

Clarifications to the K–9 Mathematics Program of Studies 2016

Fall 2016

Alberta Mathematics Program of Studies

Alberta's Kindergarten to Grade 9 mathematics program was informed by research reviews in learning and teaching and was developed in consultation with education partners.

The Alberta Mathematics K–9 Program of Studies

MATHEMATICS KINDERGARTEN TO GRADE 9

INTRODUCTION

The Mathematics Kindergarten to Grade 9 Program of Studies has been derived from *The Common Curriculum Framework for K–9 Mathematics: Western and Northern Canadian Protocol*, May 2006 (the Common Curriculum Framework). The program of studies incorporates the conceptual framework for Kindergarten to Grade 9 Mathematics and the general outcomes and specific outcomes that were established in the Common Curriculum Framework.

BACKGROUND

The Common Curriculum Framework was developed by the seven ministries of education (Alberta, British Columbia, Manitoba, Northwest Territories, Nunavut, Saskatchewan and Yukon Territory) in collaboration with teachers, administrators, parents, business representatives, post-secondary educators and others. The framework identifies beliefs about mathematics, general and specific student outcomes, and achievement indicators agreed upon by the seven jurisdictions.

BELIEFS ABOUT STUDENTS AND MATHEMATICS LEARNING

Students are curious, active learners with individual interests, abilities and needs. They

come to classrooms with varying knowledge, life experiences and backgrounds. A key component in successfully developing numeracy is making connections to these backgrounds and experiences.

Students learn by attaching meaning to what they do, and they need to construct their own meaning of mathematics. This meaning is best developed when learners encounter mathematical experiences that proceed from the simple to the complex and from the concrete to the abstract. Through the use of manipulatives and a variety of pedagogical approaches, teachers can address the diverse learning styles, cultural backgrounds and developmental stages of students, and enhance within them the formation of sound, transferable mathematical understandings. At all levels, students benefit from working with a variety of materials, tools and contexts when constructing meaning about new mathematical ideas. Meaningful student discussions provide essential links among concrete, pictorial and symbolic representations of mathematical concepts.

The learning environment should value and respect the diversity of students' experiences and ways of thinking, so that students are comfortable taking intellectual risks, asking questions and posing conjectures. Students need to explore problem-solving situations in order to develop personal strategies and become mathematically literate. They must realize that it is acceptable to solve problems in a variety of ways and that a variety of solutions may be acceptable.

June 2014

Clarifications

The Alberta Mathematics Kindergarten to Grade 9 Program of Studies was updated in order to clarify program expectations. The updates clarify the following:

- expectations around number facts
- expectations around strategies
- how the program supports teachers in meeting their students' needs

Definitions

TERM	DEFINITION
Number Facts	Single digit addition, subtraction, multiplication and division.
Mastery	Mastery of number facts occurs when students understand and recall facts.
Recall	Recall of number facts is when students commit them to memory and retrieve them when needed.
Strategy	The application of a procedure with reasoning.

Number Facts Expectations

Grade 1

- Students begin to learn strategies for addition facts up to and including $9 + 9$ and related subtraction facts.
- Students recall addition facts to a sum of 5 and related subtraction facts by the end of Grade 1.

Grade 2

- Students apply strategies for addition facts up to and including $9 + 9$ and related subtraction facts.
- Students recall addition facts up to and including $5 + 5$ and related subtraction facts by the end of Grade 2.

Grade 3

- Students recall and apply addition facts up to and including $9 + 9$ and related subtraction facts.
- Students recall multiplication facts up to and including 5×5 and related division facts by the end of Grade 3.

Grade 4

- Students apply strategies for multiplication facts up to and including 9×9 and related division facts.
- Students recall multiplication facts up to and including 7×7 and related division facts by the end of Grade 4.

Grade 5

- Students recall and apply multiplication facts (multiplication tables) up to and including 9×9 and related division facts by the end of Grade 5.

2016 Clarifications

The Alberta Mathematics Kindergarten to Grade 9 Program of Studies has been updated for September 2016 in order to clarify program expectations. The updates clarify the following:

- removal of “such as” in specific outcomes in the Number strand
- clarification of “addition facts up to and including $5 + 5$ and $9 + 9$ ”
- addition of maintenance notes in specific outcomes in the Number strand in grades 4–9
- addition of notes regarding strategies in the Number strand in grades 2–5

Front matter

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 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.

Clarification of Expectations

Grade 2, Number, SO10

2016	Specific Outcome	Achievement Indicators
Grade 2 Number	<p>10. Apply mental mathematics strategies, such as:</p> <ul style="list-style-type: none"> • using doubles • making 10 • one more, one less • two more, two less • building on a known double • thinking addition for subtraction <p>for basic addition facts and related subtraction facts to 18. [C, CN, ME, PS, R, V]</p> <div data-bbox="343 782 852 972" style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>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.</p> </div>	<ul style="list-style-type: none"> ➤ Explain or demonstrate the mental mathematics strategy that could be used to determine a basic fact, such as: <ul style="list-style-type: none"> • 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.

Addition of Maintenance Notes

Grade 4, Number, SO11

Specific Outcome

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.

Addition of Maintenance Notes

Grade 9, Number, SO4

Specific Outcome

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]

Addition of Notes Regarding Strategies

Grade 3, Number, SO9

Specific Outcome

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.

Strategies

Strategies—the application of a procedure with reasoning.

Strategies must be:

- efficient
- accurate
- understood by the student (both conceptually and procedurally).

Students investigate a variety of strategies, including standard/traditional algorithms, to become proficient in at least one appropriate and efficient strategy that they understand.

Support Documents

Clarification of Expectations Regarding Strategies and Maintenance fact sheet

- provides details about the 2016 clarifications

Clarification of Expectations Regarding Strategies and Maintenance

Clarifications to the Alberta Mathematics Kindergarten to Grade 9 Program of Studies and to mathematics curriculum support documents are effective September 2016. The updates clarify expectations regarding strategies and maintenance of previous knowledge.

Does my child need to use a specific strategy?

No. Students investigate a variety of strategies for number operations, one of which must be the standard/traditional algorithm.

Students are to use a strategy that they understand. A student's strategy may evolve over time as the student continues to develop mathematical understanding.

Here are some samples of different ways that a student could solve an addition problem.

645 + 230 = ?

$$\begin{array}{r} 645 \\ + 230 \\ \hline 875 \end{array}$$

645 + 230 = 875

645 + 230 = ?

$$\begin{array}{r} 600 + 200 = 800 \\ 40 + 30 = 70 \\ 5 + 0 = 5 \\ 800 + 70 + 5 = 875 \end{array}$$

645 + 230 = 875

645 + 230 = ?

$$\begin{array}{r} 645 + 200 = 845 \\ 845 + 30 = 875 \end{array}$$

645 + 230 = 875

A fact sheet regarding [Strategies for Arithmetic Operations](https://education.alberta.ca/mathematics-k-9/program-supports/everyone/support-documents/) can be found on the Mathematics web page at <https://education.alberta.ca/mathematics-k-9/program-supports/everyone/support-documents/>.

Do students maintain previous knowledge related to number operations?

Yes. It is important for students to maintain knowledge related to number facts and number operations. Notes have been added to the mathematics program of studies to indicate to teachers areas where this knowledge could be reinforced.

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May 2016

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Support Documents

Strategies for Arithmetic Operations fact sheet

- provides samples of strategies for addition

Strategies for Arithmetic Operations

Our math program supports students in understanding math. We want students to be able to add, subtract, multiply and divide. We also want them to know how to reason, solve problems and apply math in real-life situations.

Based on students' needs, teachers can teach strategies to help build students' confidence and skill in problem solving.

What are strategies?

Strategies are meaningful steps students take to solve problems. Students refine their strategies as they continue to develop mathematically to become more efficient and skilled at solving problems.

There are different ways to record the steps for each operation. What's important is that students understand the math behind the steps. To help develop understanding, connections should be made to place value, base-ten concepts and number properties.

Samples

Some methods for recording steps may be familiar and others may be new. Here are some examples of strategies for addition.

Example 1 (Orange box):

$$\begin{array}{r} 645 \\ + 230 \\ \hline 875 \end{array}$$

⇒ $645 + 230 = 875$

Example 2 (Yellow box):

$$\begin{array}{r} 600 + 200 = 800 \\ 40 + 30 = 70 \\ 5 + 0 = 5 \\ 800 + 70 + 5 = 875 \end{array}$$

⇒ $645 + 230 = 875$

Example 3 (Green box):

$$\begin{array}{r} 645 + 200 = 845 \\ 845 + 30 = 875 \end{array}$$

⇒ $645 + 230 = 875$

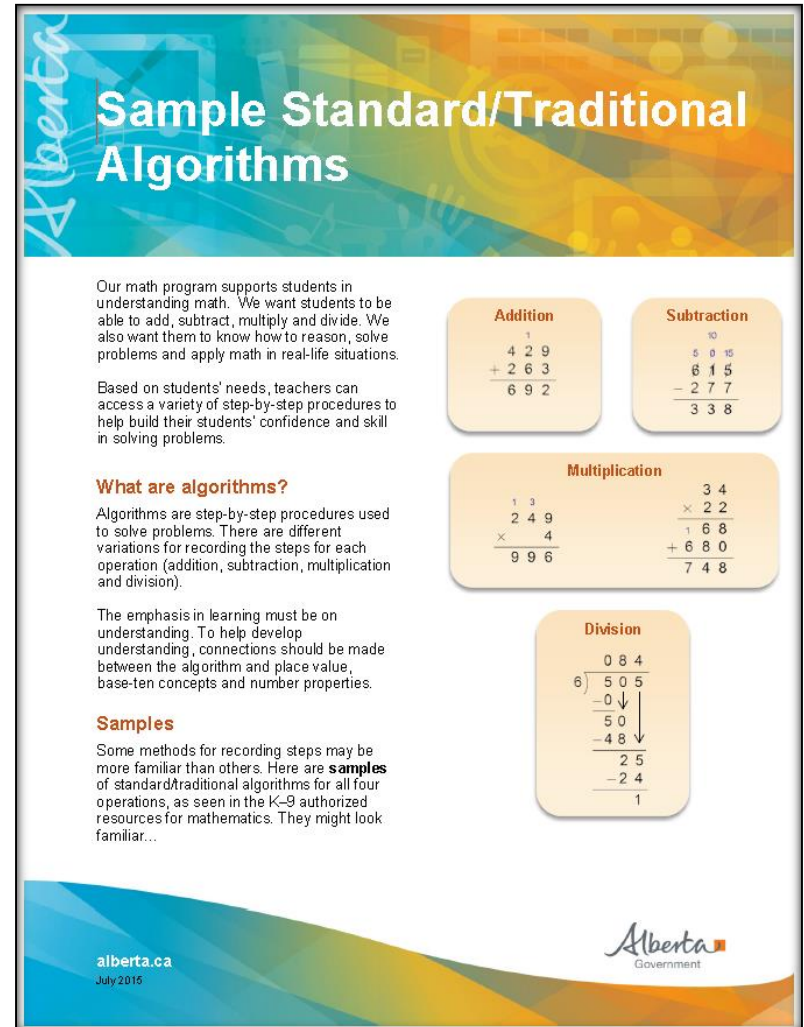
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Support Documents

Sample Standard/Traditional Algorithms fact sheet

- provides samples of standard/traditional algorithms for all four operations



The fact sheet is titled "Sample Standard/Traditional Algorithms" and features a header with the word "Alberta" in a stylized font. It contains four sections, each with a sample algorithm and an explanation. The sections are: Addition, Subtraction, Multiplication, and Division. Each section includes a sample problem and a brief description of the algorithm. The fact sheet also includes a section titled "What are algorithms?" and "Samples" which provide additional context and examples.

Sample Standard/Traditional Algorithms

Our math program supports students in understanding math. We want students to be able to add, subtract, multiply and divide. We also want them to know how to reason, solve problems and apply math in real-life situations.

Based on students' needs, teachers can access a variety of step-by-step procedures to help build their students' confidence and skill in solving problems.

Addition

$$\begin{array}{r} 1 \\ 429 \\ + 263 \\ \hline 692 \end{array}$$

Subtraction

$$\begin{array}{r} 10 \\ 5015 \\ - 277 \\ \hline 338 \end{array}$$

Multiplication

$$\begin{array}{r} 13 \\ 249 \\ \times 4 \\ \hline 996 \end{array}$$
$$\begin{array}{r} 34 \\ \times 22 \\ \hline 68 \\ + 680 \\ \hline 748 \end{array}$$

Division

$$\begin{array}{r} 084 \\ 6 \overline{) 505} \\ \underline{-0} \\ 50 \\ \underline{-48} \\ 25 \\ \underline{-24} \\ 1 \end{array}$$

What are algorithms?

Algorithms are step-by-step procedures used to solve problems. There are different variations for recording the steps for each operation (addition, subtraction, multiplication and division).

Samples

Some methods for recording steps may be more familiar than others. Here are **samples** of standard/traditional algorithms for all four operations, as seen in the K-9 authorized resources for mathematics. They might look familiar...

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Additional Support Resources

Additional Support Resources: Kindergarten to Grade 9 Mathematics

Alberta Education has developed the following list of resources in collaboration with teachers and administrators throughout Alberta to further support the teaching and learning of basics related to number facts, or number operations, or to support a variety of learning and teaching approaches for the Mathematics Kindergarten to Grade 9 Program of Studies. These resources are not part of Alberta Education's Authorized Resource List but are additional support resources for teachers to consider using in their classrooms. This list is updated on an ongoing basis.

Alberta Education does not advocate any one method of teaching over another. Teachers use their professional judgement and knowledge to select the most appropriate resources and methods of teaching that best meet the needs of their students.

The resources in this list have been reviewed by Alberta Education for [Recognizing Diversity and Promoting Respect](#) (RDPR) appropriateness (see Note 1 below regarding resources marked with a superscripted ❶). Curriculum congruency for each resource was provided by publishers and/or external partners. The contents of this list do not reflect the views, opinions and/or endorsement of Alberta Education. Teachers may wish to review the [list of authorized resources](#), as well as resources available digitally from [LearnAlberta.ca](#).

For more information regarding mathematics resources, contact Jan Olson, Senior Manager, Mathematics K–9 (English), at 780-427-3588 or Diane Stobbe, Senior Manager, Mathematics K–12 (French), at 780-427-7489. To be connected toll-free inside Alberta to either of these contacts, dial 310-0000.

Note:

1. For those digital resources noted with a superscripted ❶, only a portion of the components/links was reviewed for RDPR because of the nature of digital resources. In addition, digital content may have changed since the review. Teachers should independently confirm that resources are acceptable prior to use.
2. For those resources noted with a superscripted ❷, not all components of the resource correlate to the Alberta Mathematics Kindergarten to Grade 9 Program of Studies for that particular grade. Teachers should independently confirm that resources are acceptable for their grade prior to use.

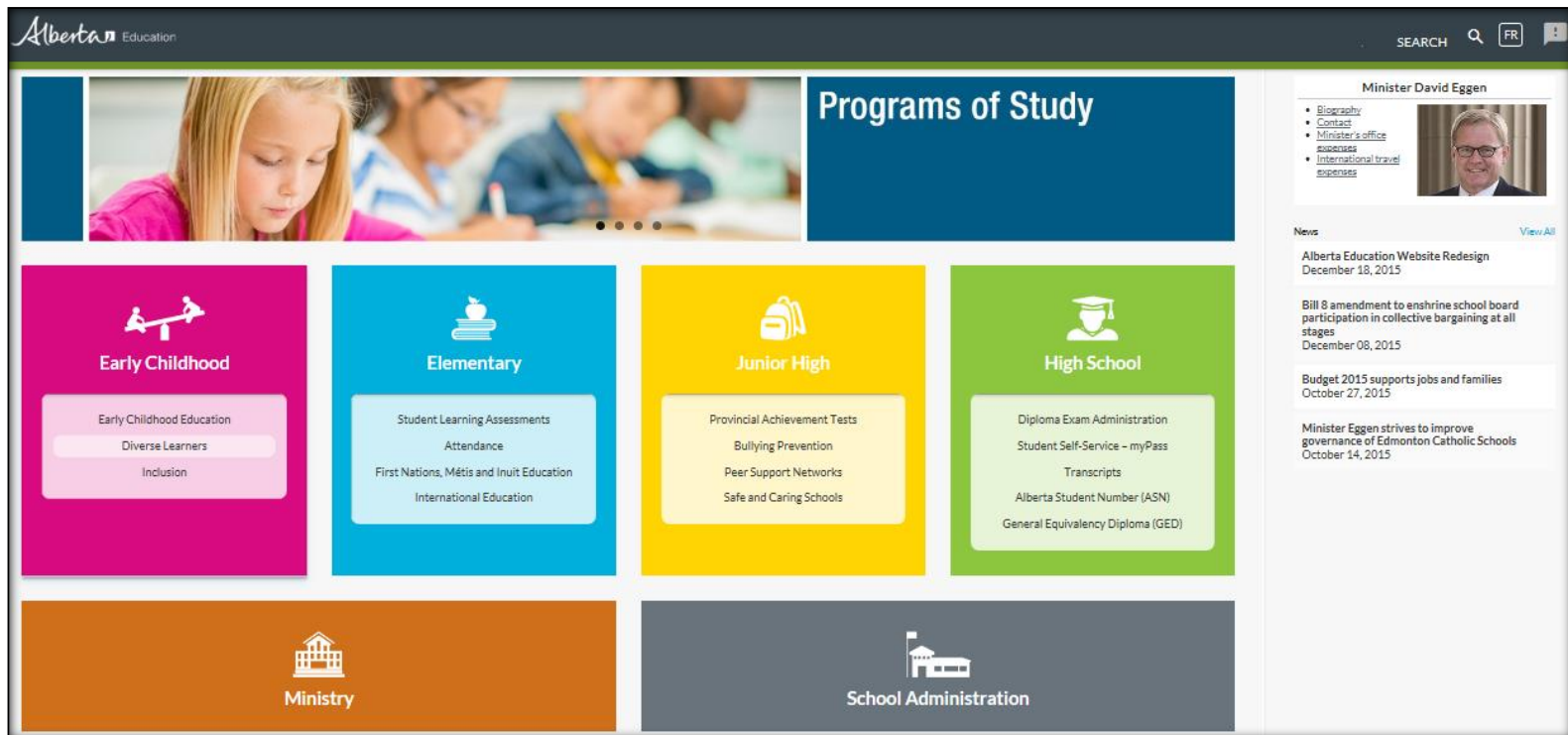
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Alberta Education Website

education.alberta.ca



Elementary Mathematics Professional Learning Opportunities

For teachers and pre-service teachers, a series of learning opportunities are being offered to provide additional support in the areas of:

- mathematics content
- assessment
- choices for instructional practice
- resources
- communicating with parents

Available through the Alberta Regional Professional Development Consortia (ARPDC)

WORK IN PROGRESS - CONTENT UNDER DEVELOPMENT

Equality section now accessible



Updates on Grade 3 SLA Numeracy and Grade 6 Math PAT

- In 2015, a Grade 3 SLA number facts component was added to the digital numeracy questions.
- In Spring 2016, a new number operations component for the Grade 6 Math PAT was field tested.
- In June 2017, the Grade 6 Math PAT will have a number operations component that students will complete without a calculator.
- For further information contact Nicole Lamarre, SLA and PAT Director, at:
Nicole.Lamarre@gov.ab.ca or 780-427-6204.

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