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# GENERAL COMMENTS

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## Grade 12 Applied Mathematics Achievement Test (January 2014)

### 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](http://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* (2009).

### Relations and Functions

#### Conceptual knowledge

For logarithmic regression, students reversed independent and dependent variables. Another common error was mistaking LinReg for LnReg.

Students had difficulty determining a sinusoidal equation based on a contextual situation.

When asked to identify the domain and range of a function, students reversed them.

#### Procedural skill

Students used cosine instead of sine for sinusoidal regression. In the context of a sinusoidal variation in height, some students had trouble calculating the length of time above 100 m, presenting an incomplete answer by finding only one point of intersection, or finding both points but not the follow-up subtraction.

For graphing, students often drew inappropriate shapes; in some cases the maximum on the graph was incorrect.

Students also did not use the data in context, for example using actual years (e.g., 2016) instead of years since 1996 (e.g., 20).

#### Communication

Commonly observed errors included incorrect rounding and not placing variables in the correct equation form.

## Probability

### Conceptual knowledge

Some students had trouble when given three independent events with the same probability (e.g., multiplying or dividing by 3 instead of by itself three times).

Common misunderstood concepts included the following:

- odds
- mutually exclusive (or not able to apply its definition to a situation)

For the Venn diagram, the total number of outcomes was determined incorrectly.

There were also instances where students used  $P$  instead of  $C$  (e.g.,  ${}_{12}P_5$  instead of  ${}_{12}C_5$ ).

There were instances of probabilities being added instead of multiplied.

Students did not explain dependent well; they had difficulty generating situations of dependent events. For the same question, two scenarios instead of two dependent events were created.

### Procedural skill

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### Communication

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## Financial Mathematics

### Conceptual knowledge

For rate of return, answers were sometimes given in dollars instead of percentage.

When asked to calculate compound interest,  $(1.08 \times 7)$  was used instead of  $(1.08)^7$ .

Students calculated the future value instead of the loan payment in a question involving loans.

### Procedural skill

The wrong denominator was inputted when calculating a rate of return (current value rather than initial investment).

For the question involving loans, students used number of years instead of number of months when compounded monthly.

### Communication

When asked to explain a financial decision, students simply wrote that it was “cheaper” or they provided vague explanations.

Students stated an advantage instead of a disadvantage for a given financial instrument.

## **Design and Measurement**

### **Conceptual knowledge**

For the question involving dimensions, when asked to explain the error, students had conceptual issues with dimensional units.

Students added taxes when the question stated that they were included in the price.

### **Procedural skill**

No common errors observed.

### **Communication**

No common errors observed.

## **Logical Reasoning**

### **Conceptual knowledge**

An incorrect calculation was used when determining the number of people who liked neither of two choices. Students either forgot or did not subtract the intersection out (people who liked both choices).

Students sometimes provided the conditional statement instead of the counterexample.

### **Procedural skill**

No common errors observed.

### **Communication**

Students did not add braces  $\{ \}$  when expressing their answers using set notation.

Another communication error was not including the box in Venn diagrams.

Sets were sometimes not labelled.

## 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.

<b>E1</b>	Student does not include one of the following in the equation: “y=”, “sin”, “ln”, or “x”, or writes parameters separately from the equation.	11.6%
<b>E2</b>	Student does not include the units in the final answer.	19.3%
<b>E3</b>	Student does not include one of the following on the graph: labels for the axes, units for the axes, or scales for the axes.	11.3%
<b>E4</b>	Student does not state or incorrectly states the final answer.	29.6%
<b>E5</b>	Student rounds too soon or rounds incorrectly.	61.1%
<b>E6</b>	Student does not use whole units appropriately (e.g., in the context of purchasing supplies such as paint, which must be purchased in whole units).	20.0%
<b>E7</b>	Student makes a transcription or transposition error.	14.1%

## 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](http://www.edu.gov.mb.ca/k12/assess/support/results/index.html).

These reports include a chart comparing the local marking results to the results from the departmental re-marking of sample test booklets. Provincially, 51.2% of the test booklets sampled were given nearly identical total scores. In 39.4% of the cases, local marking resulted in a higher score than those given at the department; in 9.3% of the cases, local marking resulted in a lower score. On average, the difference was approximately 1.6% with local marking resulting in the slightly higher average score.

## Survey Results

Teachers who supervised the Grade 12 Applied Mathematics Achievement Test in January 2014 were invited to provide comments regarding the test and its administration. A total of 78 teachers responded to the survey. A summary of their comments is provided below.

After adjusting for non-responses:

- 80.8% of the teachers indicated that all of the topics in the test were taught by the time the test was written.
- 97.3% of the teachers thought that the test content was consistent with the learning outcomes outlined in the curriculum documents and 93.2% thought that the difficulty of the test was appropriate.
- 91.0% of the teachers indicated that their students used a study sheet during the semester and 93.6% of the teachers indicated that their students used a study sheet during the test.
- 67.9% of the teachers indicated that their students used the formula sheet during the semester and 94.9% of teachers indicated that their students used the formula sheet during the test.
- 93.6% of the teachers indicated that their students used a graphing calculator during the test. 7.7% of the teachers indicated that their students used computer software and 2.6% indicated that their students used Internet tools during the test.
- 93.3% of the teachers indicated that students were able to complete the test in the time allowed.

