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

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

General Outcome: Develop number sense.

Kindergarten		Grade 1		Grade 2		Grade 3		Grade 4	
Specific Outcome *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*
1. Say the number sequence 1 to 10 by 1s, starting anywhere from 1 to 10 and from 10 to 1. [C, CN, V]	* Name the number that comes after a given number, one to nine. * Name the number that comes before a given number, two to ten. * Recite number names from a given number to a stated number (forward – one to ten, backward – ten to one), using visual aids.	**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]	* Recite forward by 1s the number sequence between two given numbers (0 to 100). * Recite backward by 1s the number sequence between two given numbers (20 to 0). * Read a given numeral (0 to 100) when it is presented symbolically. * Skip count forward by 2s to 20, starting at 0. * Skip count forward by 5s to 100, starting at 0. * Skip count forward by 10s to 100, starting at 0. * Identify and read numbers in the environment. * Identify and correct errors and omissions in a given number sequence.	**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]	* Extend a given skip counting sequence (by 2s, 5s or 10s) forward and backward. * Skip count by 10s, given any number from 1 to 9 as a starting point. * Identify and correct errors and omissions in a given skip counting sequence. * Count a given sum of money with pennies, nickels or dimes (to 100¢). * Count quantity, using groups of 2, 5 or 10 and counting on.	**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]	* Extend a given skip counting sequence by 5s, 10s or 100s, forward and backward, using a given starting point. * Extend a given skip counting sequence by 3s, forward and backward, starting at a given multiple of 3. * Extend a given skip counting sequence by 4s, forward and backward, starting at a given multiple of 4. * Extend a given skip counting sequence by 25s, forward and backward, starting at a given multiple of 25. * Identify and correct errors and omissions in a given skip counting sequence. * Determine the value of a given set of coins (nickels, dimes, quarters, loonies) by using skip counting. * Identify and explain the skip counting pattern for a given number sequence.		
						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]	* Identify events from experience that can be described as equal sharing. * Identify events from experience that can be described as equal grouping. * Illustrate, with counters or a diagram, a given story problem, presented orally, that involves equal sharing; and solve the problem. * Illustrate, with counters or a diagram, a given story problem, presented orally, that involves equal grouping; and solve the problem. * Listen to a story problem; represent the numbers, using manipulatives or a sketch; and record the problem with a number sentence. * Create and illustrate, with counters, a story problem for a given number sentence; e.g., 6 ÷ 3 = 2. * Represent a given division expression as repeated subtraction. * Represent a given repeated subtraction as a division expression. * Relate division to multiplication by using arrays and writing related number sentences.	**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]	(It is not intended that remainders be expressed as decimals or fractions.) * Solve a given division problem without a remainder, using arrays or base ten materials, and connect this process to the symbolic representation. * Solve a given division problem with a remainder, using arrays or base ten materials, and connect this process to the symbolic representation. * Solve a given division problem, using a personal strategy, and record the process. * Refine personal strategies to increase their efficiency. * Create and solve a division problem involving a 1- or 2-digit dividend, and record the process. * Estimate a quotient, using a personal strategy; e.g., 86 ÷ 4 is close to 80 ÷ 4 or close to 80 ÷ 5. * Solve a given division problem by relating division to multiplication; e.g., for 100 ÷ 4, we know that 4 × 25 = 100, so 100 ÷ 4 = 25.
2. Subitize (recognize at a glance) and name familiar arrangements of 1 to 5 objects or dots. [C, CN, ME, V]	* Look briefly at a given familiar arrangement of 1 to 5 objects or dots, and identify the number represented without counting. * Identify the number represented by a given dot arrangement on a five frame.	**2.** Subitize (recognize at a glance) and name familiar arrangements of 1 to **10** objects or dots. [C, CN, ME, V]	* Look briefly at a given familiar arrangement of objects or dots, and identify how many objects or dots there are without counting. * Identify the number represented by a given arrangement of dots on a ten frame.	**2.** Demonstrate **if a number (up to 100) is even or odd.** [C, CN, PS, R]	* Use concrete materials or pictorial representations to determine if a given number is even or odd. * Identify even and odd numbers in a given sequence, such as in a hundred chart. * Sort a given set of numbers into even and odd.	**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]	(It is not expected that students recall the basic facts but become familiar with strategies to mentally determine products.) * Identify events from experience that can be described as multiplication. * Represent a given story problem, using manipulatives or diagrams, and record the problem in a number sentence. * Represent a given multiplication expression as repeated addition. * Represent a given repeated addition as multiplication. * Create and illustrate a story problem for a given number sentence; e.g., 2 × 3 = 6. * Represent, concretely or pictorially, equal groups for a given number sentence. * Represent a given multiplication expression, using an array. * Create an array to model the commutative property of multiplication. * Relate multiplication to division by using arrays and writing related number sentences. * Solve a given multiplication problem.		
3. Relate a numeral, 1 to 10, to its respective quantity. [CN, R, V]	* Construct a set of objects corresponding to a given numeral. * Name the number for a given set of objects. * Hold up the appropriate number of fingers for a given numeral. * Match numerals with their given pictorial representations.	**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]	* Answer the question, "How many are in the set?", using the last number counted in a given set. * Identify and correct counting errors in a given counting sequence. * Show that the count of the number of objects in a given set does not change regardless of the order in which the objects are counted. * Count the number of objects in a given set, rearrange the objects, predict the new count and recount to verify the prediction. * Determine the total number of objects in a given set, starting from a known quantity and counting on. * Count quantity, using groups of 2, 5 or 10 and counting on. * Record the number of objects in a given set (up to 100).	**3.** Describe **order or relative position, using ordinal numbers (up to tenth).** [C, CN, R]	* Indicate a position of a specific object in a sequence by using ordinal numbers up to tenth. * Compare the ordinal position of a specific object in two different given sequences.	**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]	* Subtract two given 2-digit numerals, using a mental mathematics strategy, and explain or model the strategy used. * Explain how to use the "taking the subtrahend to the nearest multiple of ten and then compensating" strategy; e.g., to determine the difference of 48 – 19, think 48 – 20 + 1. * Explain how to use the "adding on" strategy; e.g., to determine the difference of 62 – 45, think 45 + 5, then 50 + 12 and then 5 + 12. * Explain how to use the "using doubles" strategy; e.g., to determine the difference of 24 – 12, think 12 + 12 = 24. * Apply a mental mathematics strategy for subtracting two given 2-digit numerals.	**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]	* Model a given multiplication problem, using the distributive property; e.g., 8 × 365 = (8 × 300) + (8 × 60) + (8 × 5). * Use concrete materials, such as base ten blocks or their pictorial representations, to represent multiplication; and record the process symbolically. * Create and solve a multiplication problem that is limited to 2- or 3-digits by 1-digit, and record the process. * Refine personal strategies to increase their efficiency. * Estimate a product, using a personal strategy; e.g., 2 × 243 is close to or a little more than 2 × 200, or close to or a little less than 2 × 250. * Model and solve a given multiplication problem, using an array, and record the process. * Solve a given multiplication problem, and record the process.

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4. Represent and describe numbers 2 to 10, concretely and pictorially. [C, CN, ME, R, V]	* Partition a given quantity into two parts, using fingers, counters or other objects, and identify the number of objects in each part. * Show a given number as two parts, using pictures, and name the number of objects in each part.	**4.** Represent and describe numbers to **20**, concretely, pictorially and **symbolically**. [C, CN, V]	* Represent a given number up to 20, using a variety of manipulatives, including ten frames and base ten materials. * Read given number words to 20. * Partition any given quantity up to 20 into 2 parts, and identify the number of objects in each part. * Model a given number, using two different objects; e.g., 10 desks represents the same number as 10 pencils. * Place given numerals on a number line with benchmarks 0, 5, 10 and 20. * Find examples of a given number in the environment.	**4.** Represent and describe numbers to **100**, concretely, pictorially and symbolically. [C, CN, V]	* Represent a given number, using concrete materials such as ten frames and base ten materials. * Represent a given number, using coins (pennies, nickels, dimes and quarters). * Represent a given number, using tallies. * Represent a given number pictorially. * Represent a given number, using expressions; e.g., 24 + 6, 15 + 15, 40 – 10. * Read a given number (0–100) in symbolic or word form. * Record a given number (0–20) in words.	**2.** Represent and describe numbers to **1000**, concretely, pictorially and symbolically. [C, CN, V]	* Read a given three-digit numeral without using the word and; e.g., 321 is three hundred twenty-one, NOT three hundred AND twenty-one. * Read a given number word (0 to 1000). * Represent a given number as an expression; e.g., 300 – 44 or 20 + 236 for 256. * Represent a given number, using manipulatives such as base ten materials. * Represent a given number pictorially. * Write number words for given multiples of ten to 90. * Write number words for given multiples of a hundred to 900.	**1.** Represent and describe whole numbers to **10 000**, pictorially and symbolically. [C, CN, V]	* Read a given four-digit numeral without using the word and; e.g., 5321 is five thousand three hundred twenty-one, NOT five thousand three hundred AND twenty-one. * Write a given numeral, using proper spacing without commas; e.g., 4567 or 4 567, 10 000. * Write a given numeral 0–10 000 in words. * Represent a given numeral, using a place value chart or diagrams. * Express a given numeral in expanded notation; e.g., 321 = 300 + 20 + 1. * Write the numeral represented by a given expanded notation. * Explain the meaning of each digit in a given 4-digit numeral, including numerals with all digits the same; e.g., for the numeral 2222, the first digit represents two thousands, the second digit two hundreds, the third digit two tens and the fourth digit two ones.
		6. **Estimate quantities to 20 by using referents.** [C, CN, ME, PS, R, V]	* Estimate a given quantity by comparing it to a given referent (known quantity). * Select an estimate for a given quantity from at least two possible choices, and explain the choice.	**6.** Estimate quantities to **100**, using referents. [C, ME, PS, R]	* Estimate a given quantity by comparing it to a referent (known quantity). * Estimate the number of groups of ten in a given quantity, using 10 as a referent. * Select between two possible estimates for a given quantity, and explain the choice.	**4.** Estimate quantities less than **1000**, using referents. [ME, PS, R, V]	* Estimate the number of groups of ten in a given quantity, using 10 as a referent (known quantity). * Estimate the number of groups of a hundred in a given quantity, using 100 as a referent. * Estimate a given quantity by comparing it to a referent. * Select an estimate for a given quantity by choosing among three possible choices. * Select and justify a referent for determining an estimate for a given quantity.		
		7. **Demonstrate an understanding of conservation of** number. [C, R, V]	* Explain why for a given number of counters, no matter how they are grouped, the total number of counters does not change. * Group a set of given counters in more than one way.	**7.** **Illustrate**, concretely and pictorially, **the meaning of place value for numerals to 100.** [C, CN, R, V]	* Explain and show with counters the meaning of each digit for a given 2-digit numeral with both digits the same; e.g., for the numeral 22, the first digit represents two tens (twenty counters) and the second digit represents two ones (two counters). * Count the number of objects in a given set, using groups of 10s and 1s, and record the result as a 2-digit numeral under the headings 10s and 1s. * Describe a given 2-digit numeral in at least two ways; e.g., 24 as two 10s and four 1s, twenty and four, two groups of ten and four left over, and twenty-four ones. * Illustrate, using ten frames and diagrams, that a given numeral consists of a certain number of groups of ten and a certain number of ones. * Illustrate, using base 10 materials, that a given numeral consists of a certain number of tens and a certain number of ones. * Explain why the value of a digit depends on its placement within a numeral.	**5.** Illustrate, concretely and pictorially, the meaning of place value for numerals to **1000**. [C, CN, R, V]	* Record, in more than one way, the number represented by given proportional materials (e.g., baseten materials) and non-proportional materials (e.g., money). * Represent a given number in different ways, using proportional and non-proportional materials, and explain how the representations are equivalent; e.g., 351 can be represented as three 100s, five 10s and one 1; or two 100s, fifteen 10s and one 1; or three 100s, four 10s and eleven 1s. * Explain and show, with counters, the meaning of each digit for a given 3-digit numeral with all digits the same; e.g., for the numeral 222, the first digit represents two hundreds (two hundred counters) the second digit represents two tens (twenty counters) and the third digit represents two ones (two counters). * Explain, using concrete materials, the meaning of zero as a place holder in a given number.		
		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]	* Name the number that is one more, two more, one less or two less than a given number, up to 20. * Represent a number on a ten frame that is one more, two more, one less or two less than a given number.	**8.** Demonstrate and **explain the effect of adding zero to, or subtracting zero from, any number**. [C, R]	* Add zero to a given number, and explain why the sum is the same as the given number. * Subtract zero from a given number, and explain why the difference is the same as the given number.	**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]	* Add two given 2-digit numerals, using a mental mathematics strategy, and explain or illustrate the strategy. * Explain how to use the "adding from left to right" strategy; e.g., to determine the sum of 23 + 46, think 20 + 40 and 3 + 6. * Explain how to use the "taking one addend to the nearest multiple of ten and then compensating" strategy; e.g., to determine the sum of 28 + 47, think 30 + 47 – 2 or 50 + 28 – 3. * Explain how to use the "using doubles" strategy; e.g., to determine the sum of 24 + 26, think 25 + 25; to determine the sum of 25 + 26, think 25 + 25 + 1 or doubles plus 1. * Apply a mental mathematics strategy for adding two given 2-digit numerals.	**4.** Apply the properties of **0 and 1 for multiplication and the property of 1 for division.** [C, CN, R]	* Determine the answer to a given question involving the multiplication of a number by 1, and explain the answer. * Determine the answer to a given question involving the multiplication of a number by 0, and explain the answer. * Determine the answer to a given question involving the division of a number by 1, and explain the answer.
						8. Apply **estimation strategies to predict sums and differences of two 2-digit numerals** in a problem solving context. [C, ME, PS, R]	* Estimate the solution for a given problem involving the sum of two 2-digit numerals; e.g., to estimate the sum of 43 + 56, use 40 + 50 (the sum is close to 90). * Estimate the solution for a given problem involving the difference of two 2-digit numerals; e.g., to estimate the difference of 56 – 23, use 50 – 20 (the difference is close to 30).		
		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]	* Act out a given problem presented orally or through shared reading. * Indicate if the scenario in a given problem represents additive or subtractive action. * Represent the numbers and actions presented in a given problem by using manipulatives, and record them using sketches and/or number sentences. * Create an addition problem based on personal experiences, and simulate the action with counters. * Create a subtraction problem based on personal experiences, and simulate the action with counters. * Create a word problem for a given number sentence (equation). * Represent a given problem pictorially or symbolically to show the additive or subtractive action, and solve the problem.	**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]	* Model addition and subtraction, using concrete materials or visual representations, and record the process symbolically. * Create an addition or a subtraction number sentence and a story problem for a given solution. * Solve a given problem involving a missing addend, and describe the strategy used. * Solve a given problem involving a missing minuend or subtrahend, and describe the strategy used. * Refine personal strategies to increase their efficiency. * Match a number sentence to a given missing addend problem. * Match a number sentence to a given missing subtrahend or minuend problem. * Explain or demonstrate why 5 + 6 = 6 + 5. * Add a given set of numbers, using the associative property of addition, and explain why the sum is the same; e.g., 2 + 5 + 3 + 8 = (2 + 3) + 5 + 8 or 5 + 3 + (8 + 2). * Solve a given problem, using horizontal and vertical formats.	**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 in context that involve addition and subtraction of numbers. [C, CN, ME, PS, R, V]	* Model the addition of two or more given numbers, using concrete or visual representations, and record the process symbolically. * Model the subtraction of two given numbers, using concrete or visual representations, and record the process symbolically. * Create an addition or subtraction story problem for a given solution. * Determine the sum of two given numbers, using a personal strategy; e.g., for 326 + 48, record 300 + 60 + 14. * Determine the difference of two given numbers, using a personal strategy; e.g., for 127 – 38, record 38 + 2 + 80 + 7 or 127 – 20 – 10 – 8. * Refine personal strategies to increase their efficiency. * Solve a given problem involving the sum or difference of two given numbers.	**3.** Demonstrate an understanding of addition of numbers with answers to **10 000** and their corresponding subtractions (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]	* Explain how to keep track of digits that have the same place value when adding numbers, limited to 3- and 4-digit numerals. * Explain how to keep track of digits that have the same place value when subtracting numbers, limited to 3- and 4-digit numerals. * Describe a situation in which an estimate rather than an exact answer is sufficient. * Estimate sums and differences, using different strategies; e.g., front-end estimation and compensation. * Refine personal strategies to increase their efficiency. * Solve problems that involve addition and subtraction of more than 2 numbers.
		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]	* Use and describe a personal strategy for determining a given sum. * Use and describe a personal strategy for determining a given difference. * Refine personal strategies to increase their efficiency. * Write the related subtraction fact for a given addition fact. * Write the related addition fact for a given subtraction fact.	**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]	* Explain or demonstrate the mental mathematics strategy that could be used to determine a basic fact, such as: • doubles; e.g., for 4 + 6, think 5 + 5 • doubles plus one; e.g., for 4 + 5, think 4 + 4 + 1 • doubles take away one; e.g., for 4 + 5, think 5 + 5 – 1 • doubles plus two; e.g., for 4 + 6, think 4 + 4 + 2 • doubles take away two; e.g., for 4 + 6, think 6 + 6 – 2 • making 10; e.g., for 7 + 5, think 7 + 3 + 2 • building on a known double; e.g., 6 + 6 = 12, so 6 + 7 = 12 + 1 = 13 • addition for subtraction; e.g., for 7 – 3, think 3 + 7 = 7. * Use and describe a personal strategy for determining a sum to 18 and the corresponding subtraction. * Refine personal strategies to increase their efficiency.	**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]	* Describe a mental mathematics strategy that could be used to determine a given basic fact, such as: • doubles; e.g., for 6 + 8, think 7 + 7 • doubles plus one; e.g., for 6 + 7, think 6 + 6 + 1 • doubles take away one; e.g., for 6 + 7, think 7 + 7 – 1 • doubles plus two; e.g., for 6 + 8, think 6 + 6 + 2 • doubles take away two; e.g., for 6 + 8, think 8 + 8 – 2 • making 10; e.g., for 6 + 8, think 6 + 4 + 4 or 8 + 2 + 4 • commutative property; e.g., for 3 + 9, think 9 + 3 • addition for subtraction; e.g., for 13 – 7, think 7 + 7 = 13. * Provide a rule for determining answers when adding and subtracting zero. * Apply a mental mathematics strategy to provide a solution to a given basic addition or subtraction fact to 18.	**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]	* Provide examples for applying mental mathematics strategies: • skip counting from a known fact; e.g., for 3 × 6, think 3 × 5 = 15 plus 3 = 18 • doubling; e.g., for 4 × 3, think 2 × 3 = 6 and 4 × 3 = 6 + 6 • doubling and adding one more group; e.g., for 3 × 7, think 2 × 7 = 14 and 14 + 7 = 21 • use ten facts when multiplying by 9; e.g., for 9 × 6, think 10 × 6 = 60 and 60 – 6 = 54; for 7 × 9, think 7 × 10 = 70 and 70 – 7 = 63 • halving; e.g., if 4 × 6 is equal to 24, then 2 × 6 is equal to 12 • relating division to multiplication; e.g., for 64 ÷ 8, think 8 × ☐ = 64 • repeated doubling; e.g., for 4 × 6, think 2 × 6 = 12 and 2 × 12 = 24.

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						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]	* Identify common characteristics of a given set of fractions. * Describe everyday situations where fractions are used. * Cut or fold a whole into equal parts, or draw a whole in equal parts; demonstrate that the parts are equal; and name the parts. * Sort a given set of shaded regions into those that represent equal parts and those that do not, and explain the sorting. * Represent a given fraction concretely or pictorially. * Name and record the fraction represented by the shaded and non-shaded parts of a given region. * Compare given fractions with the same denominator, using models. * Identify the numerator and denominator for a given fraction. * Model and explain the meaning of numerator and denominator.	**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]	* Represent a given fraction, using a region, object or set. * Identify a fraction from its given concrete representation. * Name and record the shaded and non-shaded parts of a given set. * Name and record the shaded and non-shaded parts of a given whole region, object or set. * Represent a given fraction pictorially by shading parts of a given set. * Represent a given fraction pictorially by shading parts of a given whole region, object or set. * Explain how denominators can be used to compare two given unit fractions with a numerator of 1. * Order a given set of fractions that have the same numerator, and explain the ordering. * Order a given set of fractions that have the same denominator, and explain the ordering. * Identify which of the benchmarks 0, ½ or 1 is closer to a given fraction. * Name fractions between two given benchmarks on a number line. * Order a given set of fractions by placing them on a number line with given benchmarks. * Provide examples of when two identical fractions may not represent the same quantity; e.g., half of a large apple is not equivalent to half of a small apple, half of ten Saskatoon berries is not equivalent to half of sixteen Saskatoon berries. * Provide, from everyday contexts, an example of a fraction that represents part of a set and an example of a fraction that represents part of a whole.
								9. Represent and describe **decimals (tenths and hundredths),** concretely, pictorially and symbolically. [C, CN, R, V]	* Write the decimal for a given concrete or pictorial representation of part of a set, part of a region or part of a unit of measure. * Represent a given decimal, using concrete materials or a pictorial representation. * Explain the meaning of each digit in a given decimal with all digits the same. * Represent a given decimal, using money values (dimes and pennies). * Record a given money value, using decimals. * Provide examples of everyday contexts in which tenths and hundredths are used. * Model, using manipulatives or pictures, that a given tenth can be expressed as a hundredth; e.g., 0.9 is equivalent to 0.90, or 9 dimes is equivalent to 90 pennies.
								10. Relate **decimals to fractions and fractions to decimals (to hundredths).** [C, CN, R, V]	* Express, orally and in written form, a given fraction with a denominator of 10 or 100 as a decimal. * Read decimals as fractions; e.g., 0.5 is zero and five tenths. * Express, orally and in written form, a given decimal in fraction form. * Express a given pictorial or concrete representation as a fraction or decimal; e.g., 15 shaded squares on a hundredth grid can be expressed as 0.15 or 15/100 . * Express, orally and in written form, the decimal equivalent for a given fraction; e.g., 50/100 can be expressed as 0.50.
								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]	* Predict sums and differences of decimals, using estimation strategies. * Determine the sum or difference of two given decimal numbers, using a mental mathematics strategy, and explain the strategy. * Refine personal strategies to increase their efficiency. * Solve problems, including money problems, which involve addition and subtraction of decimals, limited to hundredths. * Determine the approximate solution of a given problem not requiring an exact answer.

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

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

Grade 5		Grade 6		Grade 7		Grade 8		Grade 9	
General Outcome: Develop number sense.									
Specific Outcome *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*
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]	* Model the division process as equal sharing, using base ten blocks, and record it symbolically. * Explain that the interpretation of a remainder depends on the context: • ignore the remainder; e.g., making teams of 4 from 22 people • round up the quotient; e.g., the number of five passenger cars required to transport 13 people • express remainders as fractions; e.g., five apples shared by two people • express remainders as decimals; e.g., measurement and money. * Solve a given division problem in context, using personal strategies, and record the process. * Refine personal strategies to increase their efficiency. * Create and solve a division problem, and record the process.			**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]	* Determine if a given number is divisible by 2, 3, 4, 5, 6, 8, 9 or 10, and explain why. * Sort a given set of numbers based upon their divisibility, using organizers such as Venn and Carroll diagrams. * Determine the factors of a given number, using the divisibility rules. * Explain, using an example, why numbers cannot be divided by 0.	**1.** Demonstrate an understanding of **perfect squares and square roots**, concretely, pictorially and symbolically (limited to whole numbers). [C, CN, R, V]	* Represent a given perfect square as a square region, using materials such as grid paper or square shapes. * Determine the factors of a given perfect square, and explain why one of the factors is the square root and the others are not. * Determine whether or not a given number is a perfect square, using materials and strategies such as square shapes, grid paper or prime factorization, and explain the reasoning. * Determine the square root of a given perfect square, and record it symbolically. * Determine the square of a given number.	**5.** Determine the square root **of positive rational numbers** that **are** perfect squares. [C, CN, PS, R, T] [ICT: P2–3.4]	(Students should be aware of the existence of positive and negative square roots; however, at this grade, they should only work with the principal, positive square root.) * Determine whether or not a given rational number is a square number, and explain the reasoning. * Determine the square root of a given positive rational number that is a perfect square. * Identify the error made in a given calculation of a square root; e.g., is 3.2 the square root of 6.4? * Determine a positive rational number, given the square root of that positive rational number.
								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]	* Order a given set of rational numbers in fraction and decimal form by placing them on a number line; e.g., $\frac{1}{3}, -0.666\ldots, 0.5, -\frac{1}{2}, \frac{2}{3}$ * Identify a rational number that is between two given rational numbers. * Solve a given problem involving operations on rational numbers in fraction or decimal form.
5. Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems. [C, CN, PS, V]	* Illustrate partial products in expanded notation for both factors; e.g., for 36 × 42, determine the partial products for (30 + 6) × (40 + 2). * Represent both 2-digit factors in expanded notation to illustrate the distributive property; e.g., to determine the partial products of 36 × 42, (30 + 6) × (40 + 2) = 30 × 40 + 30 × 2 + 6 × 40 + 6 × 2 = 1200 + 60 + 240 + 12 = 1512. * Model the steps for multiplying 2-digit factors, using an array and base ten blocks, and record the process symbolically. * Describe a solution procedure for determining the product of two given 2-digit factors, using a pictorial representation such as an area model. * Solve a given multiplication problem in context, using personal strategies, and record the process. * Refine personal strategies to increase their efficiency. * Create and solve a multiplication problem, and record the process.	**3.** 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]	* Identify multiples for a given number, and explain the strategy used to identify them. * Determine all the whole number factors of a given number, using arrays. * Identify the factors for a given number, and explain the strategy used; e.g., concrete or visual representations, repeated division by prime numbers, factor trees. * Provide an example of a prime number, and explain why it is a prime number. * Provide an example of a composite number, and explain why it is a composite number. * Sort a given set of numbers as prime and composite. * Solve a given problem involving factors or multiples. * Explain why 0 and 1 are neither prime nor composite.			**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]	* Estimate the square root of a given number that is not a perfect square, using the roots of perfect squares as benchmarks. * Approximate the square root of a given number that is not a perfect square, using technology; e.g., a calculator, a computer. * Explain why the square root of a number shown on a calculator may be an approximation. * Identify a number with a square root that is between two given numbers.	**6.** Determine an approximate square root of **positive rational** numbers that are non-perfect squares. [C, CN, PS, R, T] [ICT: P2–3.4]	* Estimate the square root of a given rational number that is not a perfect square, using the roots of perfect squares as benchmarks. * Determine an approximate square root of a given rational number that is not a perfect square, using technology; e.g., a calculator, a computer. * Explain why the square root of a given rational number as shown on a calculator may be an approximation. * Identify a number with a square root that is between two given numbers.

General Outcome: Develop number sense.

Grade 5		Grade 6		Grade 7		Grade 8		Grade 9	
Specific Outcome *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*
1. Represent and describe whole numbers to **1 000 000**. [C, CN, V, T] [ICT: C6–2.2]	* Write a given numeral, using proper spacing without commas; e.g., 934 567. * Describe the pattern of adjacent place positions moving from right to left. * Describe the meaning of each digit in a given numeral. * Provide examples of large numbers used in print or electronic media. * Express a given numeral in expanded notation; e.g., 45 321 = (4 × 10 000) + (5 × 1000) + (3 × 100) + (2 × 10) + (1 × 1) or 40 000 + 5000 + 300 + 20 + 1. * Write the numeral represented by a given expanded notation.	**5.** Demonstrate an understanding of **ratio**, concretely, pictorially and symbolically. [C, CN, PS, R, V]	* Provide a concrete or pictorial representation for a given ratio. * Write a ratio from a given concrete or pictorial representation. * Express a given ratio in multiple forms, such as 3:5, 3/5 or 3 to 5. * Identify and describe ratios from real-life contexts, and record them symbolically. * Explain the part/whole and part/part ratios of a set; e.g., for a group of 9 girls and 5 boys, explain the ratios 3:5, 3:8 and 5:8. * Solve a given problem involving ratio.			**4.** Demonstrate an understanding of ratio and **rate**. [C, CN, V]	* Express a two-term ratio from a given context in the forms 3:5 or 3 to 5. * Express a three-term ratio from a given context in the forms 4:7:3 or 4 to 7 to 3. * Express a part to part ratio as a part to whole fraction; e.g., frozen juice to water: 1 can concentrate to 4 cans of water can be represented as 1/5 , which is the ratio of concentrate to solution, or 4/5 , which is the ratio of water to solution. * Identify and describe ratios and rates (including unit rates) from real-life examples, and record them symbolically. * Express a given rate, using words or symbols; e.g., 20 L per 100 km or 20 L/100 km. * Express a given ratio as a percent, and explain why a rate cannot be represented as a percent.		
2. Use estimation **strategies**, including: • **front-end rounding** • **compensation** • **compatible numbers** in problem-solving contexts. [C, CN, ME, PS, R, V]	* Provide a context for when estimation is used to: • make predictions • check the reasonableness of an answer • determine approximate answers. * Describe contexts in which overestimating is important. * Determine the approximate solution to a given problem not requiring an exact answer. * Estimate a sum or product, using compatible numbers. * Estimate the solution to a given problem, using compensation, and explain the reason for compensation. * Select and use an estimation strategy for a given problem. * Apply front-end rounding to estimate: • sums; e.g., 253 + 615 is more than 200 + 600 = 800 • differences; e.g., 974 – 250 is close to 900 – 200 = 700 • products; e.g., the product of 23 × 24 is greater than 20 × 20 (400) and less than 25 × 25 (625) • quotients; e.g., the quotient of 831 ÷ 4 is greater than 800 ÷ 4 (200).	**6.** Demonstrate an understanding of **percent (limited to whole numbers)**, concretely, pictorially and symbolically. [C, CN, PS, R, V]	* Explain that "percent" means "out of 100." * Explain that percent is a ratio out of 100. * Use concrete materials and pictorial representations to illustrate a given percent. * Record the percent displayed in a given concrete or pictorial representation. * Express a given percent as a fraction and a decimal. * Identify and describe percents from real-life contexts, and record them symbolically. * Solve a given problem involving percents.	**3.** Solve problems **involving percents from 1% to 100%**. [C, CN, PS, R, T] [ICT: P2–3.4]	* Express a given percent as a decimal or fraction. * Solve a given problem that involves finding a percent. * Determine the answer to a given percent problem where the answer requires rounding, and explain why an approximate answer is needed; e.g., total cost including taxes.	**3.** Demonstrate an understanding of **percents greater than** or **equal to 0%**, including **greater than** 100%. [CN, PS, R, V]	* Provide a context where a percent may be more than 100% or **between** 0% and 1%. * Represent a given fractional percent, using grid paper. * Represent a given percent greater than 100%, using grid paper. * Determine the percent represented by a given shaded region on a grid, and record it in decimal, fraction and percent form. * Express a given percent in decimal or fraction form. * Express a given decimal in percent or fraction form. * Express a given fraction in decimal or percent form. * Solve a given problem involving percents. * Solve a given problem involving combined percents, e.g., addition of percents, such as GST + PST. * Solve a given problem that involves finding the percent of a percent; e.g., "A population increased by 10% one year and by 15% the next year. Explain why there was not a 25% increase in population over the two years."		
		1. Demonstrate an understanding of place value, including numbers that are: • **greater than one million** • less than **one thousandth**. [C, CN, R, T]	* Explain how the pattern of the place value system, i.e., the repetition of ones, tens and hundreds within each period, makes it possible to read and write numerals for numbers of any magnitude. * Provide examples of where large and small numbers are used; e.g., media, science, medicine, technology.					**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]	* Demonstrate the differences between the exponent and the base by building models of a given power, such as 2^5 and 3^2. * Explain, using repeated multiplication, the difference between two given powers in which the exponent and base are interchanged; e.g., 10^3 and 3^{10}. * Express a given power as a repeated multiplication. * Express a given repeated multiplication as a power. * Explain the role of parentheses in powers by evaluating a given set of powers; e.g., $(-2)^4$, (-2^4) and -2^4. * Demonstrate, using patterns, that a^0 is equal to 1 for a given value of a ($a \neq 0$). * Evaluate powers with integral bases (excluding base 0) and whole number exponents.
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]	* Determine the products when one factor is a multiple of 10, 100 or 1000 by annexing and adding zero; e.g., for 3 × 200 think 3 × 2 and then add two zeros. * Apply halving and doubling when determining a given product; e.g., 32 × 5 is the same as 16 × 10. * Apply the distributive property to determine a given product that involves multiplying factors that are close to multiples of 10; e.g., 98 × 7 = (100 × 7) – (2 × 7).	**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]	* Explain, using examples, why there is a need to have a standardized order of operations. * Apply the order of operations to solve multistep problems with and without technology; e.g., a computer, a calculator.					**4.** Explain and apply the order of operations, **including** exponents, with and without technology. [PS, T] [ICT: P2–3.4]	* Solve a given problem by applying the order of operations without the use of technology. * Solve a given problem by applying the order of operations with the use of technology. * Identify the error in applying the order of operations in a given incorrect solution.
								2. Demonstrate an understanding of operations **on powers with integral bases (excluding base 0)** and whole number **exponents**: • $(a^m)(a^n) = a^{m+n}$ • $a^m \div a^n = a^{m-n}, m > n$ • $(a^m)^n = a^{mn}$ • $(ab)^m = a^m b^m$ • $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$. [C, CN, PS, R, T] [ICT: P2–3.4]	* Explain, using examples, the exponent laws of powers with integral bases (excluding base 0) and whole number exponents. * Evaluate a given expression by applying the exponent laws. * Determine the sum of two given powers, e.g., $5^2 + 5^3$, and record the process. * Determine the difference of two given powers, e.g., $4^5 - 4^4$, and record the process. * Identify the error(s) in a given simplification of an expression involving powers.
5. 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]	* Describe the mental mathematics strategy used to determine a given basic fact, such as: • skip count up by one or two groups from a known fact; e.g., if 5 × 7 = 35, then 6 × 7 is equal to 35 + 7 and 7 × 7 is equal to 35 + 7 + 7 • skip count down by one or two groups from a known fact; e.g., if 8 × 8 = 64, then 7 × 8 is equal to 64 – 8 and 6 × 8 is equal to 64 – 8 – 8 • doubling; e.g., for 8 × 3 think 4 × 3 = 12, and 8 × 3 = 12 + 12 • patterns when multiplying by 9; e.g., for 9 × 6, think 10 × 6 = 60, and 60 – 6 = 54; for 7 × 9, think 7 × 10 = 70, and 70 – 7 = 63 • repeated doubling; e.g., if 2 × 6 is equal to 12, then 4 × 6 is equal to 24 and 8 × 6 is equal to 48 • repeated halving; e.g., for 60 ÷ 4, think 60 ÷ 2 = 30 and 30 ÷ 2 = 15. * Explain why multiplying by zero produces a product of zero (zero property of multiplication). * Explain why division by zero is not possible or is undefined; e.g., 8 ÷ 0. * Determine, with confidence, answers to multiplication facts to 81and related division facts.								

General Outcome: Develop number sense.

Grade 5		Grade 6		Grade 7		Grade 8		Grade 9	
Specific Outcome *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*	**Specific Outcome** *It is expected that students will:*	**Achievement Indicators** *The following set of indicators may be used to determine whether students have met the corresponding specific outcome.*
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]	* Create a set of equivalent fractions; and explain, using concrete materials, why there are many equivalent fractions for any given fraction. * Model and explain that equivalent fractions represent the same quantity. * Determine if two given fractions are equivalent, using concrete materials or pictorial representations. * Formulate and verify a rule for developing a set of equivalent fractions. * Identify equivalent fractions for a given fraction. * Compare two given fractions with unlike denominators by creating equivalent fractions. * Position a given set of fractions with like and unlike denominators on a number line, and explain strategies used to determine the order.	**7.** Demonstrate an understanding of **integers**, concretely, pictorially and symbolically. [C, CN, R, V]	* Extend a given number line by adding numbers less than zero, and explain the pattern on each side of zero. * Place given integers on a number line, and explain how integers are ordered. * Describe contexts in which integers are used; e.g., on a thermometer. * Compare two integers; represent their relationship using the symbols <, > and =, and verify the relationship, using a number line. * Order given integers in ascending or descending order.	**6.** Demonstrate an understanding of addition and subtraction of **integers**, concretely, pictorially and symbolically. [C, CN, PS, R, V]	* Explain, using concrete materials such as integer tiles and diagrams, that the sum of opposite integers is zero. * Illustrate, using a number line, the results of adding or subtracting negative and positive integers; e.g., a move in one direction followed by an equivalent move in the opposite direction results in no net change in position. * Add two given integers, using concrete materials or pictorial representations, and record the process symbolically. * Subtract two given integers, using concrete materials or pictorial representations, and record the process symbolically. * Solve a given problem involving the addition and subtraction of integers.	**7.** Demonstrate an understanding of multiplication and division of **integers**, concretely, pictorially and symbolically. [C, CN, PS, R, V]	* Identify the operation required to solve a given problem involving integers. * Provide a context that requires multiplying two integers. * Provide a context that requires dividing two integers. * Model the process of multiplying two integers, using concrete materials or pictorial representations, and record the process. * Model the process of dividing an integer by an integer, using concrete materials or pictorial representations, and record the process. * Generalize and apply a rule for determining the sign of the product and quotient of integers. * Solve a given problem involving the division of integers (2-digit by 1-digit) without the use of technology. * Solve a given problem involving the division of integers (2-digit by 2-digit) with the use of technology. * Solve a given problem involving integers, taking into consideration order of operations.		
8. Describe and represent decimals (tenths, **hundredths**, **thousandths**), concretely, pictorially and symbolically. [C, CN, R, V]	* Write the decimal for a given concrete or pictorial representation of part of a set, part of a region or part of a unit of measure. * Represent a given decimal, using concrete materials or a pictorial representation. * Represent an equivalent tenth, hundredth or thousandth for a given decimal, using a grid. * Express a given tenth as an equivalent hundredth and thousandth. * Express a given hundredth as an equivalent thousandth. * Describe the value of each digit in a given decimal.	**2.** Solve problems involving whole numbers and decimal numbers. [ME, PS, T] [ICT: C6–2.4]	* Identify which operation is necessary to solve a given problem, and solve it. * Determine the reasonableness of an answer. * Estimate the solution to, and solve, a given problem. * Determine whether the use of technology is appropriate to solve a given problem, and explain why. * Use technology when appropriate to solve a given problem.						
9. Relate decimals to fractions and fractions to decimals (to **thousandths**). [CN, R, V]	* Write a given decimal in fraction form. * Write a given fraction with a denominator of 10, 100 or 1000 as a decimal. * Express a given pictorial or concrete representation as a fraction or decimal; e.g., 250 shaded squares on a thousandth grid can be expressed as 0.250 or 250/1000.	**4.** Relate **improper** fractions to **mixed numbers** and **mixed numbers** to **improper fractions**. [CN, ME, R, V]	* Demonstrate, using models, that a given improper fraction represents a number greater than 1. * Express improper fractions as mixed numbers. * Express mixed numbers as improper fractions. * Place a given set of fractions, including mixed numbers and improper fractions, on a number line, and explain strategies used to determine position. * Translate a given improper fraction between concrete, pictorial and symbolic forms. * Translate a given mixed number between concrete, pictorial and symbolic forms.	**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]	(It is intended that repeating decimals be limited to decimals with 1 or 2 repeating digits.) * Predict the decimal representation of a given fraction, using patterns; e.g., $\frac{1}{11}=1.\overline{09}$, $\frac{2}{11}=1.\overline{18}$, $\frac{3}{11}=?\ldots$ * Match a given set of fractions to their decimal representations. * Sort a given set of fractions as repeating or terminating decimals. * Express a given fraction as a terminating or repeating decimal. * Express a given repeating decimal as a fraction. * Express a given terminating decimal as a fraction. * Provide an example where the decimal representation of a fraction is an approximation of its exact value.				
10. Demonstrate an understanding of addition and subtraction of decimals (limited to **thousandths**). [C, CN, PS, R, V]	* Order a given set of decimals by placing them on a number line that contains the benchmarks 0.0, 0.5 and 1.0. * Order a given set of decimals including only tenths, using place value. * Order a given set of decimals including only hundredths, using place value. * Order a given set of decimals including only thousandths, using place value. * Explain what is the same and what is different about 0.2, 0.20 and 0.200. * Order a given set of decimals including tenths, hundredths and thousandths, using equivalent decimals; e.g., 0.92, 0.7, 0.9, 0.876, 0.925 in order is: 0.700, 0.876, 0.900, 0.920, 0.925.	**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]	* Place the decimal point in a product, using front-end estimation; e.g., for 15.205 m × 4, think 15 m × 4, so the product is greater than 60 m. * Place the decimal point in a quotient, using front-end estimation; e.g., for $26.83 ÷ 4, think $24 ÷ 4, so the quotient is greater than $6. * Correct errors of decimal point placement in a given product or quotient without using paper and pencil. * Predict products and quotients of decimals, using estimation strategies. * Solve a given problem that involves multiplication and division of decimals using multipliers from 0 to 9 and divisors from 1 to 9.	**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]	* Model addition and subtraction of a given positive fraction or given mixed number, using concrete representations, and record symbolically. * Determine the sum of two given positive fractions or mixed numbers with like denominators. * Determine the difference of two given positive fractions or mixed numbers with like denominators. * Determine a common denominator for a given set of positive fractions or mixed numbers. * Determine the sum of two given positive fractions or mixed numbers with unlike denominators. * Determine the difference of two given positive fractions or mixed numbers with unlike denominators. * Simplify a given positive fraction or mixed number by identifying the common factor between the numerator and denominator. * Simplify the solution to a given problem involving the sum or difference of two positive fractions or mixed numbers. * Solve a given problem involving the addition or subtraction of positive fractions or mixed numbers, and determine if the solution is reasonable.	**6.** Demonstrate an understanding of multiplying and dividing positive fractions and mixed numbers, concretely, pictorially and symbolically. [C, CN, ME, PS]	* Identify the operation required to solve a given problem involving positive fractions. * Provide a context that requires the multiplying of two given positive fractions. * Provide a context that requires the dividing of two given positive fractions. * Estimate the product of two given positive proper fractions to determine if the product will be closer to 0, ½ or 1. * Estimate the quotient of two given positive fractions, and compare the estimate to whole number benchmarks. * Express a given positive mixed number as an improper fraction and a given positive improper fraction as a mixed number. * Model multiplication of a positive fraction by a whole number concretely or pictorially, and record the process. * Model multiplication of a positive fraction by a positive fraction concretely or pictorially, using an area model, and record the process. * Model division of a positive proper fraction by a whole number concretely or pictorially, and record the process. * Model division of a whole number by a positive proper fraction concretely or pictorially, using an area model, and record the process. * Model division of a positive proper fraction by a positive proper fraction pictorially, and record the process. * Generalize and apply rules for multiplying and dividing positive fractions, including mixed numbers. * Solve a given problem involving positive fractions, taking into consideration order of operations (limited to problems with positive solutions). * Apply a personal strategy to solve, symbolically, a given division problem involving improper fractions. * Refine personal strategies to increase their efficiency.		
				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]	* Solve a given problem involving the addition of two or more decimal numbers. * Solve a given problem involving the subtraction of decimal numbers. * Solve a given problem involving the multiplication of decimal numbers. * Solve a given problem involving the multiplication or division of decimal numbers with 2-digit multipliers or 1-digit divisors (whole numbers or decimals) without the use of technology. * Solve a given problem involving the multiplication or division of decimal numbers with more than 2-digit multipliers or 1-digit divisors (whole numbers or decimals) with the use of technology. * Place the decimal in a sum or difference, using front-end estimation; e.g., for 4.5 + 0.73 + 256.458, think 4 + 256, so the sum is greater than 260. * Place the decimal in a product, using front-end estimation; e.g., for $12.33 × 2.4, think $12 × 2, so the product is greater than $24. * Place the decimal in a quotient, using front-end estimation; e.g., for 51.50 m ÷ 2.1, think 50 m ÷ 2, so the quotient is approximately 25 m. * Check the reasonableness of solutions, using estimation. * Solve a given problem that involves operations on decimals (limited to thousandths), taking into consideration the order of operations.				