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# GENERAL COMMENTS

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## Grade 12 Essential 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](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* (2014).

### Unit: Home Finance (provincial mean: 61.1%)

#### Conceptual Knowledge

Many students struggled to calculate the interest on the first monthly mortgage payment as they did not know to use the simple interest formula. When calculating the Gross Debt Service Ratio (GDSR), several students directly substituted the given annual property taxes into the formula instead of calculating the monthly amount. Some students has difficulty with the concept of one-time costs associated with buying a house, especially the purpose of lawyer fees.

#### Procedural Skill

Some students did not reference 32% when discussing mortgage affordability and the GDSR. When given the value of a property and a portion of the land transfer tax due, many students did not calculate the additional land transfer tax accurately; they disregarded the given information and recalculated the entire tax amount using a variety of incorrect approaches.

#### Communication

Students often rounded too soon or rounded to the nearest whole number when calculating the GDSR. When a written response was required, many students provided answers that were vague and lacked detail.

## **Unit: Vehicle Finance (provincial mean: 63.3%)**

### **Conceptual Knowledge**

Some students thought that the age and/or sex of the driver were factors that affect car insurance premiums. When calculating vehicle payments, some students assumed a 12-month term rather than using the given term length. Many students did not understand whether the down payment, the tax, and the finance charge were to be added or subtracted when calculating the final cost of a new vehicle.

### **Procedural Skill**

When calculating the residual value on a leased vehicle, some students used the depreciation rate instead of the residual value rate. When working with fuel economy ratios, some students made errors when substituting the values into the ratios.

### **Communication**

When calculating the amount of fuel saved, in litres, during one year of driving, many students correctly calculated the amount, but mistakenly identified the units as either dollars or percentage saved. When explaining the advantage of purchasing versus leasing a vehicle, students gave unclear or insufficient responses.

## **Unit: Precision Measurement (provincial mean: 54.3%)**

### **Conceptual knowledge**

When asked to express a measure in the form measurement  $\pm$  uncertainty, students correctly determined the precision, but did not divide by two before substituting the value in for the uncertainty. Students had difficulty calculating the percent of a given value (i.e., 5% of 60). Rather than identifying one numerical value, some students qualified precision as a range of values. When asked to determine the precision given an uncertainty, students divided the uncertainty by two instead of multiplying it by two.

### **Procedural skill**

Many students had difficulty with place value. When given a measure to the nearest hundredth, some students stated the precision as one tenth. When adding a measure that was given to the nearest hundredth, students dropped a zero and ended up adding a measure expressed to the nearest tenth (i.e., 0.02 cm became 0.2 cm).

### **Communication**

When asked to state the maximum value, some students correctly stated the minimum and maximum values, but did not clearly indicate the final answer. Many times, units were forgotten.

## **Unit: Probability (provincial mean: 50.4%)**

### **Conceptual knowledge**

Some students had difficulty demonstrating the difference between odds and probability. Others struggled with the concepts of theoretical and experimental probability. Some common errors made when calculating expected value were using the given earned value as the amount gained, and determining the expected value of multiple outcomes rather than the desired individual outcome.

### **Procedural skill**

When given a spinner of various colours, many students assumed that each colour only appeared once, resulting in an incorrect probability. When asked to determine the probability of a sum greater than 8, students included the sum of 8 in their response.

### **Communication**

Explanation questions proved difficult for some students and often yielded insufficient responses. Students gave the definition of a concept rather than relating it to the given scenario. Many unit errors were made when determining the expected value. Some students did not express their final answers to at least two decimal places.

## **Unit: Geometry and Trigonometry (provincial mean: 47.1%)**

### **Conceptual knowledge**

Many students tried using the Pythagorean Theorem to calculate the unknown side of an obtuse triangle instead of using cosine law. When solving for an obtuse angle using the cosine law, many students dropped the negative sign, which resulted in the acute angle being their final answer.

### **Procedural skill**

When using cosine law to calculate an unknown side, many students did not take the square root and ended up with an impossible solution. Some students correctly set up sine law ratios, but did not know how to proceed. For students who did proceed, some did not use the inverse sine function to solve for the angle; they simply used the sine function.

### **Communication**

Many students rounded too soon and/or rounded incorrectly when using the sine and cosine law formulae. Some students did not express their answers to at least two decimal places. Students struggled when asked to explain specific properties of triangles and kites. Many answers were vague and insufficient. Often, students provided definitions of the terms, rather than an explanation.

## Unit: Statistics (provincial mean: 61.3%)

### Conceptual knowledge

Many students identified the first number listed in the data set as the low outlier rather than numerically ordering the data and identifying the lowest value. Although students seemed to understand the concept of mode, there was a lack of attention to detail that resulted in students identifying two modes rather than the given one. Students struggled to correctly substitute into the percentile rank formula; many used the number of the score they were asked to find rather than determining the number of scores below. Some students calculated the arithmetic mean when asked to calculate the weighted mean. Some students included a percent sign with their percentile rank answer, committing a conceptual error.

### Procedural skill

When calculating an overall score using a weighted mean, some students went too far and divided the weighed mean by the sum of the given scores. Students seemed to understand that data needs to be numerically ordered when determining the median however, rather than calculating the mean of the middle two numbers, students indicated that both values were the median.

### Communication

Many times students did not include units for the calculation of mean, median, and mode. When asked to calculate an overall score, students assumed the score was a percent and included a percent sign with their final answer. Many rounding errors were committed; students either truncated their final answer or stated monetary answers to one decimal place. When asked to explain the impact of certain measures of central tendency, some students defined the term, but did not explain the effect, resulting in insufficient explanations.

### 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>	Final Answer	21.0%
<b>E2</b>	Notation	4.5%
<b>E3</b>	Transcription/Transposition	11.2%
<b>E4</b>	Whole Units	2.5%
<b>E5</b>	Units	55.4%
<b>E6</b>	Rounding	59.4%

## 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 compare the local marking results to the results from the departmental re-marking of sample test booklets. Provincially, 46.9% of the test booklets sampled were given nearly identical total scores. In 33.3% of the cases, local marking resulted in a higher score than those given at the department; in 23.9% of the cases, local marking resulted in a lower score. On average, the difference was approximately 0.6% with local marking resulting in the slightly higher average score.

## Survey Results

Teachers who supervised the Grade 12 Essential Mathematics Achievement Test in June 2019 were invited to provide comments regarding the test and its administration. A total of 229 teachers responded to the survey. A summary of their comments is provided below.

After adjusting for non-responses:

- 98.6% of the teachers indicated that the questions reflected the curriculum outcomes.
- 96.3% of the teachers indicated that the reading level of the test was appropriate and 96.8% of them indicated the difficulty level of the test was appropriate.
- 95.3% of the teachers indicated that the time allotted to write the test was adequate.
- 85.9% of the teachers indicated that their students used a study sheet throughout the semester and 92.5% of them indicated that their students used a study sheet during the test.