Summary of Clarifications to the *Alberta K–9 Mathematics Achievement Indicators*

This document summarizes the clarifications to mathematics outcomes and achievement indicators as found in the *Alberta K–9 Mathematics Achievement Indicators* (2016). 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 introduction has been updated (page 1, *Alberta K–9 Mathematics Achievement Indicators* [2016]).

- Some specific outcomes and achievement indicators in grades 1–9 have been clarified. These specific outcomes and achievement indicators are highlighted on the following pages.

- The achievement indicators are organized by specific outcome. Refer to the *Alberta Mathematics Kindergarten to Grade 9 Program of Studies* (2016) for the complete program of studies.

2016

OUTCOMES AND ACHIEVEMENT INDICATORS

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 become proficient in at least one appropriate and efficient strategy that they understand. ~~Strategies may include standard/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.

Achievement indicators are samples of how students **may** demonstrate their achievement of the goals of a specific outcome. The range of samples provided is meant to reflect the scope of the specific 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.

2016	Specific Outcome	Achievement Indicators
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~~.	➢ Use and describe a mental mathematics strategy for determining a given sum. ➢ Use and describe a mental mathematics strategy for determining a given difference. ➢ Use and describe mental mathematics strategies, such as: • counting on and counting back • making 10 • using doubles • thinking addition for subtraction. ➢ Refine mental mathematics 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. ➢ Demonstrate understanding and application of strategies for addition facts up to and including 9 + 9 and related subtraction facts ~~to 18~~. ➢ Demonstrate recall/memorization of addition facts to a sum of 5 and related subtraction facts ~~to 5~~.

2016	Specific Outcome	Achievement Indicators
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.*	~~(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.)~~ ➢ 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. ➢ Solve a given problem using the standard/traditional addition algorithm. ➢ Solve a given problem using the standard/traditional subtraction algorithm.

2016	Specific Outcome	Achievement Indicators
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~~.	➢ 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 • one more; e.g., for 7 + 1, think one more than 7 • one less; e.g., for 9 – 1, think one less than 9 • two more; e.g., for 6 + 2, think two more than 6 • two less; e.g., for 11 – 2, think two less than 11 • 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. ➢ Use and describe a mental mathematics strategy for determining a sum to 18 and the related subtraction facts. ➢ Refine mental mathematics strategies to increase their efficiency. ➢ Demonstrate understanding and application of strategies for addition facts up to and including 9 + 9 and related subtraction facts ~~to 18~~. ➢ Demonstrate recall/memorization of addition facts up to and including 5 + 5 and related subtraction facts ~~to 10~~.

2016	Specific Outcome	Achievement Indicators
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]	~~(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.)~~ ➢ 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.

2016	Specific Outcome	Achievement Indicators
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]	~~(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.)~~ ➢ 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.

2016	Specific Outcome	Achievement Indicators
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.*	~~(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.)~~ ➢ 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. ➢ Solve a given problem using the standard/traditional addition algorithm. ➢ Solve a given problem using the standard/traditional subtraction algorithm.

2016	Specific Outcome	Achievement Indicators
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~~.	➢ 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 + ? = 13. ➢ Apply the property of zero to determine a given sum or difference when adding or subtracting zero; e.g., 5 + 0 = 5 and 5 – 0 = 5. ➢ 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 fact up to and including 9 + 9 or a related subtraction fact ~~to 18~~. ➢ Demonstrate understanding, recall/memorization and application of addition facts up to and including 9 + 9 and related subtraction facts ~~to 18~~.

2016	Specific Outcome	Achievement Indicators
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.*	~~(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.)~~ ➢ 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. ➢ Solve a given problem using the standard/traditional addition algorithm. ➢ Solve a given problem using the standard/traditional subtraction algorithm.

2016	Specific Outcome	Achievement Indicators
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.	➢ Provide examples for applying mental mathematics strategies: • skip counting from a known fact; e.g., for 3×6, think $3 \times 5 = 15$ plus $3 = 18$ • doubling; e.g., for 4×3, think $2 \times 3 = 6$ and $4 \times 3 = 6 + 6$ • doubling and adding one more group; e.g., for 3×7, think $2 \times 7 = 14$ and $14 + 7 = 21$ • ~~ten facts~~ patterns when multiplying by 9; e.g., for 9×6, think $10 \times 6 = 60$, and $60 - 6 = 54$; for 7×9, think $7 \times 10 = 70$, 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 $64 \div 8$, think $8 \times \square = 64$ • repeated doubling; e.g., for 4×6, think $2 \times 6 = 12$ and $2 \times 12 = 24$. ➢ Demonstrate understanding and application of strategies for multiplication and related division facts to 9×9. ➢ Demonstrate recall/memorization of multiplication and related division facts to 7×7.

2016	Specific Outcome	Achievement Indicators
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.*	~~(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.)~~ ➢ 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. ➢ Solve a given problem using the standard/traditional multiplication algorithm.

2016	Specific Outcome	Achievement Indicators
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.*	(It is not intended that remainders be expressed as decimals or fractions.) ~~(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.)~~ ➢ 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. ➢ Solve a given problem using the standard/traditional division algorithm.

2016	Specific Outcome	Achievement Indicators
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.*	➢ 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.

2016	Specific Outcome	Achievement Indicators
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.*	➢ Represent and solve a given one-step equation concretely, pictorially or symbolically. ➢ Solve a given one-step equation, using guess and test. ➢ Describe, orally, the meaning of a given one-step equation with one unknown. ➢ Solve a given equation when the unknown is on the left or right side of the equation. ➢ Represent and solve a given addition or subtraction problem involving a "part-part-whole" or comparison context, using a symbol to represent the unknown. ➢ Represent and solve a given multiplication or division problem involving equal grouping or partitioning (equal sharing), using a symbol to represent the unknown.

2016	Specific Outcome	Achievement Indicators
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]	➢ 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).

2016	Specific Outcome	Achievement Indicators
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.	➢ 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. ➢ Demonstrate understanding, recall/memorization and application of multiplication and related division facts to 9 × 9.

2016	Specific Outcome	Achievement Indicators
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]	➢ 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).

2016	Specific Outcome	Achievement Indicators
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]*	~~(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.)~~ ➢ Illustrate partial products in expanded notation for both factors; e.g., for 36×42, determine the partial products for $(30 + 6) \times (40 + 2)$. ➢ Represent both 2-digit factors in expanded notation to illustrate the distributive property; e.g., to determine the partial products of 36×42, $(30 + 6) \times (40 + 2) = 30 \times 40 + 30 \times 2 + 6 \times 40 + 6 \times 2 = 1200 + 60 + 240 + 12 = 1512$. ➢ 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. ➢ Solve a given problem using the standard/traditional multiplication algorithm.

2016	Specific Outcome	Achievement Indicators
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]*	~~(Students investigate a variety of strategies and become proficient in at least one appropriate and efficient strategy that they understand.)~~ ➢ 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. ➢ Solve a given problem using the standard/traditional division algorithm.

2016	Specific Outcome	Achievement Indicators
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]*	➢ Place the decimal point in a sum or difference, using front-end estimation; e.g., for 6.3 + 0.25 + 306.158, think 6 + 306, so the sum is greater than 312. ➢ Correct errors of decimal point placements in sums and differences without using paper and pencil. ➢ Explain why keeping track of place value positions is important when adding and subtracting decimals. ➢ Predict sums and differences of decimals, using estimation strategies. ➢ Solve a given problem that involves addition and subtraction of decimals, limited to thousandths.

2016	Specific Outcome	Achievement Indicators
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]* (continued)	➢ 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.

2016	Specific Outcome	Achievement Indicators
Grade 6 Number	(continued) *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	Achievement Indicators
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.*	➢ 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.

2016	Specific Outcome	Achievement Indicators
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* (continued)	➢ 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.

2016	Specific Outcome	Achievement Indicators
Grade 6 Number	(continued) • *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	Achievement Indicators
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* (continued)	➢ 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.

2016	Specific Outcome	Achievement Indicators
Grade 6 Number	(continued) • *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	Achievement Indicators
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]* (continued)	➢ 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.

2016	Specific Outcome	Achievement Indicators
Grade 7 Number	(continued) *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	Achievement Indicators
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]*	➢ 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.

2016	Specific Outcome	Achievement Indicators
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]*	➢ Substitute a value for an unknown in a given expression, and evaluate the expression.

2016	Specific Outcome	Achievement Indicators
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]*	➢ Represent a given problem with a linear equation; and solve the equation, using concrete models, e.g., counters, integer tiles. ➢ Draw a visual representation of the steps required to solve a given linear equation. ➢ Solve a given problem, using a linear equation. ➢ Verify the solution to a given linear equation, using concrete materials and diagrams. ➢ Substitute a possible solution for the variable in a given linear equation into the original linear equation to verify the equality.

2016	Specific Outcome	Achievement Indicators
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]* (continued)	➢ Model a given problem with a linear equation; and solve the equation, using concrete models, e.g., counters, integer tiles. ➢ Draw a visual representation of the steps used to solve a given linear equation. ➢ Solve a given problem, using a linear equation, and record the process. ➢ Verify the solution to a given linear equation, using concrete materials and diagrams. ➢ Substitute a possible solution for the variable in a given linear equation into the original linear equation to verify the equality.

2016	Specific Outcome	Achievement Indicators
Grade 7 Patterns and Relations	(continued) *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	Achievement Indicators
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]*	➢ 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.

2016	Specific Outcome	Achievement Indicators
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]*	➢ 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.

2016	Specific Outcome	Achievement Indicators
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]*	➢ 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.

2016	Specific Outcome	Achievement Indicators
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]* (continued)	➢ Model a given problem with a linear equation; and solve the equation, using concrete models, e.g., counters, integer tiles. ➢ Verify the solution to a given linear equation, using a variety of methods, including concrete materials, diagrams and substitution. ➢ Draw a visual representation of the steps used to solve a given linear equation, and record each step symbolically. ➢ Solve a given linear equation symbolically. ➢ Identify and correct an error in a given incorrect solution of a linear equation. ➢ Apply the distributive property to solve a given linear equation; e.g., $2(x + 3) = 5$ is equivalent to $2x + 6 = 5$. ➢ Solve a given problem, using a linear equation, and record the process.

2016	Specific Outcome	Achievement Indicators
Grade 8 Patterns and Relations	(continued) *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	Achievement Indicators
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]* (continued)	➢ Order a given set of rational numbers in fraction and decimal form by placing them on a number line; e.g., $\frac{3}{5}$, $-0.666\ldots$, 0.5, $-\frac{5}{8}$, $\frac{3}{2}$. ➢ 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.

2016	Specific Outcome	Achievement Indicators
Grade 9 Number	(continued) *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	Achievement Indicators
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]* (continued)	➢ 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.

2016	Specific Outcome	Achievement Indicators
Grade 9 Number	(continued) ▪ *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	Achievement Indicators
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]*	➢ Model addition of two given polynomial expressions concretely or pictorially, and record the process symbolically. ➢ Model subtraction of two given polynomial expressions concretely or pictorially, and record the process symbolically. ➢ Identify like terms in a given polynomial expression. ➢ Apply a personal strategy for addition or subtraction of two given polynomial expressions, and record the process symbolically. ➢ Refine personal strategies to increase their efficiency. ➢ Identify equivalent polynomial expressions from a given set of polynomial expressions, including pictorial and symbolic representations. ➢ Identify the error(s) in a given simplification of a given polynomial expression.

2016	Specific Outcome	Achievement Indicators
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]*	➢ Model multiplication of a given polynomial expression by a given monomial concretely or pictorially, and record the process symbolically. ➢ Model division of a given polynomial expression by a given monomial concretely or pictorially, and record the process symbolically. ➢ Apply a personal strategy for multiplication and division of a given polynomial expression by a given monomial. ➢ Refine personal strategies to increase their efficiency. ➢ Provide examples of equivalent polynomial expressions. ➢ Identify the error(s) in a given simplification of a given polynomial expression.