

THE ONTARIO MATHEMATICS PROFICIENCY TEST (MPT)

ASSESSMENT BLUEPRINT



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Overview

Demonstrating Mathematics Proficiency

The Ontario government requires all teacher applicants to demonstrate their mathematics proficiency through the successful completion of a mathematics proficiency test. Accordingly, the Ontario Legislature has enacted, as part of the Safe and Supportive Classrooms Act, 2019, amendments to the Ontario College of Teachers Act (OCTA), 1996, that all Ontario applicants (individuals who are enrolled in, or have completed, a program of professional education in Ontario) and Internationally Educated Teacher applicants must successfully complete the **Mathematics Proficiency Test (MPT)** prior to qualification.

The principal purpose of the *MPT*, according to the Ontario Deputy Minister of Education, is to “enhance teacher confidence and sense of efficacy in teaching mathematics, which will ensure that students are better prepared for success in all aspects of their lives”.

Subsequently, the Ontario Ministry of Education (OMOE) has mandated the Education Quality and Accountability Office (EQAO) to take responsibility for the development and reporting of the *MPT* and has issued regulations concerning aspects of the form, content, and operations of the test, details of which are set out in this blueprint.

Underpinning Principles

The philosophy of assessment at the Ontario Ministry of Education and at EQAO has always been that its primary purpose is to support learning. This philosophy underpins the development and operation of the *MPT*.

The *MPT* is not intended to discourage new teachers from entering the profession nor is it intended to add difficulties to teacher education either for teacher applicants or Ontario Faculties of Education (OFOE). Rather, it is, as the Ministry of Education has mentioned, a means to “enhance teacher confidence” and to support teachers in a subject area where their confidence may be low. Accordingly, the *MPT* will largely be based on the **principles of Assessment for Learning**.

The *MPT* will combine the diagnostic assessment of teacher applicants’ strengths and weaknesses in mathematics content and pedagogy with feedback and opportunities for remediation in those areas shown to be needed. Teacher applicants will have the ability to reattempt the test to build confidence and confirm their proficiency in mathematics.

Components of the Mathematics Proficiency Test

The regulations setting up the *MPT* call for the test to be composed of two components:

- **A mathematics content component** (70% of the test) based on mathematics content knowledge from the Ontario Curriculum Mathematics documents (grades 3 to 9); and
- **A pedagogy component** (30% of the test) based on foundational understanding of the mathematics curriculum, assessment and evaluation practices, as well as learning for all students centred on Ministry policy documents:
 - ✓ *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools - First Edition, Covering Grades 1 to 12, 2010 (Growing Success)*,
 - ✓ *Learning for All: A Guide to Effective Assessment and Instruction for All Students, Kindergarten to Grade 12, 2013 (Learning for All)*, and the
 - ✓ Front matter of the Ontario Curriculum mathematics documents¹. This refers to the pages of each curriculum document that precede the curriculum expectations for the specified grades (Front Matter).

Big Ideas in Mathematics

The *MPT* is not intended to assess all the mathematics skills and knowledge from Grades 3 through 9. The assessment items that comprise the mathematics content component of the *MPT* will be based on core understandings, otherwise known as big ideas, surrounding important content dimensions in mathematics. Big ideas in mathematics involve the interconnectedness of concepts “that form a framework for learning mathematics in a coherent way”.²

The *MPT* is developed on the principle that it is critical for teachers to have a good grasp of how mathematical concepts are inter-connected through overarching big ideas. “Teachers need to understand the big ideas of mathematics and be able to represent mathematics as a coherent and connected enterprise.” (Martin & Herrera, 2010, p.16).

The blueprint for the *MPT* involves overarching big ideas based on the following important mathematics content dimensions, as reflected in the Ontario curriculum:

- ✓ **Number Sense,**
- ✓ **Relationships and Proportional Reasoning,** and
- ✓ **Measurement.**

Assessment items will be embedded in contexts that reflect big ideas of the above three mathematics content dimensions so teacher applicants can demonstrate proficiency in key principles of mathematics knowledge and will apply mathematical reasoning.³

¹ Ontario Ministry of Education. (2005a). *The Ontario curriculum, Grades 1-8: Mathematics*. Ontario Ministry of Education. (2005b). *The Ontario curriculum, Grades 9-10: Mathematics*.

² Ontario Ministry of Education, 2005a, p.4

³ Ontario Ministry of Education, 2005b

Assessment Model

Teacher applicants will attempt the *MPT* in a proctored environment using a computer-based testing (CBT) delivery method. They will have the ability to select a test session⁴ (during a test window) on the platform according to their choice based on timing, location, available test sessions, and required accommodations.

The *MPT* will be automatically machine-scored and will provide diagnostic feedback on the performance to the teacher applicants within 10 days⁵ of completion of the test. The feedback will provide teacher applicants with their overall performance on both the mathematics content and pedagogy components of the test along with whether they were successful in each component. Additionally, they will receive feedback on the mathematics content dimensions and the associated categories of knowledge and skills, to support in identifying areas of the assessment they hold a strong understanding and areas of the assessment they need to remediate.

Upon completion of the assessment and receiving feedback, teacher applicants will have the opportunity to upgrade their skills. They can reattempt the *MPT* as many times as they would like, or as needed, based on the test session availability.

Number of Items

The *MPT* will have **75 items**. Each unique test (test form) will contain 71 items that count towards the teacher applicant's score. These will be 50 mathematics content items (70% of the test) and 21 pedagogy items (30% of the test).

The first 5 mathematics content items will cover the knowledge and understanding of number sense. Teacher applicants will be required to solve these items without the use of a calculator. The remaining 45 mathematics content items can be answered with the use (if desired) of a built-in calculator on the platform. The mathematics content items will be drawn from a test bank of over 250 psychometrically validated assessment items. The pedagogy items will be drawn from a test bank of over 100 items.

In every test administration, 4 field test items (that will not count towards the teacher applicant's score) will be included. These will be 1 non-calculator item, 2 calculator-enabled items, and 1 pedagogy item.

Time Period

The *MPT* is designed to be completed in a **2-hour time period**.⁶ This will provide teacher applicants with a little over 1 ½ minutes per item, although, some items could take teacher applicants a few seconds to attempt, resulting in more time allocated to what teacher applicants would perceive as more complex problems.

⁴ *Test sessions* are time periods that are pre-set by test administrators (OFOE) for teacher applicants to attempt the *MPT*. *Test windows* are time periods that are pre-set by EQAO for test administrators to create test sessions. EQAO has planned to have four, month-long test windows every year: winter, spring, summer, and fall.

⁵ The results are immediately made available for EQAO to review and validate prior to the report being automatically emailed from the system to the respective candidate.

⁶ Additional accommodations can be provided if required. See Accommodations and Accessibility section.

Framework for Mathematics Content

Content Dimensions for Mathematics

The mathematics content component of the *MPT* is designed to assess the understanding of big ideas based on the three mathematics content dimensions that encompass a wide range of learning expectations from Grade 3 to Grade 9 within the Ontario Mathematics Curricula. The mathematics content dimensions are: number sense, relationships and proportional reasoning, and measurement.

The content of the assessment items are embedded in contexts that reflect big ideas in mathematics. This will enable teacher applicants to demonstrate their understanding of key fundamental principles in mathematics and the application of mathematical reasoning. (OMOE, 2005b, p.23)

Subcategories

The subcategories of the mathematics content dimensions are interrelated and represent fundamental mathematics concepts. The assessment items in the *MPT* cover all the subcategories to ensure that a balance of concepts is assessed. The blueprint for the mathematics content component of the *MPT* includes the following subcategories:

Number Sense

- Operating with whole numbers, integers, decimals, and fractions: addition, subtraction, multiplication, division, and square root
- Expressing whole numbers using place value and expanded form
- Working with exponents
- Evaluating numeric expressions involving order of operations

Relationships and Proportional Reasoning

- Ordering and comparing whole numbers, integers, decimals and fractions
- Using relationships among fractions, decimals, and percent
- Working with percent
- Working with ratios, proportions, rates, and unit rates
- Solving problems involving proportional thinking
- Solving problems involving probability
- Recognizing linear vs non-linear relationships
- Representing linear relations: graphically, numerically, and algebraically
- Solving first degree equations
- Solving linear systems graphically
- Solving mean, median, and mode

Measurement (formulas provided)

- Applying Pythagorean theorem
- Solving problems involving conversions of metric units (perimeter, area, and volume).
- Solving problems involving perimeter of regular and irregular shapes and circles
- Solving problems involving area of regular and irregular shapes and circles
- Solving problems involving surface area of prisms and cylinders
- Solving problems involving volume of prisms and cylinders

Categories of Knowledge and Skills

The mathematics content assessment items are categorized under one of the three categories of knowledge and skills:

- **Knowledge and Understanding:** assesses the basic knowledge and understanding of mathematics concepts.
For example, demonstrating an understanding of the tenths place value in decimal numbers.
- **Application:** assesses the use of knowledge and understanding to make connections within and between various contexts. (OMOE, 2005a).
For example, applying the relationship between area and perimeter to solve for the area of a shape.
- **Thinking:** assesses critical thinking processes.
For example, the use of critical thinking to find the surface area of two attached cubes.

A higher proportion of assessment items are mapped to the Application category of knowledge and skills since the *MPT* is a minimum-competency mathematics assessment and teacher applicants will need to demonstrate that they can apply their knowledge and understanding of mathematics concepts to various contexts using a variety of tools and strategies to solve problems.

Financial Literacy

Through mathematics concepts, financial literacy engages major themes such as personal finances, budgeting, consumer literacy, and economic contexts (OMOE, 2016a; OMOE, 2016b). At least **12 mathematics content items** (24%+) of the mathematics content component of the *MPT* will have a financial literacy context. These items will cover content from any of the mathematics content dimensions and any of the categories of knowledge and skills.

Money amounts and financial literacy are embedded in specific mathematical learning expectations seen throughout The Ontario Mathematics Curricula. We can see this in Grade 3 Number Sense and Numeration where students are expected to “represent (using the \$ symbol) the value of a collection of coins” (OMOE, 2005a, p.55), all the way to Grade 9.

Financial literacy is not only important when it comes to the Ontario Curriculum expectations but is embedded in the daily lives of people. The *MPT* will cover financial literacy in day-to-day contexts, such as earning and purchasing; saving, investing, and borrowing; and scenarios related to transportation and travel.

Distribution of Assessment Items

This section describes the distribution of the mathematics content dimensions and categories of knowledge and skills that make up the mathematics content component **(70% of the *MPT*)** of test forms.

Distribution of Mathematics Content Dimensions

The *MPT* is designed to assess the Knowledge and Understanding, Application, and Thinking strategies of big ideas in mathematics based on the following mathematics content dimensions: number sense, relationships and proportional reasoning, and measurement.

The Ontario Curriculum, Grades 1-8: Mathematics states, under the strand Number Sense and Numeration, that “a well-developed understanding of number includes a grasp of more-or-less relationships, part-whole relationships, measures in the environment, and much more” (OMOE, 2005, p.8). It also states that representing number sense in various contexts can help students construct an understanding of numbers.

Measurement units are often used within a proportional reasoning context (when examining rates and ratios), also involving knowledge and understanding of number sense.

All of the mathematics content dimensions are connected; however, a larger overlap of number sense and measurement are shown within relationships and proportional reasoning.

The following table shows the distribution of the mathematics content dimensions on the *MPT*.

MATHEMATICS CONTENT DIMENSIONS	DISTRIBUTION
Number Sense	32%
Relationships and Proportional Reasoning	54%
Measurement	14%

Distribution of the Categories of Knowledge and Skills

As mentioned previously, the highest proportion of assessment items are mapped to the Application category of knowledge and skills. Since the *MPT* is a minimum-competency mathematics assessment, teacher applicants need to demonstrate that they can apply their understanding of mathematics concepts to various contexts.

Similar to the distribution of mathematics content dimensions, there is an overlap between the categories of knowledge and skills. A variety of items involve Knowledge and Understanding, Application, and Thinking.

Knowledge and Understanding is demonstrated within Application items and within Thinking items. Teacher applicants need knowledge and understanding in order to apply mathematics to a context as well as to plan, process, and critically think about how they will solve a problem. Items mapped to the skill of Thinking are more complex than those mapped to Knowledge and Understanding or Application. The cognitive load on the teacher applicant is greater for Thinking items. The *MPT* will have a larger proportion of items mapped to Knowledge and Understanding and Application than to Thinking.

The following table shows the distribution of categories of knowledge and skills on the *MPT*.

CATEGORIES OF KNOWLEDGE AND SKILLS	DISTRIBUTION
Knowledge and Understanding	40%
Application	50%
Thinking	10%

Distribution of Mathematics Content Dimensions Within the Categories of Knowledge and Skills

The mathematics content component of *MPT* consists of a total of 50 assessment items.

The Ontario Curriculum, Grades 1 to 8: Mathematics states that the strand Number Sense and Numeration refers to a general understanding of number and operations as well as the ability to apply this understanding in flexible ways (OMOE, 2005a).

Therefore, number sense is assessed through Knowledge and Understanding and Application mapped items.

Relationships and Proportional Reasoning is assessed across all categories of knowledge and skills with an emphasis towards Knowledge and Understanding and Application mapped items, however, still embedded among a variety of Thinking items.

Measurement is directly applicable to real world contextualized problem solving associated with telling time, finding length, perimeter, area, etc. (OMOE, 2005a), thus, measurement knowledge and skills are assessed through Application and Thinking items.

The following table shows the distribution of mathematics content assessment dimensions within the categories of knowledge and skills on the *MPT*.

MATHEMATICS CONTENT DIMENSIONS	KNOWLEDGE AND UNDERSTANDING	APPLICATION	THINKING
Number Sense	20%	12%	0%
Relationships and Proportional Reasoning	20%	28%	6%
Measurement	0%	10%	4%

Distribution of Mathematics Content Assessment Items

The table below shows how the types of assessment items will be distributed among the mathematics content dimensions and categories of knowledge and skills, ultimately showing the number of assessment items in the mathematics content component of the *MPT*: 16 number sense items, 27 relationships and proportional reasoning items, and 7 measurement items.

From the table, it is also evident that a greater proportion of number sense items require knowledge and understanding whereas a greater percentage of relationships and proportional reasoning and measurement items require an application component, showing a framework that has been further described in the following sections of the blueprint.

The following table shows the distribution of mathematics content items on the *MPT*.

MATHEMATICS CONTENT DIMENSIONS	KNOWLEDGE AND UNDERSTANDING	APPLICATION	THINKING
Number Sense	10 Items	6 Items	0 Items
Relationships and Proportional Reasoning	10 Items	14 Items	3 Items
Measurement	0 Items	5 Items	2 Items

Framework for Pedagogy

Content Dimensions for Pedagogy

The pedagogy component assesses knowledge surrounding *Growing Success*, *Learning for All*, and the Front Matter.

Growing Success

The Ontario Ministry of Education has outlined policies for the growing success of Ontario students in regards to the assessment, evaluation, and reporting of students across Ontario and within Ontario School Boards (2010). One of the primary roles of a teacher is to assess and evaluate student achievement levels and to then implement action to support the continued and growing success of students. Thus, this dimension of the pedagogy component will explore underlying principles, learning skills, working habits, performance standards, knowledge of assessment (*for, as and of learning*), knowledge of evaluation, as well as knowledge regarding the reporting of student achievement that are outlined within *Growing Success*.

Learning for All

This section of the pedagogy portion will assess the knowledge of teacher applicants regarding learning for all students, the connection between assessment and student achievement that is closely connected to a number of policies and initiatives regarding numeracy strategy, student success, and equity and inclusive education strategies to name a few (*Learning for All*, 2013, p.5).

This dimension of the pedagogy component assesses the knowledge of instructional approaches including differentiated instruction practices that will support learning for all students across Ontario. This includes the strategies that teachers may use to help all students reach their highest achievement potential ultimately leading towards closing the achievement gap (2013). It is imperative that teacher applicants have knowledge of effective instructional practices and strategies that will support the learning of all students across the province. This dimension of the pedagogy component will focus largely on the assessment for student learning.

Front Matter of the Mathematics Curriculum

This dimension of the pedagogy component of the *MPT* will focus on the Front Matter ensuring that teacher applicants have an understanding of the underlying concepts, ideas, program planning, strands, and the language used in the Ontario Mathematics curricula. This dimension will ensure teachers have a good understanding of the pages of the curriculum that precede the curriculum expectations from Grade 3 to Grade 9.

Assessing teacher applicants on pedagogy provides a good assurance that teachers are effective in supporting Ontario student achievement levels within the mathematical learning space across Ontario School Boards.

Distribution of Assessment Items

This section describes the distribution of the pedagogy dimensions that make up the pedagogy component (**30% of the *MPT***) of test forms.

Distribution of Pedagogy Dimensions

The three dimensions that make up the pedagogy component of the *MPT* are distributed in a way that a larger emphasis is on the first two dimensions: *Growing Success* and *Learning for All*.

It is also understood that ideas and contents of each of these categories are intertwined and connected. For example, assessment and evaluation of student achievement are contents of both *Growing Success* and the Front Matter, whereas instructional approaches is a content of both the *Learning for All* and Front Matter dimensions. Therefore, assessment items will be mapped to the most appropriate category.

The following table shows the distribution of pedagogy dimensions on the *MPT*.

PEDAGOGY DIMENSIONS	DISTRIBUTION
Growing Success	43%
Learning for All	43%
Front Matter of the Mathematics Curricula	14%

Distribution of Pedagogy Assessment Items

The pedagogy component of the *MPT* will consist of a total of 21 assessment items.

The following table shows the distribution of pedagogy items on the *MPT*.

PEDAGOGY DIMENSIONS	NUMBER OF ASSESSMENT ITEMS
Growing Success	9
Learning for All	9
Front Matter of the Mathematics Curricula	3

Assessment Items and Questionnaire

Item Types

Assessment items will be created in the form of multiple-choice type questions (e.g., check boxes, drag and drop, selection, ordering lists, number lines, etc.).

A few examples of the assessment item types include:

Selection Response Type

This number line segment is divided into four equal parts.



When the four numbers $\frac{1}{6}$, $\frac{2}{5}$, 0.19 and 0.3 are placed on the number line, how many have positions to the left of A?

1	2
3	4

Ordering Response Type

Place the following measurements in order from least to greatest.

Drag the values to place them in order.

1 m 90 cm	2 m	85 cm
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Drag and Drop Response Type

What is the missing value in the proportion?

$$\boxed{} = \frac{36}{24}$$

27	12	48	6
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Drag the appropriate value into the blank space above.

Number Line Drag and Drop Response Type

Drag the appropriate value into the indicated location on the number line.



$\frac{1}{25}$	$\frac{1}{20}$	$\frac{1}{4}$	$\frac{4}{10}$
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These types of items will allow for immediate machine scoring of the results and can therefore provide a list of successful teacher applicants to the OCT in a relatively quick time period.

Bias and Sensitivity

Bias and sensitivity is a key aspect that will be taken into consideration when identifying assessment items for the *MPT*.

Some aspects of bias and sensitivity will be measured objectively during item field testing using parameters from item-response theory to identify geographic and other demographic indicators which predict reduced performance on items. These will then be further reviewed to identify more specific causes (e.g. religious holidays, celebrations, pets). Items in the item bank will be carefully reviewed against a rubric that factors in identity, social justice, and equity issues prior to being released for field testing.

Non-calculator Items and Calculator-enabled Items

When a calculator is used to solve mathematics content problems, it is important for teacher applicants to know how to operate it properly. It is certainly a useful tool to work through problems while focusing on critical thinking. However, it is also important for teacher applicants to demonstrate the ability to perform mathematical operations without it.

To this end, the first 5 assessment items of the mathematics content component of the *MPT* will be answered without the use of a calculator. These items, referred to as non-calculator items, will be number sense items from the Knowledge and Understanding category of knowledge and skills and will test the skills of basic computations. Once teacher applicants complete these 5 items, they will have access to the remaining 45 items that can be answered with the use (if desired) of a built-in calculator available within the *MPT* platform. These items are referred to as calculator-enabled items.

Item Bank

Although each test form will have 50 mathematics content items and 21 pedagogy items, the item bank (test bank) will consist of over 250 mathematics content items and 100 pedagogy items. This will ensure a variety of items covering all subcategories and will support the creation of unique testlets (blocks of items used to create the unique test form) of equal difficulty and ultimately unique test forms of equal difficulty.

The item bank maintains critical metadata on each item. The item testlet allocation metadata, for example, allows for an efficient pull of (pre-computed) psychometrically equated test forms. The item bank also employs an immutable version control system for items to ensure that every edit made to an item is tracked.

Item Pre-testing

The initial 250+ items that will make up the mathematics component of the *MPT* in winter 2020 are pre-tested items that have been psychometrically validated. The initial implementation of the *MPT* in winter 2020, will also act as a pre-testing of both the mathematics content and pedagogy items that will soon after be psychometrically validated.

Item Field Testing

The mathematics assessment items for the *MPT* will have strong psychometric properties to ensure a reliable and accurate reflection of the teacher applicants' proficiency in mathematics. As much as the increase in the number of test sessions and test windows may affect a high exposure of items which would motivate new item construction, the increased usage of the *MPT* also provides opportunities for field-testing newly constructed items. Field-test items will be embedded in every *MPT* that is administered to derive item statistics for equating purposes and to ensure a continued high quality item bank.

As described earlier, in every test administration, 4 field test items (that will not count towards the teacher applicants score on the test) will be included in the *MPT*. These items will be 1 non-calculator item, 2 calculator-enabled items, and 1 pedagogy item.

Questionnaire Items

In addition to the two components of the *MPT*, teacher applicants will complete the Mathematics Attitude and Perceptions Survey (MAPS), a 32-item questionnaire designed to assess overall attitudes and dispositions towards mathematics at the undergraduate level. The survey was developed at the University of British Columbia (UBC) and its validation has been peer-reviewed and published (2016). As part of the survey, teacher applicants will be asked to respond to identity-based questions to permit the examination of identity-informed outcomes.

Test Design

Test Design Criteria

A test bank of assessment items (with psychometric properties) will be available and categorized into testlets (blocks) of items from which versions (test forms) of the *MPT* will be constructed.

The following are key criteria⁷ followed in the test design:

- ✓ Each teacher applicant will receive a unique test form.
- ✓ Each test form will be of equal difficulty.
- ✓ Each test form will be equally representative of the assessment framework.
- ✓ Each test form will have the same number of items.
- ✓ Each test form will contain sufficient items for reporting purposes yet short enough to complete in a reasonable length of time.
- ✓ Each test form will have enough items to enable reliable reporting of the performance on both the mathematics content component and pedagogy component of the *MPT*.

Assessment Delivery Method

For a technology-based, modern, integrated assessment design, the *MPT* uses a computer-based testing (CBT) method of delivery.

Today, the high level of sophistication that can be achieved with CBT such as on-demand testing anywhere and at any time, the ability to produce large numbers of equivalent test forms, adaptive and multistage testing, the use of technology-enhanced items and game-based items, and the ability to perform complex computerized exercises on low (to no) WiFi enabled devices, has created numerous opportunities for assessing the performance and cognitive ability of teacher applicants in many dimensions.

The *MPT* uses the ***testlet-based Linear-on-the-Fly Test (tLOFT)*** delivery method⁸.

The tLOFT is an assessment delivery method where test forms are generated in real-time by selecting pre-constructed testlets (blocks of items). This delivery method has the following key features:

- It randomly chooses testlets⁹ that are categorized.
- Every testlet is designed to meet the required content and statistical expectation.
- It enables review and answer changes by teacher applicants.
- It provides a fixed test length.
- It aligns to the multiple mathematics content dimensions and categories of knowledge and skills.

⁷ The College Student Achievement Project Team (2015)

⁸ For your reference, there are numerous CBT delivery methods that have been summarized and compared by Luecht & Sireci (2011); Folk & Smith (2002); Luecht (2013); and van der Linden (2006).

⁹ Wainer and Kiely (1987)

Construction of Test Forms

The *MPT* will have two sections: a mathematics content component and a pedagogy component. The mathematics content component is divided into two sections: the first one containing 5 items that are solved without the use of calculators (non-calculator items) and the remaining 45 items that may be solved with the use of calculators (calculator-enabled items). The pedagogy component will have 21 questions.

Mathematics Content Component

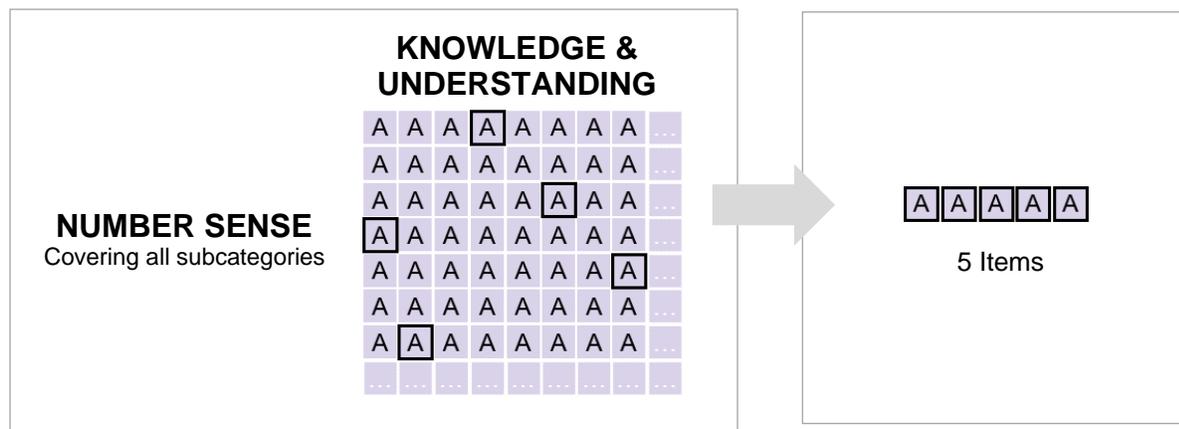
The item bank for the mathematics component will be comprised of over 250 assessment items distributed across the mathematics content dimensions and categories of knowledge and skills. The items are categorized as type A (Knowledge and Understanding), type B (Application), and type C (Thinking) items.

Out of the 250+ items, about 25 will be non-calculator items that will comprise the initial 5 questions of the test form. The remaining items (about 225) can be answered with the use of a calculator (if desired).

Selecting Non-calculator Items from the Item Bank

Non-calculator items are those items for which the use of calculators is not permitted. They test the skills of teacher applicants to perform mathematical operations.

The following example illustrates the selection of non-calculator items from the test bank as highlighted with a black border and the creation of the test form.



With every attempt of the *MPT*, teacher applicants receive a unique test form. After attempting the 5 non-calculator items, teacher applicants will have access to the 45 calculator-enabled items.

Selecting Calculator-enabled Items from the Item Bank

Based on the distribution, calculator-enabled items will be selected from the item bank for each test form.

The following example illustrates the selection of calculator-enabled items from the test bank as highlighted with a black border.

	KNOWLEDGE & UNDERSTANDING	APPLICATION	THINKING
NUMBER SENSE Covering all subcategories	A A A A A A A A ...	B B B B B B B B ...	
	A A A A A A A A ...	B B B B B B B B ...	
	A A A A A A A A ...	B B B B B B B B B ...	
	A A A A A A A A ...	B B B B B B B B ...	
	A A A A A A A A ...	B B B B B B B B ...	
	A A A A A A A A ...	B B B B B B B B B ...	
	A A A A A A A A ...	B B B B B B B B ...	
RELATIONSHIPS & PROPORTIONAL REASONING Covering all subcategories	A A A A A A A A ...	B B B B B B B B ...	C C C C C C C C ...
	A A A A A A A A ...	B B B B B B B B ...	C C C C C C C C ...
	A A A A A A A A ...	B B B B B B B B ...	C C C C C C C C ...
	A A A A A A A A ...	B B B B B B B B ...	C C C C C C C C ...
	A A A A A A A A ...	B B B B B B B B ...	C C C C C C C C ...
	A A A A A A A A ...	B B B B B B B B ...	C C C C C C C C ...
	A A A A A A A A ...	B B B B B B B B ...	C C C C C C C C ...
MEASUREMENT Covering all subcategories		B B B B B B B B ...	C C C C C C C C ...
		B B B B B B B B ...	C C C C C C C C ...
		B B B B B B B B ...	C C C C C C C C ...
		B B B B B B B B ...	C C C C C C C C ...
		B B B B B B B B ...	C C C C C C C C ...
		B B B B B B B B ...	C C C C C C C C ...
		B B B B B B B B ...	C C C C C C C C ...

The numbers of items selected from the test bank for each category of calculator-enabled items are shown in the table below.

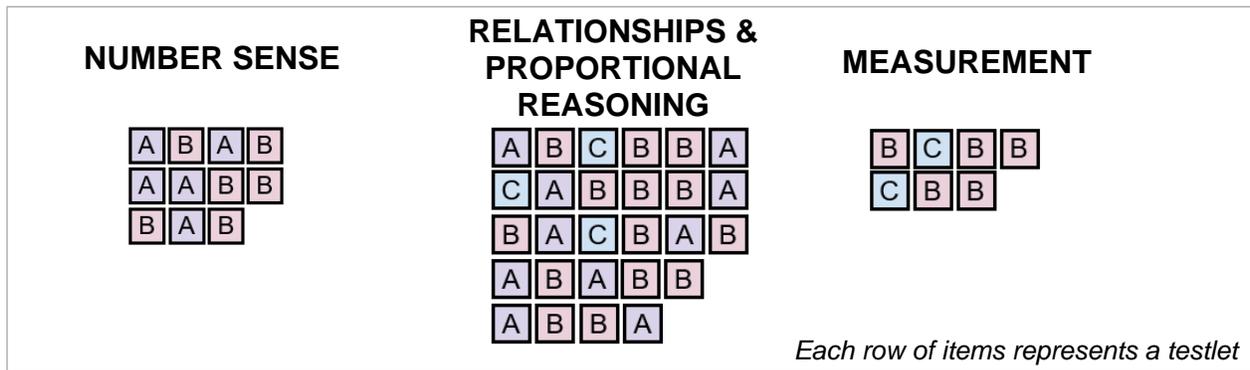
#	MATHEMATICS CONTENT DIMENSIONS	CATEGORIES OF KNOWLEDGE AND SKILLS	NUMBER OF ITEMS	
			PER CATEGORY	PER DIMENSION
1	Number Sense	Knowledge and Understanding	5 Items	11 items
2	Number Sense	Application	6 Items	
3	Relationships and Proportional Reasoning	Knowledge and Understanding	10 Items	27 items
4	Relationships and Proportional Reasoning	Application	14 Items	
5	Relationships and Proportional Reasoning	Thinking	3 Items	
6	Measurement	Application	5 Items	7 items
7	Measurement	Thinking	2 Items	
			Total: 45 items	

Testlets Construction

The following are key features in the construction of testlets of items for test forms:

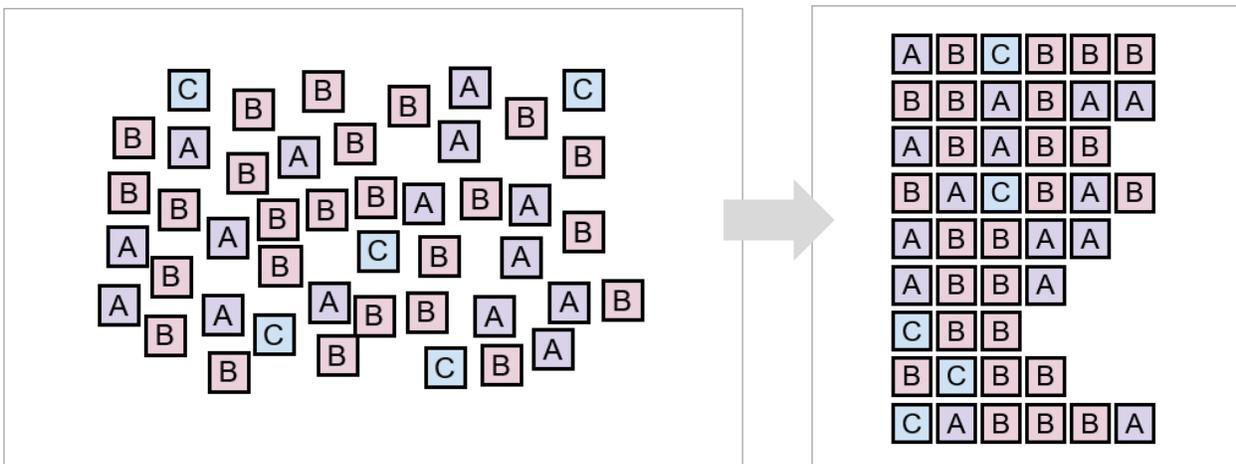
- Each testlet of items will have, as close as possible, the approximate difficulty level (i.e., average p -value);
- Each testlet of items will have a range of content tags (i.e., the range of subcategories) that will be as broad as possible;
- Each number sense testlet will have at least 1 type A item, at least 2 type B items, and no type C items.
- Each relationships and proportional reasoning testlet will have at least 1 type A item, at least 2 type B items, and no more than 1 type C item.
- Each measurement testlet will have no type A items, at least 1 type B item, and at least 1 type C item.

The following example illustrates the selected calculator-enabled items used for the construction of testlets.



Item Reordering and Test Form Creation

Once the testlets have been constructed, the calculator-enabled items are reordered and a unique test form is generated.



With every attempt of the *MPT*, teacher applicants receive a unique test form.

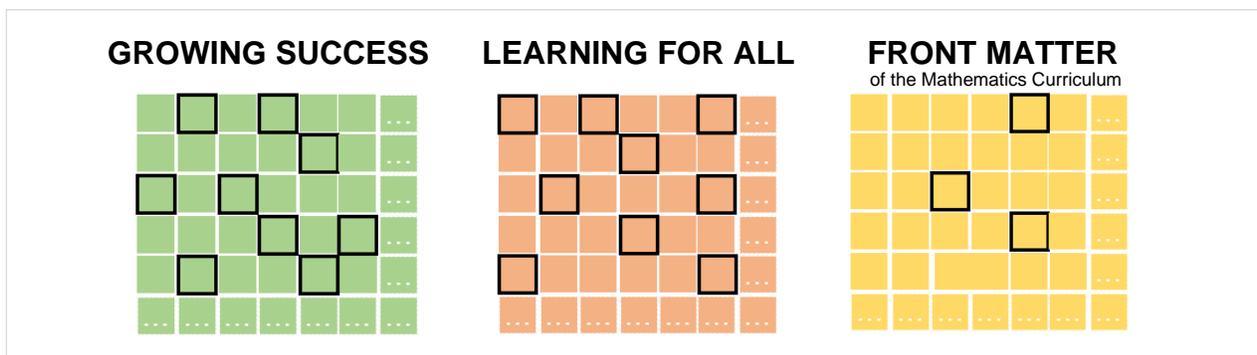
Pedagogy Component

Pedagogy assessment items will be sorted into the following three dimensions that make up the *MPT* framework as per the distribution: *Growing Success*, *Learning for All*, and the Front Matter of The Ontario Mathematics Curriculum.

Selecting Items from the Item Bank

The item bank will comprise of over 100 assessment items distributed across the three dimensions. Based on the distribution, items will be selected from the item bank for each test form.

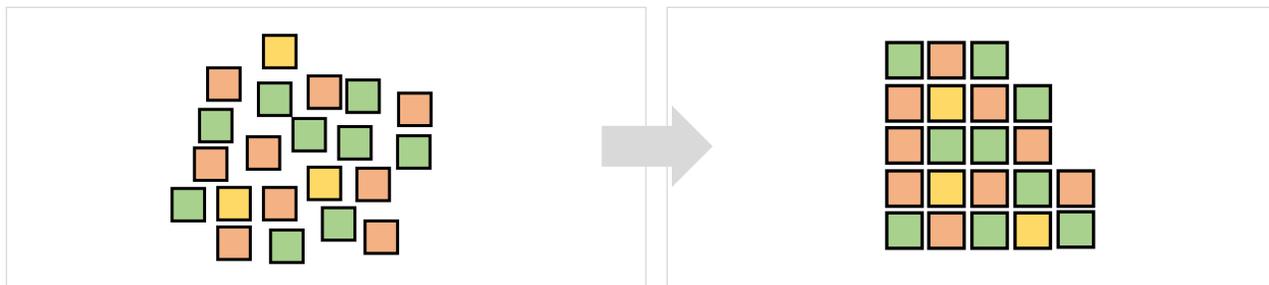
The following example illustrates items that are selected from the test bank as highlighted with a black border.



The number of items selected for each category is shown below.



The items are then reordered and a unique test form is generated.



With every attempt of the *MPT*, teacher applicants receive a unique test form.

On-demand Test Form Creation

When the teacher applicant is ready to begin the test, the testlets of items are constructed automatically from the respective test banks to generate a unique test form.

The first 5 questions to be solved without the use of a calculator are reordered and placed at the beginning of the test. The following 45 content questions are reordered and placed next, and finally, 21 pedagogy questions are selected, reordered and placed at the end of the test form. This on-demand test form creation allows for numerous test forms to be created for each test session and across multiple test sessions that equally represent the *MPT* framework.

Reporting

When a teacher applicant completes the *MPT*, their test is automatically machine-scored. Within 10 days (after validation by EQAO), the teacher applicant will receive an email, generated from the *MPT* platform, with a report describing their performance on both the mathematics content component and pedagogy component.

The report shows teacher applicants if they are **“successful”** or **“not yet successful”** on the test. This is based on an achievement of at least 70% on each of the two components: mathematics content component and pedagogy component. The report will show their score (as a percentage) on each of the components.

Additionally, they will see a visual representation of their performance on the three mathematics content dimensions and knowledge and skills categories for the mathematics content component and the three dimensions of the pedagogy component.

Their performance is indicated with two colours:

-  Green (G) represents a score above the threshold.
-  Amber (A) represents a score under the threshold.

If teacher applicants are not successful on the *MPT*:

- They can use their performance feedback, which is provided on the report, to improve their skills and reattempt the test.
- They are required to reattempt the entire test (both components), irrespective of their results on individual components on the previous attempt.
- They can reattempt the test based on the test session and test window availability at the faculty.

An example of a report that teacher applicants receive is shown below.

English Français

Mathematics Proficiency Test

Sample Teacher Applicant [Logout](#)

Teacher Applicant / Results / Jan. 23, 2020 Print

Attempt #1

Status:	Not Yet Successful
Applicant:	Sample Test Cand...
College application number:	123456
Administered By:	University of Ottawa
Date:	Jan. 23, 2020
Time:	10:00am to 11:23am
Location:	Room 123, H Hall
Attempt Key:	XYZ

Number of Questions Answered: 64 of 75

The Ontario Mathematics Proficiency Test measures key skills in the Ontario mathematics curriculum from grades 3 to 11 and knowledge of pedagogy described in official Ministry of Education documents. Success on both parts of the test confirms that an applicant has met the minimum standard for mathematics proficiency required for certification by the Ontario College of Teachers (OCT).

In order to be deemed successful, those writing the test require a score of 70% or higher in each of the two components. On this results page, a *green light* or "G" represents a score at or above this threshold, and an *amber light* or "A" represents a score below this threshold.

Performance and Feedback

A ● Mathematics Content (62%: not yet successful)

- A ● Number Sense (non-calculator)
G ● Number Sense (calculator-enabled)
You demonstrated *knowledge and understanding* of number sense concepts.
You demonstrated the ability to *apply* knowledge and understanding to solve number sense problems.
- A ● Relationships and Proportional Reasoning
You demonstrated *knowledge and understanding* of relationships and proportional reasoning concepts.
As a next step, it is recommended that you focus on demonstrating the ability to *apply* knowledge and understanding to solve relationships and proportional reasoning problems.
As a next step, it is recommended that you focus on demonstrating an ability to *apply* a *critical thinking* process to solve relationships and proportional reasoning problems.
- G ● Measurement
You demonstrated the ability to *apply* knowledge and understanding to solve measurement problems.
You demonstrated an ability to *apply* a *critical thinking* process to solve measurement problems.

G ● Pedagogy (91%: successful)

- A ● Growing Success
- G ● Learning for All
- G ● Front matter of The Ontario Mathematics Curriculum

Accommodations and Accessibility

Accommodations

Accommodations support learning and also aid in the expression of understanding of concepts and ideas.

Test administrators, through the accessibility office at their university, can provide appropriate accommodations to teacher applicants without compromising the demonstration of knowledge and skills reflected in the components of the *MPT*. According to the Ontario Human Rights Commission, it is necessary for test providers to “Implement policies and procedures to ensure that students with disabilities receive appropriate, dignified, and confidential accommodations to testing procedures” (Ontario Human Rights Commission, 2003, p.78).

Some ways in which Faculties can provide accommodations for teacher applicants with respect to the *MPT* are listed below:

- additional and unlimited breaks throughout the test session;
- distraction reduced areas for testing sessions;
- extension of allocated time;
- use of a reader for testing sessions;
- use of a scribe for testing sessions.

Accessibility

The *MPT* platform will accommodate teacher applicants with accessibility requirements, up to the standard of Web Content Accessibility Guidelines (WCAG) 2.0 Level AA. This is the requirement set by the Ontario government for public websites by January 1, 2021, to comply with the Accessibility for Ontarians with Disabilities Act (AODA). The purpose of these standards is to provide alternative content or functionality for teacher applicants with different learning needs, including:

- Blindness and low vision
 - Screen zooming, high contrast mode, text alternatives for color-dependent items, compatibility with screen reader software
- Deafness and hearing loss
 - Design will avoid a need for deafness and hearing loss accommodations.
- Mobility impairments
 - Alternatives to drag & drop items
 - Full keyboard navigation
- Speech impairments
 - Design will avoid a need for speech accommodations.

The *MPT* platform is compliant with the principles of the WCAG, in that it implements content that is Perceivable, Operable, Understandable, and Robust for all users.

Data Analysis and Security

Data Analysis

Teacher applicant response data and activity data from the *MPT* platform will enable insights primarily into performance on test content as well as general use of the platform. Of key interest is how teacher applicants are responding to items with regards to both the range of responses (including whether or not they attempted an item), as well as their overall performance on the test and on an item to item basis. Some further insight into test difficulty is provided with timestamps and time spent on a response level.

Analysis on the overall use of the platform includes how often teacher applicants are using the platform, what test windows are frequented, and how many test sessions have closed or have been completed.

Field testing will accompany psychometric analysis to establish test reliability. The results from this process will ensure that data analysis carried out by EQAO will produce valid and actionable results.

Security

A key concern regarding the *MPT* is test security. Measures have been implemented to guard against compromised test questions and/or answers. Using a large item pool of items to construct test forms provides assurance that each test form will be unique. The large test bank ensures that a possible leak will not be representative of the test bank.

Another key element concerning the security of the *MPT* is how data will be governed and who will have the right to access the data that will be collected. A *MPT* Data Governance, established by the EQAO, will ensure that all stakeholders understand their role in the data processing, and more importantly that restrictions on data processing protect the freedoms and privacy rights of the teacher applicants.

The *MPT* will follow the high standards set by the Government of Ontario Information and Technology Standards (GO-ITS) for Cloud Services 25.21. This adoption by the Government of Ontario sets a gold standard regarding guidelines, technical reports, and preferred practices. In line with the GO-ITS, the *MPT* platform will accompany the standard audits, documentation, and policies recommended to ensure that the platform follows high standards of security.

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