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Test Specifications

Provincial Mathematics Assessment Program

This document summarizes the test specifications of the Provincial Mathematics Assessments at Grade 3, Grade 5, and Grade 8.

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Provincial Mathematics Assessment Program

Overview

The Provincial Mathematics Assessment Program consists of three assessments:

1. Provincial Mathematics Assessment at Grade 3
2. Provincial Mathematics Assessment at Grade 5
3. Provincial Middle-Level Mathematics Assessment at Grade 8

Large-scale data gathered through the provincial assessment program enables policy makers to make programming decisions at the provincial, district or school level. Historical and longitudinal data provide information that may inform policy, professional development, and/or strategies to improve instructional practice. The provincial mathematics assessment program gathers information on each of the four strands of mathematics; Number, Patterns and Relations, Shape and Space, and Statistics and Probability. The provincial mathematics program also makes every effort to provide information on the goals of the New Brunswick Mathematics Curriculum (2010), which includes preparing students to:

- use mathematics confidently to solve problems,
- communicate and reason mathematically,
- appreciate and value mathematics,
- make connections between mathematics and its applications,
- commit themselves to lifelong learning,
- become mathematically literate adults,
- use mathematics to contribute to society (p. 3).

Students receive an overall score based on the percentage of questions correct. This, in turn, is compared to the assessment cut-point scores to determine level of achievement.

Content

Numeracy assessments are conducted at grade 3, grade 5 and grade 8 in both the English Prime and French Immersion programs. The assessments require students to respond independently to selected-response items, and to generate answers to open-response questions. Each question is selected or created by New Brunswick educators and is aligned to the New Brunswick Mathematics Curriculum.

The areas for assessment are based upon the General Curriculum Outcomes of the New Brunswick Mathematics Curriculum:

Strand	Percentage of Assessment*
Number <ul style="list-style-type: none">• Number Sense	40 - 50%
Patterns and Relations <ul style="list-style-type: none">• Patterns• Variables and Equations	10 - 15%
Shape and Space <ul style="list-style-type: none">• Measurement• 3-D Objects and 2-D Shapes• Transformations	20 - 30%
Statistics and Probability <ul style="list-style-type: none">• Data Analysis• Chance and Uncertainty	10 - 15%

* Percentages reflect the range within each of the different grade level curricular outcomes.

Competencies

A sound mathematical understanding is central in preparing our students for life in modern society. It is thus important to ensure students are adequately prepared to apply mathematical knowledge and to communicate mathematically when solving problems. To ensure the mathematics assessment program provides information on the mathematical literacy of our students, questions are aligned to measure competency in knowledge, problem solving, and communication. Each of these competencies is defined as follows:

Knowledge: The ability to recall factual and procedural knowledge with accuracy.

Problem Solving: The ability to extend prior knowledge to understand and solve problems. To make connections between and within the different strands of mathematics (number, patterns and relations, shape and space, statistics, and probability) and to employ efficient, methodical and organized thought processes to reach reasonable solutions.

Communication: The ability to use precise mathematical language, units, symbolic notation, models, and graphic representations to communicate with clarity.

Structure and Format

All elementary assessments will take place in late May to early June. In response to teacher feedback, the Provincial Mathematics Assessment at Grades 3 and 5 will consist of three separate parts which can be administered on a flexible schedule at any time during the elementary administration schedule. It is expected that each section will be completed independently and students will not be permitted to return to a previous section. The general layout of the elementary assessments will be as follows:

Grade 3	Grade 5
Part A: <i>Mental Math</i> <i>Multiple Choice</i>	Part A: <i>Mental Math</i> <i>Multiple Choice</i>
Part B: <i>Mental Math</i> <i>Multiple Choice</i>	Part B: <i>Mental Math</i> <i>Multiple Choice</i>
Basic Facts	Basic Facts
Part C: <i>Constructed Response</i>	Part C: <i>Constructed Response</i>

The Provincial Middle-Level Mathematics Assessment at Grade 8 will take place in early June. The general layout of the assessments will be as follows:

Grade 8
Part A: Calculator <i>Multiple Choice</i> <i>Constructed Response</i>
Part B: Non-Calculator <i>Mental Mathematics</i> <i>Multiple Choice</i> <i>Constructed Response</i>

Administration

To assist teachers and to ensure consistent administration, all teachers will use the *Teacher Guide* in the administration of the May/June assessment. Every teacher will receive the *Teacher Guide* along with each class set of assessment booklets.

Answer Sheets (bubble sheets) are no longer required for the provincial mathematics assessments.

Marking and Reporting

Open-response items are marked by a committee of teachers selected from across the province. The committee reviews each of the rubrics and establishes consistent standards for marking. Upon completion of the marking sessions, the booklets are sent for scanning and computer compilation. The results are reported at the school, district and provincial level per strand and competency.

To align with the new curriculum and new assessment format, a rubric was developed to assist in scoring constructed-response questions. There are two forms of the rubric: a General Rubric, which can be applied to problem-solving responses in all grade levels (see below) and a Specific Rubric, which is an adaptation of the General Rubric and is tailored specifically to measure the competencies demonstrated in response to specific questions. The new rubric replaces the 'point system' where information can get lost in conventions (i.e., calculation errors, using the incorrect or omitting units, etc.). The rubric is diagnostic in that each competency is assessed individually within a range of proficiency.

Mathematics Rubric (general)

	1	2
Knowledge	<i>Snapshot: Solution is partially complete</i>	<i>Snapshot: Correct solution</i>
	<ul style="list-style-type: none"> • Recalls factual and procedural knowledge with few errors. • Generally demonstrates accurate application of procedures. • May be minor errors or omissions but do not detract from meaning. 	<ul style="list-style-type: none"> • Recalls factual and procedural knowledge with accuracy. • Consistently demonstrates accurate application of procedures. • No errors or omissions.
Processes & Problem Solving	<i>Snapshot: Some evidence of appropriate strategy</i>	<i>Snapshot: Efficient strategy implemented</i>
	<ul style="list-style-type: none"> • Evidence of drawing on some prior knowledge. • Makes some connections between and within the different strands of mathematics. • Successfully selects effective strategies to solve the given problem. • Demonstrates evidence of thought process. • May omit some aspects of problem. • Provides reasonable answer within context of problem. 	<ul style="list-style-type: none"> • Analyses situation and extends prior knowledge. • Makes connections between and within the different strands of mathematics. • Successfully selects efficient strategies to solve the given problem. • Methodical and organized thought process. • All aspects of problem addressed. • Recognize and extract the mathematics embedded in the situation (mathematize). • Provides reasonable answer within context of problem.
Communication	<i>Snapshot: Diagrams and explanation may contain errors or be incomplete.</i>	<i>Snapshot: Work is clear, detailed, organized. Diagrams and explanation clear.</i>
	<ul style="list-style-type: none"> • Generally uses mathematical language, units and symbolic notation. • Uses some models and graphic representations to communicate thinking; some representations may lack clarity. • Records and explains reasoning and procedures with some clarity. • Demonstrates evidence of thought process. • Some awareness of audience and purpose. 	<ul style="list-style-type: none"> • Consistently uses precise mathematical language, units and symbolic notation. • Uses models and graphic representations efficiently to represent and communicate with clarity. • Records and explains reasoning and procedures with clarity, precision and thoroughness. • Thought processes can be easily followed. • Awareness of audience and purpose.

Scoring Using the Rubric

When marking a student response, teachers first assess the student’s knowledge and accuracy of a particular outcome; for example, a student’s ability to calculate area accurately. With a new lens, teachers then score the response based on the student’s ability to problem solve; to extract the necessary information from the scenario, select an appropriate strategy, and come to a reasonable solution. Finally, teachers then approach the same response regarding the student’s ability to communicate effectively; for example, using the appropriate units, models and mathematical language. Each competency is scored separately.

The bullets in this section identify the elements to look for within the competency, specific to each question.

	1	2
Knowledge <ul style="list-style-type: none"> Decomposing 200 cm into 3 parts (not necessarily equal) Adding and subtracting 50 blue beads and 30 red beads 	Snapshot: Solution is not fully complete <ul style="list-style-type: none"> Recalls factual and procedural knowledge with few errors Generally demonstrates accurate application of procedures May be minor errors or omissions but do not detract from meaning 	Snapshot: Correct solution <ul style="list-style-type: none"> Recalls factual and procedural knowledge with accuracy Consistently demonstrates accurate application of procedures No errors or omissions
Processes & Problem Solving <ul style="list-style-type: none"> Extracting necessary information from problem Designing/creating necklaces based on criteria 	Snapshot: Some evidence of appropriate strategy <ul style="list-style-type: none"> Evidence of drawing on some prior knowledge Makes some connections between and within the different strands of mathematics Successfully selects effective strategies Demonstrates limited evidence of thought process May omit some aspects of problem Provides reasonable answer within context of problem 	Snapshot: Appropriate strategy implemented <ul style="list-style-type: none"> Analyses situation and extends prior knowledge Makes connections between and within the different strands of mathematics Successfully selects efficient strategies to solve the given problem Methodical and organized thought process All aspects of problem addressed Recognize and extract the mathematics embedded in the situation (mathematize) Provides reasonable answer within context of problem
Communication <ul style="list-style-type: none"> Diagrams Explanations Showing steps/calculations 	Snapshot: Diagrams and explanation may contain errors or be incomplete. <ul style="list-style-type: none"> Generally uses mathematical language, units and symbolic notation Uses some models & graphic representations to communicate thinking; some representations may lack clarity Records and explains reasoning and procedures with some clarity. Demonstrates evidence of thought process Some awareness of audience and purpose 	Snapshot: Work is clear, detailed, organized. Diagrams and explanation clear. <ul style="list-style-type: none"> Consistently uses precise mathematical language, units and symbolic notation Uses models & graphic representations efficiently to represent and communicate thinking Records and explains reasoning and procedures with clarity, precision and thoroughness so thought processes can be easily followed Awareness of audience and purpose

When determining if the student response should get a 1 or a 2, look at each section holistically. Don’t count bullets, determine generally which category the response best belongs (exemplars can help with this determination).

Additional Information

Samples of the 2012 mathematics assessments are available on the Assessment and Evaluation portal site at: <https://portal.nbed.nb.ca/tr/AaE/Pages/default.aspx>

Further information regarding the Provincial Assessment Program can be found on the Assessment and Evaluation portal site located at: <https://portal.nbed.nb.ca/tr/AaE/Pages/default.aspx>

The *Administration of Provincial Assessments Protocols and Procedures* (2010) provides detailed information on the administration of the Provincial Mathematics Assessments and can be found at: <https://portal.nbed.nb.ca/tr/AaE/Other/Pages/default.aspx>

For information on Exemptions and Accommodations, please refer to *Protocols for Accommodations and Exemptions* (2010) which can be found on the portal at: <https://portal.nbed.nb.ca/tr/AaE/Documents/Assessment%20Protocols%20for%20Accommodations%20and%20Exemptions.pdf>