
GENERAL COMMENTS

Grade 12 Applied Mathematics Achievement Test (June 2019)

Student Performance—Observations

The following observations are based on local marking results and on comments made by markers during the sample marking session. These comments refer to common errors made by students at the provincial level and are not specific to school jurisdictions.

Information regarding how to interpret the provincial test and assessment results is provided in the document *Interpreting and Using Results from Provincial Tests and Assessments* available at www.edu.gov.mb.ca/k12/assess/support/results/index.html.

Various factors impact changes in performance over time: classroom-based, school-based, and home-based contexts, changes to demographics, and student choice of mathematics course. In addition, Grade 12 provincial tests may vary slightly in overall difficulty although every effort is made to minimize variation throughout the test development and pilot testing processes.

When considering performance relative to specific areas of course content, the level of difficulty of the content and its representation on the provincial test vary over time according to the type of test questions and learning outcomes addressed. Information regarding learning outcomes is provided in the document *Grades 9 to 12 Mathematics: Manitoba Curriculum Framework of Outcomes* (2014).

Relations and Functions (provincial mean: 62.7%)

Conceptual knowledge

When asked to determine a specific regression model, many students created incorrect models. Many students struggled to make the connection between the domain of a quadratic relationship and the context of a situation.

Procedural skill

Students did not know how to set up a table of values for a sinusoidal regression when the regression involved a situation that did not start at a minimum or a maximum.

Communication

Students often used incorrect units, rounded incorrectly, and omitted $y =$ when writing a regression equation. Many students did not draw a curve of best fit after having plotted points on a grid.

Probability (provincial mean: 57.9%)

Conceptual knowledge

Students often used permutations instead of combinations. Many students added rather than multiplied permutations. Students did not recognize that they needed to arrange items both as groups of objects and as individual objects.

Procedural skill

When creating tree diagrams, many students wrote incorrect probabilities on the branches. When calculating a conditional probability, students did not add the probabilities of the two cases together. When asked to show pathways, many students provided unnecessary paths.

Communication

When creating tree diagrams, many students labelled them with undefined variables. In some cases, they used the same variable to represent different events.

Financial Mathematics (provincial mean: 68.8%)

Conceptual knowledge

When asked to calculate a monthly loan payment, students used the down payment as the present value and treated it as a loan without a future value. Students did not know what to do with the down payment. Many students did not know that the present value and payment should have the same sign. Some students did not know how to apply the initial deposit. The initial deposit was often added at the end, thus not collecting interest throughout the investment. Students calculated the amount of a payment or the number of years (e.g., \$122 or 6 years) instead of the number of additional monthly payments. Students had difficulty understanding given scenarios, which sometimes resulted in unnecessary calculations.

Procedural skill

Some students indicated correct input values but did not enter them correctly in the calculator. Many students who chose to use the compound interest formula were unable to use it correctly.

Communication

When asked to explain or support their answer, many students did not provide specific explanations, which resulted in a lack of clarity. Many students provided examples that did not distinguish between buying and renting a house. Students did not always round to two decimal places for monetary values and used whole units for the number of payments.

Design and Measurement (provincial mean: 66.5%)

Conceptual knowledge

Students were able to calculate the volume of a single object, but had difficulty using that volume to determine the total volume required by the question. When designing a bedroom, students were unable to create dimensions that result in an area consistent with the given restrictions.

Procedural skill

Many students had difficulty converting between units, both when using volume and when using area. When given a question that required a choice of flooring options, some students did not understand that they needed to make a selection. Instead, they provided answers that incorporated both options. Students had difficulty calculating the additional percent of an area needed to compensate for installation and waste. Some students did not calculate any additional area, while others applied the additional percent to the cost instead of to the area. Some students were uncertain how to calculate tax.

Communication

Many students rounded too early in the calculation process. Some students forgot to use whole units appropriate for the context.

Logical Reasoning (provincial mean: 59.6%)

Conceptual knowledge

Students struggled to write true conditional statements. Students confused the concepts of converse and inverse. Students only considered single-element subsets when writing subsets of a given set. Students did not consider the overlapping regions when identifying “or” on a Venn diagram.

Procedural skill

Some students thought that a “magic number” required adding all the sums instead of simply identifying the individual sum.

Communication

Many students omitted “if” and/or “then” when writing conditional statements. Some students struggled to use set notation correctly, for example, they omitted brackets or used incorrect brackets for set notation.

Communication Errors

Errors that are not related to the concepts within a question are called “Communication Errors” and these were indicated on the *Scoring Sheet* in a separate section. There was a maximum 0.5 mark deduction for each type of communication error committed, regardless of the number of errors committed for a certain type (i.e., committing a second error for any type did not further affect a student’s mark).

The following table indicates the percentage of students who had at least one error for each type.

E1	Final Answer	18.1%
E2	Notation	21.4%
E3	Transcription/Transposition	18.5%
E4	Whole Units	26.3%
E5	Units	24.8%
E6	Rounding	67.9%

Marking Accuracy and Consistency

Information regarding how to interpret the marking accuracy and consistency reports is provided in the document *Interpreting and Using Results from Provincial Tests and Assessments* available at www.edu.gov.mb.ca/k12/assess/support/results/index.html.

These reports compare the local marking results to the results from the departmental re-marking of sample test booklets. Provincially, 36.8% of the test booklets sampled were given nearly identical total scores. In 51.5% of the cases, local marking resulted in a higher score than those given at the department; in 11.7% of the cases, local marking resulted in a lower score. On average, the difference was approximately 2.2% with local marking resulting in the slightly higher average score.

Survey Results

Teachers who supervised the Grade 12 Applied Mathematics Achievement Test in June 2019 were invited to complete a feedback form regarding the test and its administration. A total of 141 forms were received. A summary of their comments is provided below.

After adjusting for non-responses:

- 90.1% of teachers indicated that all of the topics in the test were taught by the time the test was written.
- 97.0% of teachers thought that the test content was consistent with the learning outcomes outlined in the curriculum documents and 89.6% thought that the difficulty of the test was appropriate.

- 87.2% of teachers indicated that their students used a study sheet on classroom assessments and 86.5% of teachers indicated that all of their students used a study sheet during the test. 73.0% of teachers indicated that students were given time to make their study sheets during class.
- 69.5% of teachers indicated that their students used the *Formula Sheet* on classroom assessments and 82.6% of teachers indicated that all of their students used the *Formula Sheet* during the test.
- During the test, 81.1% of teachers indicated that all of their students used a graphing calculator, 24.1% indicated that at least some of their students used computer software, 22.1% indicated that at least some of their students used Internet applets, and 13.4% indicated that at least some of their students used apps on a mobile device.
- 94.4% of teachers indicated that students were able to complete the test in the time allowed.