip counting from a known fact • using doubling or halving • using patterns in the 9s facts • using repeated doubling **or halving** to determine, with fluency, answers for basic multiplication facts to 81 and related division facts. [C, CN, ME, R, V]				
			13. Demonstrate an understanding of fractions by: • explaining that **a fraction represents a part of a whole** • describing **situations in which fractions are used** • comparing **fractions of the same whole that have like denominators**. [C, CN, ME, R, V]	**8.** Demonstrate an understanding of fractions **less than or equal to one by** using concrete, pictorial and symbolic representations to: • name and record **fractions for the parts of a whole or a set** • compare and **order fractions** • **model and explain that for different wholes, two identical fractions may not represent the same quantity** • provide examples of **where fractions are used**. [C, CN, PS, R, V]	**7.** Demonstrate an understanding of fractions by using concrete, pictorial and symbolic representations to: • create sets of **equivalent** fractions • compare fractions with **like and unlike denominators**. [C, CN, PS, R, V]	**7.** Demonstrate an understanding of **integers**, concretely, pictorially and symbolically. [C, CN, R, V]	**6.** Demonstrate an understanding of addition and subtraction of **integers**, concretely, pictorially and symbolically. [C, CN, PS, R, V]	**7.** Demonstrate an understanding of multiplication and division of **integers**, concretely, pictorially and symbolically. [C, CN, PS, R, V]	
				9. Represent and describe **decimals (tenths and hundredths)**, concretely, pictorially and symbolically. [C, CN, R, V]	**8.** Describe and represent decimals (tenths, **hundredths**, **thousandths**), concretely, pictorially and symbolically. [C, CN, R, V]	**2.** Solve problems involving whole numbers and decimal numbers. [ME, PS, T] [ICT: C6–2.4]			
				10. Relate **decimals to fractions and fractions to decimals (to hundredths)**. [C, CN, R, V]	**9.** Relate decimals to fractions and fractions to decimals (to **thousandths**). [CN, R, V]	**4.** Relate **improper** fractions to **mixed numbers** and **mixed numbers** to **improper fractions**. [CN, ME, R, V]	**4.** Demonstrate an understanding of the relationship between positive **terminating** decimals and positive fractions and between positive **repeating** decimals and positive fractions. [C, CN, R, T] [ICT: P2–3.4]		
				11. Demonstrate an understanding of addition and subtraction **of decimals (limited to hundredths) by**: • using personal strategies to determine sums and differences • estimating sums and differences • using mental mathematics strategies to solve problems. [C, ME, PS, R, V]	**10.** Demonstrate an understanding of addition and subtraction of decimals (limited to **thousandths**). [C, CN, PS, R, V]	**8.** Demonstrate an understanding of multiplication and division of **decimals** (1-digit whole number multipliers and 1-digit natural number divisors). [C, CN, ME, PS, R, V]	**5.** Demonstrate an understanding of adding and subtracting **positive fractions** and **mixed numbers**, **with** like and unlike denominators, concretely, pictorially and symbolically (limited to positive sums and differences). [C, CN, ME, PS, R, V]	**67** Demonstrate an understanding of multiplying and dividing positive fractions and mixed numbers, concretely, pictorially and symbolically. [C, CN, ME, PS]	
							2. Demonstrate an understanding of the addition, subtraction, multiplication and division of decimals to solve problems (for **more than** 1-digit divisors or 2-digit multipliers, the use of technology is expected). [ME, PS, T] [ICT: P2–3.4]		