Summary of Updates to:
Alberta K–9 Mathematics Achievement Indicators

This document highlights updates to the ***Alberta K–9 Mathematics Achievement Indicators*** support document for September 2015.

- The introduction has been updated (page 1, AI).
- New achievement indicators have been added to include standard/traditional algorithm achievement indicators in the grades 2–5 Number strand outcomes related to operations (pages 16, 28, 41, 43, 44, 56, AI). These achievement indicators are highlighted on the following pages in this document. The corresponding 2014 outcomes and achievement indicators are included for comparison.
- The achievement indicators are organized by specific outcome. Refer to the Alberta Mathematics Kindergarten to Grade 9 Program of Studies 2007 (Updated 2014) for the complete program of studies.

2014

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 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.

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.

2015

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 and 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.

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.

2014	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]	(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.

2015	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]	(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.

2014	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]	(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.

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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]	(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.

2014	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]	(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.

2015	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]	(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.

2014	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]	(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.

2015	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]	(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.

2014	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]	(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., $86 \div 4$ is close to $80 \div 4$ or close to $80 \div 5$. ➢ Solve a given division problem by relating division to multiplication; e.g., for $100 \div 4$, we know that $4 \times 25 = 100$, so $100 \div 4 = 25$.

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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]	(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.

2014	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]	(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.

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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]	(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.

2014	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]	(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.

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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]	(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.