Summary of Clarifications to the Alberta *Mathematics Kindergarten to Grade 9 Program of Studies*

This document summarizes the clarifications for 2016 to mathematics outcomes as found in the Alberta *Mathematics Kindergarten to Grade 9 Program of Studies* (P of S). Clarifications include notes regarding the investigation of standard/traditional algorithms as a strategy in grades 2–5 outcomes related to operations with whole numbers. Notes have also been added in some outcomes to indicate where previous knowledge may be reinforced.

- The front matter has been updated (pages 9–10, P of S).
- Some specific outcomes in grades 1–9 have been clarified. These specific outcomes are highlighted on the following pages.

2016
Outcomes The program of studies is stated in terms of general outcomes and specific outcomes. **General outcomes** are overarching statements about what students are expected to learn in each strand/substrand. The general outcome for each strand/substrand is the same throughout the grades. **Specific outcomes** are statements that identify the specific skills, understanding and knowledge that students are required to attain by the end of a given grade. In the specific outcomes, the word *including* indicates that any ensuing items must be addressed to fully meet the learning outcome. The phrase *such as* indicates that the ensuing items are provided for illustrative purposes or clarification and are not requirements that must be addressed to fully meet the learning outcome. Students investigate a variety of strategies, including standard/traditional algorithms, to ~~and~~ become proficient in at least one appropriate and efficient strategy that they understand. ~~Strategies may include traditional algorithms such as long division and vertical addition; however, specific strategies are not prescribed in the outcomes.~~ The teaching professional has the flexibility and responsibility to meet the learning needs of each of his or her students. Over time, students refine their strategies to increase their accuracy and efficiency. **Notes** are statements that clarify the intent of a learning outcome. Notes guide the teaching professional in making judgements about teaching and learning. Notes in some Number outcomes for grades 2–5 highlight opportunities for students to investigate standard/traditional algorithms as a strategy for operations with whole numbers. The intent of these notes is to ensure that standard/traditional algorithms are explicitly included in students' learning experiences. Students would then use their preferred strategy to demonstrate understanding of each outcome. Notes in some outcomes for grades 4–9 highlight opportunities for students to maintain and refine previous learnings related to number facts and operations with whole numbers, fractions and integers. The intent of these notes is to indicate that through these outcomes, previous knowledge can be maintained. There may be other outcomes that provide similar opportunities for maintaining previous learning throughout the year.

2016	Specific Outcome
Grade 1 Number	10. Describe and use mental mathematics strategies~~, 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] Understand and apply strategies for addition facts up to and including 9 + 9 and related subtraction facts ~~to 18~~. Recall addition facts to a sum of 5 and related subtraction facts ~~to 5~~.

2016	Specific Outcome
Grade 2 Number	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] *Note:* *Students investigate a variety of strategies, including standard/traditional algorithms, to become proficient in at least one appropriate and efficient strategy that they understand.*

2016	Specific Outcome
Grade 2 Number	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] Understand and apply strategies for addition facts up to and including 9 + 9 and related subtraction facts ~~to 18~~. Recall addition facts up to and including 5 + 5 and related subtraction facts ~~to 10~~.

2016	Specific Outcome
Grade 3 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]

2016	Specific Outcome
Grade 3 Number	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]

2016	Specific Outcome
Grade 3 Number	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] *Note:* *Students investigate a variety of strategies, including standard/traditional algorithms, to become proficient in at least one appropriate and efficient strategy that they understand.*

2016	Specific Outcome
Grade 3 Number	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~~ in order to understand and recall basic addition facts and related subtraction facts to 18. [C, CN, ME, PS, R, V] Understand, recall and apply addition facts up to and including 9 + 9 and related subtraction facts ~~to 18~~.

2016	Specific Outcome
Grade 4 Number	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] *Note:* *Students investigate a variety of strategies, including standard/traditional algorithms, to become proficient in at least one appropriate and efficient strategy that they understand.* *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned addition and subtraction number facts:* *Grade 3, Number SO 10 – Apply mental mathematics strategies and number properties in order to understand and recall basic addition facts and related subtraction facts to 18.* *[C, CN, ME, PS, R, V]* *Understand, recall and apply addition facts up to and including 9 + 9 and related subtraction facts.*

2016	Specific Outcome
Grade 4 Number	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] Understand and apply strategies for multiplication and related division facts to 9×9. Recall multiplication and related division facts to 7×7.

2016	Specific Outcome
Grade 4 Number	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] *Note:* *Students investigate a variety of strategies, including standard/traditional algorithms, to become proficient in at least one appropriate and efficient strategy that they understand.* *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned addition and subtraction number facts:* *Grade 3, Number SO 10 – Apply mental mathematics strategies and number properties in order to understand and recall basic addition facts and related subtraction facts to 18.* *[C, CN, ME, PS, R, V]* *Understand, recall and apply addition facts up to and including 9 + 9 and related subtraction facts.*

2016	Specific Outcome
Grade 4 Number	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] *Note:* *Students investigate a variety of strategies, including standard/traditional algorithms, to become proficient in at least one appropriate and efficient strategy that they understand.* *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned addition and subtraction number facts:* *Grade 3, Number SO 10 – Apply mental mathematics strategies and number properties in order to understand and recall basic addition facts and related subtraction facts to 18.* *[C, CN, ME, PS, R, V]* *Understand, recall and apply addition facts up to and including 9 + 9 and related subtraction facts.*

2016	Specific Outcome
Grade 4 Number	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] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned addition and subtraction number facts:* *Grade 3, Number SO 10 – Apply mental mathematics strategies and number properties in order to understand and recall basic addition facts and related subtraction facts to 18.* *[C, CN, ME, PS, R, V]* *Understand, recall and apply addition facts up to and including 9 + 9 and related subtraction facts.*

2016	Specific Outcome
Grade 4 Patterns and Relations	6. Solve one-step equations involving a symbol to represent an unknown number. [C, CN, PS, R, V] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned addition and subtraction number facts:* *Grade 3, Number SO 10 – Apply mental mathematics strategies and number properties in order to understand and recall basic addition facts and related subtraction facts to 18.* *[C, CN, ME, PS, R, V]* *Understand, recall and apply addition facts up to and including 9 + 9 and related subtraction facts.*

2016	Specific Outcome
Grade 5 Number	2. Use estimation strategies~~, such as:~~ • ~~front-end rounding~~ • ~~compensation~~ • ~~compatible numbers~~ in problem-solving contexts. [C, CN, ME, PS, R, V]

2016	Specific Outcome
Grade 5 Number	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~~ in order to understand and recall basic multiplication facts (multiplication tables) to 81 and related division facts. [C, CN, ME, R, V] Understand, recall and apply multiplication and related division facts to 9×9.

2016	Specific Outcome
Grade 5 Number	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]

2016	Specific Outcome
Grade 5 Number	5. Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems. [C, CN, PS, V] *Note:* *Students investigate a variety of strategies, including standard/traditional algorithms, to become proficient in at least one appropriate and efficient strategy that they understand.* *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations of addition and subtraction with whole numbers:* *Grade 4, Number SO 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]*

2016	Specific Outcome
Grade 5 Number	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] *Note:* *Students investigate a variety of strategies, including standard/traditional algorithms, to become proficient in at least one appropriate and efficient strategy that they understand.* *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations of addition and subtraction with whole numbers:* *Grade 4, Number SO 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]*

2016	Specific Outcome
Grade 5 Number	11. Demonstrate an understanding of addition and subtraction of decimals (limited to thousandths). [C, CN, PS, R, V] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations of addition and subtraction with whole numbers:* *Grade 4, Number SO 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]*

2016	Specific Outcome
Grade 6 Number	2. Solve problems involving whole numbers and decimal numbers. [ME, PS, T] [ICT: C6–2.4] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned:* ▪ *multiplication and division number facts:* *Grade 5, Number SO 3 – Apply mental mathematics strategies and number properties in order to understand and recall basic multiplication facts (multiplication tables) to 81 and related division facts.* *[C, CN, ME, R, V]* *Understand, recall and apply multiplication and related division facts to 9×9.* ▪ *operations with whole numbers:* *Grade 4, Number SO 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]* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]*

2016	Specific Outcome
Grade 6 Number	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] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned multiplication and division number facts:* *Grade 5, Number SO 3 – Apply mental mathematics strategies and number properties in order to understand and recall basic multiplication facts (multiplication tables) to 81 and related division facts.* *[C, CN, ME, R, V]* *Understand, recall and apply multiplication and related division facts to 9×9.*

2016	Specific Outcome
Grade 6 Number	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] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned:* ▪ *multiplication and division number facts:* *Grade 5, Number SO 3 – Apply mental mathematics strategies and number properties in order to understand and recall basic multiplication facts (multiplication tables) to 81 and related division facts.* *[C, CN, ME, R, V]* *Understand, recall and apply multiplication and related division facts to 9×9.* ▪ *operations with whole numbers:* *Grade 4, Number SO 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]* *Grade 5, Number SO 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]*

2016	Specific Outcome
Grade 6 Number	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] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned:* ▪ *multiplication and division number facts:* *Grade 5, Number SO 3 – Apply mental mathematics strategies and number properties in order to understand and recall basic multiplication facts (multiplication tables) to 81 and related division facts.* *[C, CN, ME, R, V]* *Understand, recall and apply multiplication and related division facts to 9×9.* ▪ *operations with whole numbers:* *Grade 4, Number SO 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]* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]*

2016	Specific Outcome
Grade 7 Number	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] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations with whole numbers:* *Grade 4, Number SO 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]* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]*

2016	Specific Outcome
Grade 7 Number	6. Demonstrate an understanding of addition and subtraction of integers, concretely, pictorially and symbolically. [C, CN, PS, R, V] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations of addition and subtraction with whole numbers:* *Grade 4, Number SO 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]*

2016	Specific Outcome
Grade 7 Patterns and Relations	5. Evaluate an expression, given the value of the variable(s). [CN, R] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations with whole numbers:* *Grade 4, Number SO 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]* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]*

2016	Specific Outcome
Grade 7 Patterns and Relations	6. Model and solve, concretely, pictorially and symbolically, problems that can be represented by one-step linear equations of the form $x + a = b$, where a and b are integers. [CN, PS, R, V] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations of addition and subtraction with whole numbers:* *Grade 4, Number SO 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]*

2016	Specific Outcome
Grade 7 Patterns and Relations	7. Model and solve, concretely, pictorially and symbolically, problems that can be represented by linear equations of the form: • $ax + b = c$ • $ax = b$ • $\frac{x}{a} = b, \quad a \neq 0$ where a, b and c are whole numbers. [CN, PS, R, V] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations with whole numbers:* *Grade 4, Number SO 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]* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]*

2016	Specific Outcome
Grade 8 Number	1. Demonstrate an understanding of perfect squares and square roots, concretely, pictorially and symbolically (limited to whole numbers). [C, CN, R, V] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations of multiplication and division with whole numbers:* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]*

2016	Specific Outcome
Grade 8 Number	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] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations of multiplication and division with whole numbers:* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]*

2016	Specific Outcome
Grade 8 Number	7. Demonstrate an understanding of multiplication and division of integers, concretely, pictorially and symbolically. [C, CN, PS, R, V] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations of multiplication and division with whole numbers:* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]*

2016	Specific Outcome
Grade 8 Patterns and Relations	2. Model and solve problems, concretely, pictorially and symbolically, using linear equations of the form: • $ax = b$ • $\frac{x}{a} = b$, $a \neq 0$ • $ax + b = c$ • $\frac{x}{a} + b = c$, $a \neq 0$ • $a(x + b) = c$ where a, b and c are integers. [C, CN, PS, V] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned operations with whole numbers:* *Grade 4, Number SO 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]* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]*

2016	Specific Outcome
Grade 9 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] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned:* ▪ *operations with whole numbers:* *Grade 4, Number SO 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]* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]* ▪ *operations with fractions:* *Grade 7, Number SO 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]* *Grade 8, Number SO 6 – Demonstrate an understanding of multiplying and dividing positive fractions and mixed numbers, concretely, pictorially and symbolically.* *[C, CN, ME, PS]* (continued)

2016	Specific Outcome
Grade 9 Number	(continued) ▪ *operations with integers:* *Grade 7, Number SO 6 – Demonstrate an understanding of addition and subtraction of integers, concretely, pictorially and symbolically.* *[C, CN, PS, R, V]* *Grade 8, Number SO 7 – Demonstrate an understanding of multiplication and division of integers, concretely, pictorially and symbolically.* *[C, CN, PS, R, V]*

2016	Specific Outcome
Grade 9 Number	4. Explain and apply the order of operations, including exponents, with and without technology. [PS, T] [ICT: P2–3.4] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned:* ▪ *operations with whole numbers:* *Grade 4, Number SO 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]* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]* ▪ *operations with fractions:* *Grade 7, Number SO 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]* *Grade 8, Number SO 6 – Demonstrate an understanding of multiplying and dividing positive fractions and mixed numbers, concretely, pictorially and symbolically.* *[C, CN, ME, PS]* ▪ *operations with integers:* *Grade 7, Number SO 6 – Demonstrate an understanding of addition and subtraction of integers, concretely, pictorially and symbolically.* *[C, CN, PS, R, V]* *Grade 8, Number SO 7 – Demonstrate an understanding of multiplication and division of integers, concretely, pictorially and symbolically.* *[C, CN, PS, R, V]*

2016	Specific Outcome
Grade 9 Patterns and Relations	6. Model, record and explain the operations of addition and subtraction of polynomial expressions, concretely, pictorially and symbolically (limited to polynomials of degree less than or equal to 2). [C, CN, PS, R, V] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned:* ▪ *addition and subtraction with whole numbers:* *Grade 4, Number SO 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]* ▪ *addition and subtraction with integers:* *Grade 7, Number SO 6 – Demonstrate an understanding of addition and subtraction of integers, concretely, pictorially and symbolically.* *[C, CN, PS, R, V]*

2016	Specific Outcome
Grade 9 Patterns and Relations	7. Model, record and explain the operations of multiplication and division of polynomial expressions (limited to polynomials of degree less than or equal to 2) by monomials, concretely, pictorially and symbolically. [C, CN, R, V] *Note:* *Through this outcome, students have the opportunity to maintain and refine previously learned:* ▪ *multiplication and division with whole numbers:* *Grade 5, Number SO 5 – Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems.* *[C, CN, PS, V]* *Grade 5, Number SO 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]* ▪ *multiplication and division with integers:* *Grade 8, Number SO 7 – Demonstrate an understanding of multiplication and division of integers, concretely, pictorially and symbolically.* *[C, CN, PS, R, V]*