Grade 12 Mathematics Achievement Tests

Administration Manual

2019/2020

Manitoba

After the administration of this test, print copies of this resource will be available
for purchase from the Manitoba Learning Resource Centre.
Order online at www.manitobalrc.ca.

This resource will also be available on the Manitoba Education website at
www.edu.gov.mb.ca/k12/assess/admin_manuals/index.html.

Websites are subject to change without notice.

Disponible en français.

Available in alternate formats upon request.

PREAMBLE

This manual is one of a series of documents, which are available on the department's website at www.edu.gov.mb.ca/k12/assess/tests/index.html.

- *Policies and Procedures for Provincial Tests*
- *Grade 12 Mathematics Achievement Tests: Information Bulletin*
- **Grade 12 Mathematics Achievement Tests: Administration Manual**
- *Information for Local Marking*

These documents prepare teachers and administrators for the administration of the Grade 12 provincial tests. Please use this administration manual in conjunction with the other documents in the series to gain a full understanding of the procedures associated with the testing program at Manitoba Education ("the department").

This manual must be read prior to administering the provincial test. The rules and guidelines included must be strictly observed to ensure the consistency of provincial test administration.

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C ONTENTS

General Information

The department develops the Grade 12 Mathematics Achievement Tests in collaboration with teachers from across the province. These provincial tests are based on the *Grades 9 to 12 Mathematics: Manitoba Curriculum Framework of Outcomes* (2014). This document is available on the department's website at www.edu.gov.mb.ca/k12/cur/math/framework_9-12/index.html as well as at the Manitoba Learning Resource Centre.

The provincial tests are locally marked, and count for 30% of each student's final grade in Applied Mathematics and Pre-Calculus Mathematics and 20% of each student's final grade in Essential Mathematics. Test results will be released to students according to local policy on the date designated by local jurisdictions.

For information regarding who is required to write provincial tests, refer to the *Policies and Procedures* manual.

All schools should receive the test materials by

Test	Semester 1	Semester 2
Applied Mathematics	Tuesday, January 14, 2020	Thursday, June 4, 2020
Essential Mathematics	Wednesday, January 15, 2020	Wednesday, June 3, 2020
Pre-Calculus Mathematics	Thursday, January 16, 2020	Tuesday, June 2, 2020

The number of booklets sent to each school is based on the October 11, 2019 (Semester 1) and March 6, 2020 (Semester 2) registration information provided by the school.

The department supports local marking by

- providing marking guidelines
- collecting and scanning all *Answer/Scoring Sheets* or *Scoring Sheets* from jurisdictions to provide them with test result summaries
- re-marking a random sample of locally marked test booklets to provide feedback to jurisdictions on their local marking
- providing financial support for local marking to provincially funded jurisdictions

Features of the test

Tests may include selected-response and constructed-response questions.

A *Formula Sheet* for each test is provided in the test booklets. Samples are also included in this manual (see Appendix A1, A2, or A3).

Applied Mathematics and Essential Mathematics: Students may bring **one** 8½″ × 11″ sheet of paper (study sheet) that includes any information that the student has deemed important. The student may write on both sides of the paper and the information may be handwritten or typed (in any size font).

Pre-Calculus Mathematics: Students are not permitted to use a study sheet during the test.

Test-specific information

Applied Mathematics: The test will be administered in one three-hour session.

The following units will be assessed on the test:

- Relations and Functions
- Probability
- Financial Mathematics
- Design and Measurement
- Logical Reasoning

Essential Mathematics: The test will be administered in one two-hour session.

The following units will be assessed on the test:

- Home Finance
- Probability
- Vehicle Finance
- Geometry and Trigonometry
- Precision Measurement
- Statistics

Pre-Calculus Mathematics: The test will be administered in one three-hour session.

All units will be assessed on the test. The test consists of the two following parts:

- *Booklet 1* consists of short-answer and long-answer questions where a scientific calculator is required for some questions and optional for others.

- *Booklet 2* is distributed to students 45 minutes from the beginning of the test session and consists of multiple-choice, short-answer, and long-answer questions where a calculator **cannot** be used.

Students will have access to their calculators for the first 45 minutes of the test. After this time, calculators will be put away and *Booklet 2* will be distributed. Students may keep and continue working on *Booklet 1* for the remainder of the test session, but may not use their calculator once *Booklet 2* has been distributed. Students may not start working on *Booklet 2* until the first 45 minutes have elapsed.

Test schedule

The following tables summarize the schedule for the Grade 12 Mathematics Achievement Tests.

Semester 1

Date	Test	Preparation Time	Time Required for Test		Additional Time Allowed[1]
Tuesday, January 21, 2020	Applied Mathematics		3 hours		30 minutes
Wednesday, January 22, 2020	Essential Mathematics		2 hours		30 minutes
Thursday, January 23, 2020	Pre-Calculus Mathematics	15 minutes preparation and instructions	3 hours	Part 1: 45 minutes, calculators permitted	30 minutes
				Part 2: 2 hours, 15 minutes, calculators not permitted	

[1] Without requesting an adaptation

Students must begin writing the Grade 12 Mathematics Achievement Tests between 8:30 a.m. and 10:00 a.m. on the above-mentioned dates.

Semester 2

Date	Test	Preparation Time	Time Required for Test		Additional Time Allowed[1]
Thursday, June 11, 2020	Applied Mathematics		3 hours		30 minutes
Wednesday, June 10, 2020	Essential Mathematics		2 hours		30 minutes
Tuesday, June 9, 2020	Pre-Calculus Mathematics	15 minutes preparation and instructions	3 hours	Part 1: 45 minutes, calculators permitted	30 minutes
				Part 2: 2 hours, 15 minutes, calculators not permitted	

[1] Without requesting an adaptation

Students must begin writing the Grade 12 Mathematics Achievement Tests between 8:30 a.m. and 10:00 a.m. on the above-mentioned dates.

Policies for Provincial Tests

Adaptations*

Schools were asked to identify and submit requests for test adaptations **at the time of student registration**. If additional adaptations are required after the test registration deadline, schools should contact the appropriate consultant listed on page ii of this manual. All adaptation requests must be approved before the student of concern writes the test.

Note: An adaptation must be requested for students who will require **more** than 30 minutes of additional time.

Exemptions*

Schools were asked to report or request school-based exemptions **at the time of student registration**. If additional exemptions are needed after the test registration deadline, schools should contact the department as soon as possible. Exemptions are not normally granted after test administration and are not granted based on poor performance alone.

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* For further information, refer to the *Policies and Procedures* manual.

Confidentiality of test materials*

Once test materials are in the school, the school principal is responsible for ensuring that they are kept secure until test administration and are only accessed by authorized personnel.

All shrink-wrapped test packages must **not** be opened until the day of the test.

Booklets must not be reproduced nor should information about the test be communicated in any way until the test administration has been completed.

Marking Guides are to remain sealed in a secure area until the test administration has been completed.

Student materials

Students will need the following materials during the test:

- pencil
- eraser
- bilingual dictionary (if required)
- 8½″ × 11″ study sheet (Applied Mathematics and Essential Mathematics)
- ruler (Applied Mathematics and Pre-Calculus Mathematics)
- electronic devices

  - **Applied Mathematics:** graphing calculator, computer, or other approved device
  - **Essential Mathematics:** calculator
  - **Pre-Calculus Mathematics:** scientific calculator—**for the first 45 minutes of the test only**

The following materials must **not** be used during the test:

- classroom notes, textbooks, and other such materials
- subject-related materials on display
- dictionaries (other than bilingual dictionaries)

Students must not exchange materials or information during the test.

Note: Electronic communication between students through phones, email, or file sharing during the test is **strictly prohibited**.

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* For further information, refer to the *Policies and Procedures* manual.

Applied Mathematics: Access to Internet tools used in the everyday Applied Mathematics class, such as applets or a mortgage payment calculator, is allowed during the test. The same measure applies to student-created templates such as spreadsheets and programs downloaded to the graphing calculator during the school year. Use of the Internet to access course notes, find definitions, or search for conceptual information about the course is **strictly prohibited** during the test and must be monitored by the supervising teacher.

If your classroom is commonly using additional technology such as mobile devices, tablets, or other personal devices, contact the Applied Mathematics assessment consultant for further information and instructions.

Students may choose to print their responses from the computer. In this case, students are to indicate their booklet number and the question number on each page and remain seated at all times. The supervising teacher is responsible for distributing these printouts to students according to booklet number so that students can staple them in their booklets at the corresponding pages.

Students leaving the room

Students are expected to remain in the room for the first half of the test session. Students may leave before that time in exceptional circumstances such as illness.

Any student who must temporarily leave the room must be accompanied by a replacement supervisor. This practice ensures that the supervising teacher can remain in the test room with the students at all times.

Late arrivals*

Late arrivals must be advised of the test rules before receiving their test materials. Ask them to read your copy of the *Test-Taking Rules* (see Appendix B1, B2, or B3).

Students who arrive late but within the first half of the normal duration of test administration are allowed to write the test. If appropriate, the supervising teacher may allow the student additional time corresponding to the amount by which the student was late.

Students who arrive after the halfway point of any test session are not permitted to write and are considered absent.

Pre-Calculus Mathematics: Late arrivals who are granted extra time may only use their calculators for the first 45 minutes.

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* For further information, refer to the *Policies and Procedures* manual.

Student absences and changes to registration status*

Students must write the applicable Grade 12 Mathematics Achievement Test during the scheduled date and time in order for it to count as a provincial test.

Students who do not complete the provincial test because of an unexcused absence or who formally refuse to write (by their own or parental choice) will receive a mark of zero (0%) on the provincial test.

Students who do not complete the provincial test for a reason listed in Appendix D will not have a provincial test result.

Violation of rules

The supervising teacher reads the *Test-Taking Rules* to students in advance of the test session (see Appendix B1, B2, or B3).

The supervising teacher documents any incidents of cheating, plagiarism, or any other violation of rules on the *Supervising Teacher Report* and on the *Irregular Test Booklet Report*. A copy of the *Irregular Test Booklet Report* can be found in the *Marking Guide* and in the *Information for Local Marking* manual. The following information must be included:

- the booklet number
- a description of the circumstances, including available evidence

Should a violation of rules occur, the student is permitted to complete the test. The consequences of a violation of rules are a local decision. However, cheating and plagiarism result in a provincial test mark of zero (0%).

Responding to student questions

The supervising teacher must not provide any leading comments during the test. No explanations, translations, rephrasing, or clarifying statements may be provided about the test content. However, clarification regarding test-taking rules and procedures can be provided.

Damaged or misprinted materials

Any suspected error in wording should not be communicated to students unless specific instructions are received from the department. The supervising teacher should contact the appropriate clerk listed on page i of this manual, to report any such error.

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* For further information, refer to the *Policies and Procedures* manual.

Students will not be penalized for any error in printing or wording in the booklets. Teachers and local marking coordinators will be advised of any known errors as soon as possible. Any unused damaged or misprinted booklet(s) must be returned to the department with the reports and forms immediately after the test session.

Errors discovered on test date

If a damaged or misprinted booklet is discovered **at the start** of the test session, the supervising teacher

- replaces the damaged or misprinted booklet with a new booklet
- prints "DAMAGED" on the booklet cover and on the *Participation Form*

Errors discovered during test administration

If a damaged or misprinted booklet is discovered **during** the writing of the test, the supervising teacher

- gives the student a new booklet (the student keeps the damaged or misprinted booklet until the end of the session)
- crosses out the existing booklet number on the new booklet and changes it to the original booklet number so that **all student responses are recorded under the original booklet number**
- instructs the student to continue responding to test questions in the new booklet
- collects both booklets at the end of the test session and ensures that they are kept together by bundling them with an elastic band
- indicates on the *Participation Form* that two booklets have been used for one student (see Appendix E)
- records the damaged or misprinted booklet number on the *Supervising Teacher Report*

Responsibilities of School Principals

As you complete the following steps, place a check mark in the corresponding box.

(✓)	
	1. Ensure that all test materials have been received by placing a check mark beside each item on the *Packing List*.
	2. Verify that the supervising teacher has checked off all steps in the following two sections: "Advance preparations (upon receipt of test materials)" and "Prior to the test session".
	3. Contact the appropriate clerk listed on page ii of this manual if test materials are not in the school by **the date listed on page 1** or if any items are missing.
	4. Make sure that the test materials are stored in a secure area in the school and that the *Marking Guides* remain sealed until the test administration has been completed. Only authorized personnel should have access to the locked test materials.
	5. Do not open the shrink-wrapped test packages until the day of the test.
	6. Provide the test materials to the supervising teacher on the morning of the test.
	7. Distribute copies of the *Marking Guides* to the teachers after the test administration has been completed.
	8. Advise the department in writing if the students are unable to write the test due to school closures or suspended school bus transportation services that occur on the test date. Further information is available in the *Policies and Procedures* manual.
	9. Ensure that all test materials are accounted for after the test administration and until they are returned to the department.
	10. Keep the *Sample Request List* secure until after marking is completed when marking is done at the classroom or school level.

Note: Do not open the shrink-wrapped test packages until the day of the test.

Responsibilities of Supervising Teachers

As you complete the following steps, place a check mark in the corresponding box.

(✓)	Advance preparations (upon receipt of test materials)
	1. Ensure that
	— the number of booklets received equals the number requested by the school plus the additional four booklets. If additional test materials are needed, contact the appropriate clerk listed on page ii of this manual immediately
	— a replacement supervisor is available throughout the entire test session in order to accompany students who must temporarily leave the room and to assist with the collection of student materials at the end of the session
	— arrangements have been made to accommodate students with approved adaptations
	— arrangements have been made as per school policy to ensure that students exempted from writing the test are accommodated in an alternative setting
	2. Obtain a MET number for any student who was not registered or who did not have a MET number at the time of registration.
	3. Ensure that all subject-related materials have been removed from the walls and boards.
	4. Notify students of the
	— time, location, and duration of the test session
	— *Test-Taking Rules* (see Appendix B1, B2, or B3)
	— details of the study sheet (Applied Mathematics and Essential Mathematics
	5. Ensure that extra supplies are available.
	6. Photocopy the *Supervising Teacher Report* if extra copies are needed.
	7. Review the sample forms in the appendices of this manual.

Note: Do not open the shrink-wrapped test packages until the day of the test.

Checklist of procedures

As you complete the following steps, place a check mark in the corresponding box.

▓ Shaded areas indicate that the step is not applicable to the test.

Applied Mathematics	Essential Mathematics	Pre-Calculus Mathematics	
(✓)			**Prior to the test session**
			1. Ensure that the following test materials are available:
	▓	▓	— *Grade 12 Applied Mathematics Achievement Test: Student Booklet*
▓		▓	— *Grade 12 Essential Mathematics Achievement Test: Student Booklet*
▓	▓		— *Grade 12 Pre-Calculus Mathematics Achievement Test: Booklet 1* — *Grade 12 Pre-Calculus Mathematics Achievement Test: Booklet 2*
			— *Participation Form*
			— *Demographic Data Forms* (for every student with a MET number, registered to write the test)
			— *Students without a Demographic Data Form*
▓			— *Answer/Scoring Sheets*
			— *Supervising Teacher Report*
			— *Teacher Feedback Form*
	▓	▓	2. Verify that computers and printers in the testing room are functioning as intended.
			3. Make a photocopy of the *Participation Form* if splitting a bundle of booklets between classrooms. Adjust each copy of the *Participation Form* to reflect the booklets being used in each classroom.
(✓)			**Beginning the test session**
			1. Distribute the following:
	▓	▓	— *Grade 12 Applied Mathematics Achievement Test: Student Booklet*
▓		▓	— *Grade 12 Essential Mathematics Achievement Test: Student Booklet*
▓	▓		— *Grade 12 Pre-Calculus Mathematics Achievement Test: Booklet 1*
			2. Tell students that the *Participation Form* will be circulated while they are working so they can print their names beside their booklet number.
			3. Read the *Test-Taking Rules* to students (see Appendix B1, B2, or B3).
			4. Read the directions (found in the test booklet) to students.

Checklist of procedures (continued)

Applied Mathematics	Essential Mathematics	Pre-Calculus Mathematics	**As you complete the following steps, place a check mark in the corresponding box.**
			▢ Shaded areas indicate that the step is not applicable to the test.
			5. Remind students
			— to check over their work to ensure that all questions have been attempted
			— to show their work in the spaces provided in the booklet (and on extra pages provided, if required)
	(shaded)	*(shaded)*	6. Remind students using computers to remain seated as printouts will be distributed to them. The booklet number and question number must appear on each of these printouts and they must be stapled to the corresponding page of the test booklet. Students must also indicate in the response space of the question that the answer is on a printout.
			7. **Instruct students to begin. Record the start time on the *Supervising Teacher Report*.**
	(✓)		**During the test session**
			1. Ensure that each student completes the *Participation Form*. **Note:** The *Participation Form* is the only record connecting students' identities to their booklet.
			2. Verify that the name of each student on the *Class List* is recorded on the *Participation Form*.
		(shaded)	3. Advise students of the amount of time remaining by writing it on the board halfway through the test session.
(shaded)			4. Ask the students (after 45 minutes) to place their calculators on the floor for the remainder of the test session. Students retain and may continue working on *Booklet 1*; however, they may not use their calculators once *Booklet 2* has been distributed.
(shaded)			5. Distribute *Booklet 2* and the *Answer/Scoring Sheets* as students continue working on *Booklet 1*. Remind students to use the *Answer/Scoring Sheet* for responding to the multiple-choice questions. **Note:** The booklet number on the *Answer/Scoring Sheet*, *Booklet 1*, and *Booklet 2* must be identical for each student. Ask students to verify the booklet number.
(shaded)			6. Record the time that *Booklet 2* was distributed on the *Supervising Teacher Report*.
(shaded)			7. Inform students that they have 2 hours and 15 minutes left to complete the test.
			8. Advise students when there are 30 minutes left to complete the test and remind them that an additional 30 minutes are available, if needed.

Checklist of procedures (continued)

Applied Mathematics	Essential Mathematics	Pre-Calculus Mathematics	**As you complete the following steps, place a check mark in the corresponding box.** Shaded areas indicate that the step is not applicable to the test.
(✓)			**Ending the test session**
			1. **Record the time students finish writing the test on the *Supervising Teacher Report*.** Do not include any additional time.
			2. Ask students to submit their test booklet(s).
▓	▓		3. Ask students to submit their *Answer/Scoring Sheets* and place them in the labelled envelope provided.
			4. Note the circumstances on the *Supervising Teacher Report* if a student refuses to write or is present but completes no work.
			5. Ensure that each student's booklet number matches the number on the *Answer/Scoring Sheet* (Pre-Calculus Mathematics), *Demographic Data Form*, and the *Participation Form* as students submit their test materials.
	▓	▓	6. Ensure that any printouts or extra pages are stapled to the appropriate pages.
			7. Complete the *Participation Form* (see Appendix E).
			8. Complete the *Demographic Data Forms* according to the instructions on the form (see Appendix F). Ensure that there is a booklet number or reason code for each student (see Appendix D).
			— Place all *Demographic Data Forms* in order by booklet number (**not** alphabetical order) in the labelled envelope provided.
			— Do not use elastic bands, staples, or paper clips on the *Demographic Data Forms* as they may damage the sheets. **Do not seal the envelope.**
			9. Complete the form *Students without a Demographic Data Form* according to the instructions on the form if necessary (see Appendix G).
			10. Stack the booklets in order by booklet number.
			11. Make a copy of the *Participation Form* and *Supervising Teacher Report* to be retained by the school. If a centralized marking model is used, make an additional copy of each form and forward them to the local marking site.
			12. Return all booklets and other test-related materials to the **secure area** in the school until marking or until materials are forwarded to the local marking site.
			13. Send materials according to the instructions on the following pages.
			14. Obtain a copy of the *Marking Guide* and *Sample Request List* from the principal.

Submitting materials (at the end of the test)

The following materials must be returned **to the department** immediately after the test:

- original *Participation Form*
- *Demographic Data Forms* (in envelope provided in order by booklet number)
- *Students without a Demographic Data Form*
- *Supervising Teacher Report*
- damaged or misprinted booklets

Semester 1

Test	Date Returned to Department	Date of Local Marking Training
Applied Mathematics	Tuesday, January 21, 2020	Wednesday, January 22, 2020
Essential Mathematics	Wednesday, January 22, 2020	Thursday, January 23, 2020
Pre-Calculus Mathematics	Thursday, January 23, 2020	Friday, January 24, 2020

Semester 2

Test	Date Returned to Department	Date of Local Marking Training
Applied Mathematics	Thursday, June 11, 2020	Friday, June 12, 2020
Essential Mathematics	Wednesday, June 10, 2020	Thursday, June 11, 2020
Pre-Calculus Mathematics	Tuesday, June 9, 2020	Wednesday, June 10, 2020

Note: Individuals attending a local marking training session on any of the above-mentioned dates may bring the previously mentioned documents to the session or send them by following the instructions below.

Supervising teachers are responsible for bringing their copy of the *Marking Guide* to the local marking site.

School Jurisdictions within Winnipeg:

The packages must be sent directly to the department by calling Rene's Courier **(204-231-1321)** on the test date. The person placing the call should quote **account number 1769** and provide the school name and address, as well as the name of the contact person.

School Jurisdictions outside of Winnipeg:

The packages must be sent via Canada Post to the department in the **Xpresspost Flexipack envelope** provided.

If you must send a second package, please contact the appropriate clerk listed on page ii of this manual.

If a centralized marking model is used, package the following materials and forward them **to the local marking site** after the test session:

- used booklets
- *Answer/Scoring Sheets* or *Scoring Sheets*
- copy of the *Participation Form*
- copy of the *Supervising Teacher Report*
- *Sample Request List* (included with your marking package)

Submitting materials after local marking

When a centralized marking model is used, the **local marking coordinator** sends the materials to the department. When local marking is done at the classroom or school level, the **teacher** sends the materials to the department.

After centralized and local marking have been completed, prepare a package to be received by the department, Instruction, Curriculum and Assessment Branch, 1567 Dublin Avenue, Winnipeg, no later than

Semester 1	Semester 2
Monday, February 3, 2020	Wednesday, June 17, 2020

This will ensure there is sufficient time for processing.

The package must include:

- *Answer/Scoring Sheets* or *Scoring Sheets* (in envelope provided)
- booklets requested by the department (including substitute booklets)
- *Sample Request List* (included with the marking package)
- *Teacher Feedback Form*

School Jurisdictions within Winnipeg:

The packages must be sent directly to the department by calling Rene's Courier **(204-231-1321)** and arranging for pickup. The person placing the call should quote **account number 1769** and provide the school name and address, as well as the name of the contact person.

School Jurisdictions outside of Winnipeg:

The packages must be sent via Canada Post to the department in the **Xpresspost Flexipack envelope** provided.

If you must send a second package, please contact the appropriate clerk listed on page ii of this manual.

> Return **all** *Answer/Scoring Sheets* or *Scoring Sheets*. Payment will be made according to the number of students with a participation status of C or IU on the *Participation Form* and the number of *Answer/Scoring Sheets* or *Scoring Sheets* received by the department.

Appendices

Appendix A1:
Formula Sheet, Applied Mathematics

RELATIONS AND FUNCTIONS	FINANCIAL MATHEMATICS

RELATIONS AND FUNCTIONS

$$y = ax + b$$

$$y = ax^2 + bx + c$$

$$y = ax^3 + bx^2 + cx + d$$

$$y = ab^x$$

$$y = a + b\ln(x)$$

$$y = a\sin(bx + c) + d$$

FINANCIAL MATHEMATICS

$$t = \frac{72}{i}$$

$$I = Prt$$

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Net worth = Total assets − Total liabilities

$$\text{Debt-to-equity ratio (\%)} = \frac{(\text{Total liabilities} - \text{Mortgage})}{\text{Net worth}} \times 100$$

PROBABILITY

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cap B) = P(A) \times P(B)$$

$$P(A \cap B) = P(A) \times P(B|A)$$

$$_nP_r = \frac{n!}{(n-r)!}$$

$$_nC_r = \frac{n!}{r!(n-r)!}$$

$$\text{Gross debt service ratio (\%)} = \frac{\left(\begin{array}{ccc}\text{Monthly} & \text{Monthly} & \text{Monthly} \\ \text{mortgage} + \text{property} + \text{heating} \\ \text{payment} & \text{taxes} & \text{costs}\end{array}\right)}{\text{Gross monthly income}} \times 100$$

$$\text{Rate of return (\%)} = \frac{\left(\begin{array}{cc}\text{Current value} & \text{Previous value} \\ \text{of portfolio} & - \text{of portfolio}\end{array}\right)}{\text{Previous value of portfolio}} \times 100$$

DESIGN AND MEASUREMENT

Prism: Surface area = $Ph + 2B$

    Volume = Bh

Pyramid: Surface area = $B + \frac{1}{2}Ps$

    Volume = $\frac{1}{3}Bh$

Cube: Surface area = $6l^2$

    Volume = l^3

Rectangular prism: Surface area = $2lw + 2lh + 2wh$

    Volume = lwh

Triangular prism: Surface area = $bh + l(a + b + c)$

    Volume = $\frac{1}{2}bhl$

Square-based pyramid: Surface area = $b^2 + 2bs$

    Volume = $\frac{1}{3}b^2h$

Sphere: Surface area = $4\pi r^2$

    Volume = $\frac{4}{3}\pi r^3$

Cylinder: Surface area = $2\pi r^2 + 2\pi rh$

    Volume = $\pi r^2 h$

Cone: Surface area = $\pi r^2 + \pi rs$

    Volume = $\frac{1}{3}\pi r^2 h$

Appendix A2:
Formula Sheet, Essential Mathematics

Name of Formula	Formula	Details
Percentile Rank (*PR*)	$$PR = \frac{b}{n} \times 100$$	b = number of raw scores below the given score n = total number of raw scores
Simple Interest (*I*)	$$I = Prt$$	P = principal r = annual interest rate t = time in years
Education Tax or Municipal Tax	$$\text{Tax} = \text{Portioned assessment} \times \frac{\text{mill rate}}{1000}$$	
Gross Debt Service Ratio (*GDSR*)	$$GDSR = \frac{\left(\begin{array}{c}\text{Monthly} \quad \text{Monthly} \quad \text{Monthly}\\ \text{mortgage} + \text{property} + \text{heating}\\ \text{payment} \quad \text{taxes} \quad \text{costs}\end{array}\right)}{\text{Gross monthly income}}$$	
Fuel Economy in L/100 km (*FE*)	$$FE = \frac{\text{Fuel used in litres}}{\text{Distance in km}} \times 100$$	
Expected Value (*EV*)	$$EV = P(\text{win}) \times \$\text{gain} - P(\text{lose}) \times \$\text{loss}$$	P = probability
Sum of Interior Angles of Polygons (*S*)	$$S = 180° (n - 2)$$	n = number of sides
Measure of One Interior Angle of a Regular Polygon	$$\text{Interior angle} = \frac{180° (n - 2)}{n}$$	n = number of sides
Measure of One Exterior Angle of a Regular Polygon	$$\text{Exterior angle} = \frac{360°}{n}$$	n = number of sides
Central Angle of Regular Polygons (*C*)	$$C = \frac{360°}{n}$$	n = number of sides
Number of Diagonals in a Polygon (*D*)	$$D = \frac{n(n - 3)}{2}$$	n = number of sides
	Additional formulas on next page. →	

continued

Appendix A2: Formula Sheet, Essential Mathematics (continued)

Trigonometric Laws	
Sine Law $\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$	Cosine Law $a^2 = b^2 + c^2 - \left(2bc\cos A\right)$ $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Tax Rates					
Provincial	Provincial Sales Tax (PST)	7%	Federal	Goods and Services Tax (GST)	5%

Taxes on Vehicle Purchases		
	PST	**GST**
Buying New	PST	GST
Buying Used from a Dealership	PST	GST
Buying Used Privately	PST calculated on greater of book value or purchase price	No GST
Safety	No PST	GST
Materials and Labour	PST	GST
Lien Search	No PST	No GST

Taxes on Home Insurance		
	PST	**GST**
Homeowner's/Tenant's Insurance	PST	No GST

Appendix A3:
Formula Sheet, Pre-Calculus Mathematics

$s = \theta r$

$\sin^2 \theta + \cos^2 \theta = 1$

$\tan^2 \theta + 1 = \sec^2 \theta$

$1 + \cot^2 \theta = \csc^2 \theta$

$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$

$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$

$\tan(\alpha - \beta) = \dfrac{\tan \alpha - \tan \beta}{1 + \tan \alpha \tan \beta}$

$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$

$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$

$\tan(\alpha + \beta) = \dfrac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta}$

$\sin 2\alpha = 2 \sin \alpha \cos \alpha$

$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$

$\cos 2\alpha = 1 - 2 \sin^2 \alpha$

$\cos 2\alpha = 2 \cos^2 \alpha - 1$

$\tan 2\alpha = \dfrac{2 \tan \alpha}{1 - \tan^2 \alpha}$

$\log_a(MN) = \log_a M + \log_a N$

$\log_a \left(\dfrac{M}{N} \right) = \log_a M - \log_a N$

$\log_a(M^n) = n \log_a M$

$P(n,r) \text{ or } {}_nP_r = \dfrac{n!}{(n-r)!}$

$C(n,r) \text{ or } {}_nC_r = \dfrac{n!}{r!(n-r)!}$

$t_{k+1} = {}_nC_k a^{n-k} b^k$

For $ax^2 + bx + c = 0$,

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Appendix B1:
Test-Taking Rules, Applied Mathematics

The supervising teacher is expected to read the following rules to students at the beginning of the test.

- During the test session, do not proceed until instructed to do so.

- If you receive a damaged or misprinted booklet, raise your hand and I will give you a new one.

- You are expected to remain in the room for the first half of the test session. You may leave before that time in exceptional circumstances, such as illness. Should you need to temporarily leave the room, you will be accompanied by a teacher.

- To write the test you should only have the test materials, a pencil, an eraser, a bilingual dictionary (if required), an 8½″ × 11″ study sheet, a ruler, and a graphing calculator, computer, or other approved device. No other materials are permitted. Do not exchange test materials.

- You will **not** receive assistance from, nor give assistance to, another student. If you require something during the test, raise your hand.

- During the test, I can only help you with the directions, not the test questions.

- Do **not** identify yourself, your school, teacher, or town in your booklet.

- You may **not** discard any materials. The test booklet, with the exception of the perforated pages, must remain intact.

- You may **not** leave the room with any materials pertaining to the test, with the exception of the study sheet.

- Rough calculations may be done in your booklet on blank pages. No marks will be awarded for work done on these pages.

- Remember to attempt all multiple-choice questions. Marks will not be deducted for incorrect responses. Indicate your answer by circling directly in the test booklet.

- If you need more space to answer a question, extra pages may be provided. Write your booklet number and the question number on any extra page(s) used and staple the additional page(s) into the booklet where your answer begins.

- Electronic communication between students through phones, email, or file sharing during the test is **strictly prohibited**. Cheating will result in a provincial test mark of zero (0%).

- During test administration, you may consult the test rules on page i of your booklet.

Only read the test-taking rules on the next page if an approved device is used during the test administration.

Appendix B1: Test-Taking Rules, Applied Mathematics (continued)

- You may access the Internet to use applets or a mortgage payment calculator. Use of the Internet to access other content, including but not limited to course notes, definitions, or course-related conceptual information is **strictly** prohibited during the test.

- For constructed-response questions, you may print out diagrams from the computer or your calculator where applicable. Write your booklet number and the question number on every printout. Remain seated and I will bring you your printouts. Indicate in the response space of the question that the answer is on a printout and staple the printout to the appropriate page.

- Provide clear explanations or justifications where applicable.
  - If you use a software program or a Web applet, indicate all your input values and print or copy the screen showing the answers.
  - If you use a spreadsheet, print a copy of the answers.

Appendix B2:
Test-Taking Rules, Essential Mathematics

The supervising teacher is expected to read the following rules to students at the beginning of the test.

- During the test session, do not proceed until instructed to do so.

- If you receive a damaged or misprinted booklet, raise your hand and I will give you a new one.

- You are expected to remain in the room for the first half of the test session. You may leave before that time in exceptional circumstances, such as illness. Should you need to temporarily leave the room, you will be accompanied by a teacher.

- To write the test you should only have the test materials, a pencil, an eraser, a bilingual dictionary (if required), an 8½″ × 11″ study sheet, and a calculator. No other materials are permitted. Do not exchange test materials.

- You will **not** receive assistance from, nor give assistance to, another student. If you require something during the test, raise your hand.

- During the test, I can only help you with the directions, not the test questions.

- Do **not** identify yourself, your school, teacher, or town in your booklet.

- You may **not** discard any materials. The test booklet, with the exception of the perforated pages, must remain intact.

- You may **not** leave the room with any materials pertaining to the test, with the exception of the study sheet.

- Rough calculations may be done in your booklet on blank pages. No marks will be awarded for work done on these pages.

- Remember to attempt all multiple-choice questions. Marks will not be deducted for incorrect responses. Indicate your answer directly in the test booklet.

- If you need more space to answer a question, extra pages may be provided. Write your booklet number and the question number on any extra page(s) used and staple the additional page(s) into the booklet where your answer begins.

- Electronic communication between students through phones, email, or file sharing during the test is **strictly prohibited**. Cheating will result in a provincial test mark of zero (0%).

- During test administration, you may consult the test rules on page i of your booklet.

Appendix B3:
Test-Taking Rules, Pre-Calculus Mathematics

The supervising teacher is expected to read the following rules to students at the beginning of the test.

- During the test session, do not proceed until instructed to do so.

- If you receive a damaged or misprinted booklet, raise your hand and I will give you a new one.

- You are expected to remain in the room for the first half of the test session. You may leave before that time in exceptional circumstances, such as illness. Should you need to temporarily leave the room, you will be accompanied by a teacher.

- To write the test you should only have the test materials, a pencil, an eraser, a bilingual dictionary (if required), a ruler, and a scientific calculator—**for the first 45 minutes only**. No other materials are permitted. Do not exchange test materials.

- When *Booklet 2* is distributed, you will also receive an *Answer/Scoring Sheet* to record your answers to the multiple-choice questions. Make sure that the booklet number on *Booklet 1* and *Booklet 2* matches the number on your *Answer/Scoring Sheet*.

- You may keep and continue working on *Booklet 1* for the entire test session, but you may not use your calculator once *Booklet 2* has been distributed. You may not start *Booklet 2* until the first 45 minutes have elapsed.

- You will **not** receive assistance from, nor give assistance to, another student. If you require something during the test, raise your hand.

- During the test, I can only help you with the directions, not the test questions.

- Do **not** identify yourself, your school, teacher, or town in your booklets.

- You may **not** discard any materials. The test booklets, with the exception of the perforated pages, must remain intact.

- You may **not** leave the room with any materials pertaining to the test.

- Rough calculations may be done in your booklets on blank pages. No marks will be awarded for work done on these pages.

- Remember to attempt all multiple-choice questions. Marks will not be deducted for incorrect responses. Use the *Answer/Scoring Sheet* when responding to multiple-choice questions.

- If you need more space to answer a question, extra pages may be provided. Write your booklet number and the question number on any extra page(s) used and staple the additional page(s) into the booklet where your answer begins.

- Electronic communication between students through phones, email, or file sharing during the test is **strictly prohibited**. Cheating will result in a provincial test mark of zero (0%).

- During test administration, you may consult the test rules on page i of your booklet.

Appendix C:
Data Collection for Provincial Tests

The *Participation Form* and the *Demographic Data Form* indicate a student's status in terms of participation in the test and whether or not the test counts as a provincial test.

The information provided on the *Demographic Data Form* and on the form *Students without a Demographic Data Form* must be consistent with the information provided on the *Participation Form*.

Participation Form

On the *Participation Form*, a booklet number is assigned to each student expected to participate. At the end of the test, the teacher records the participation status (C, IU, or IE) for each student according to the following:

Test counts as a provincial test (test booklets locally marked)		Test does not count as a provincial test (test booklets not marked)
C = Complete	**IU = Incomplete Unexcused**	**IE = Incomplete Excused**
The student was present for all parts of the test.	The student missed all or part of the test due to an unexcused absence; a mark of zero (0%) applies to the missed parts.	The student missed all or part of the test due to an excused absence or did not write due to — excused absence — test deferral — registration error — withdrawal from course — exemption

Demographic Data Form

One of the following sections of the *Demographic Data Form* is to be completed when each student's participation status for the test is known.

Booklet Number: This section is completed only if the test is to **count** as a provincial test (participation status: C or IU).

<div align="center">OR</div>

Reason Code: This section is completed only if the test will **not count** as a provincial test (participation status: IE). The reason codes are listed in Appendix D.

If a student that is expected to participate does not have a *Demographic Data Form* (e.g., student had no MET number at the time of registration for the test or student was a late registration to the course), complete the form *Students without a Demographic Data Form*.

Appendix D:
Reason Codes

The following codes are to be used on a student's *Demographic Data Form* or on the *Students without a Demographic Data Form* only if the test will **not count** as a provincial test.*

Reason	Reason Code
Excused Absence (e.g., student illness, severe weather [cancellation/school closure], family emergency, or accident) **Note:** This reason is **not** intended for students attending sanctioned out-of-school events (alternate writing sites).	**200**
Test Deferred No course credit granted at this time (i.e., continuing course/program next year/semester).	**040**
Registered in Error The student should not have been registered to write (e.g., registered for semester 1 in error, should have been registered for semester 2).	**210**
Withdrawn from Course — No Course Credit Granted (e.g., student left the school, was expelled, or other unforeseen circumstance)	**220**
Program Schedule — Not Compatible with the Testing Schedule The student was registered for the test but completed the course well before (e.g., mid-semester) the test administration period. **Note:** This reason is primarily used for continuous intake or alternative programming situations.	**230**

In the case of an **unexcused** absence or refusal to write, no reason codes apply — a booklet number is assigned to the student and the test counts as a provincial test. Any work the student has done is marked and zero (0%) is given for the missed parts of the test.

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* For further information, refer to the *Policies and Procedures* manual.

Somewhere School
9999 (0000)

PARTICIPATION FORM

Grade 12 Provincial Test

1. **Assign a booklet number to each student expected to participate.**
2. **At the end of the test administration, indicate each student's participation status as one of the following** (see the *Administration Manual* for details):

    C = Complete (test counts as a provincial test)

    IU = Incomplete Unexcused (test counts as a provincial test)

    IE = Incomplete Excused (test does **not** count as a provincial test)

Booklet Number	Student Name (*please print*)	Program Eng/Imm/Fr	Participation Status (C, IU, or IE)	For Teacher Use (records, notes)
10001	Sandra Wong	Eng	C	
10002	Shelley Carrière	Imm	C	
10003	Damaged			
10004	Jason Chu		IE	illness
10005	Manuel Sousa	Fr	C	
10006	Bonnie Walters		IU	absent no reason
~~10007~~	Used with 10005 (damaged)			
10008	Julie Curtis		IU	suspended
10009	Unused			
~~10010~~	Used in another classroom			

John Ormiston	jormiston@email.com
Supervising Teacher's Name (*please print*)	Email Address

Please retain a copy of this form for your records.
A copy is required to link locally marked test booklets with student names.

Appendix F:
Sample Demographic Data Form

DEMOGRAPHIC DATA FORM / FORMULAIRE DE DONNÉES DÉMOGRAPHIQUES   1

GRADE 12 PROVINCIAL TEST

TEST PROVINCIAL, 12e ANNÉE

To be completed at the end of the test./À remplir à la fin du test.

Student Information/Renseignements sur l'élève

School/Ecole	**9999 SCHOOL NAME**	Program/Programme	**ENGLISH**
Name/Nom	**SURNAME, GIVEN NAME**		
Birthdate/Date de naissance	**JANUARY 1, 1995**	MET No./N° MET	**999–999–999**

Booklet Number/Numéro de cahier

If the student's participation status is **C** (Complete) or **IU** (Incomplete Unexcused), write and shade the assigned booklet number.

Booklet No./ N° de cahier

Si le statut de participation de l'élève est **C** (Complet) ou **INJ** (Incomplet non justifié), inscrire et noircir le numéro de cahier assigné.

```
0 1 2 3 4 5 6 7 8 9
```

USE PENCIL ONLY

UTILISER UNIQUEMENT UN CRAYON

OR/OU

Reason Code (see the *Administration Manual*)/Code désigné (voir le *Guide d'administration*)

If this student's participation status is **IE** (Incomplete Excused), write and shade the applicable reason code.

Reason Code/ Code désigné

Si le statut de participation de l'élève est **IJ** (Incomplet justifié), inscrire et noircir le code désigné pertinent.

```
0 1 2 3 4 5 6 7 8 9
```

USE PENCIL ONLY

UTILISER UNIQUEMENT UN CRAYON

9999

Appendix G:
Sample Students without a Demographic Data Form

STUDENTS WITHOUT A DEMOGRAPHIC DATA FORM

Grade 12 Provincial Test

Somewhere School
9999 (0000)

Complete this form only if a student is expected to participate and does not have a *Demographic Data Form*.
Provide a booklet number for students whose participation status is "**C**" (Complete) or "**IU**" (Incomplete Unexcused), **OR** provide a reason code for the students whose participation status is "**IE**" (Incomplete Excused).

MET Number*	Last Name	First Name	Date of birth	Program	Booklet Number	OR Reason Code

*The Education Administration Services Branch issues MET numbers to schools and school divisions upon request. For information about how to request a MET number, please visit www.edu.gov.mb.ca/k12/studrec/metno.html.

If additional forms are required, copy as necessary.