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# GENERAL COMMENTS

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## Grade 12 Essential Mathematics Achievement Test (January 2016)

### 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).

### Summary of Test Results (Province)

January 2016	June 2015	January 2015	June 2014	January 2014
59.7%	57.0%	55.9%	57.1%	57.5%

### Unit: Home Finance (provincial mean: 64.0%)

#### Conceptual Knowledge

For Gross Debt Service Ratio (GDSR), students did not always use monthly values (some students used annual values). When deciding to approve or disapprove a mortgage, many students did not refer to the 32% GDSR benchmark and a few students referred to the Total Debt Service Ratio (TDSR) benchmark of 40%. When solving for the interest paid over the life of the mortgage, students used the simple interest formula ( $I=Prt$ ) or correctly found the total payments, but failed to find the interest (total payments - mortgage). For home insurance, opting for a \$200 deductible caused confusion with some students using the additional amount per \$1000 while other students found unrealistic annual premiums. Many students considered preventative home maintenance to be reactionary repairs (after failure), emergency repairs, or renovations, as well as energy-efficient upgrades.

### **Procedural Skill**

When solving fractions, such as the GDSR formula, some students did not use order of operations. Some students used the wrong table value or the incorrect number of months or number of years, and some students used percent or mill rate incorrectly.

### **Communication**

Many students simply stated single word answers or vague responses. A few students used the term “rent” when answering home ownership questions, wrote multiple responses on a line requiring a single response, stated currency answers without two decimal places, or gave rounded answers.

## **Unit: Vehicle Finance (provincial mean: 75.8%)**

### **Conceptual Knowledge**

Students misread some questions, providing incorrect responses. Answers for “buying new and used” or “leasing versus buying” were given for the question requesting advantages and disadvantages of “buying used.” The concept of the effects of the length of time a vehicle is financed had been misstated by some students as saving money by lengthening the term. When asked for ways to reduce finance charges on a specific loan amount, some students responded with providing a trade-in. Some students were unclear on how to use the fuel economy formula and/or the process to calculate the total cost of fuel.

### **Procedural Skill**

Rules for the calculation of taxes on the final purchase price involving a trade-in were misunderstood by some students. Calculation of the monthly payment was at times confused with simple interest. Justification questions were insufficiently responded to by some students.

### **Communication**

Insufficient responses such as “less taxes” were provided by some students as a response to the advantages of purchasing a used vehicle instead of specifying that GST is not charged on used vehicles when purchased privately. Also “down payment” was provided as a response to decreasing total amount paid to finance without stating “larger” down payment. Incorrect values for the cost per litre, incorrect table values, and incorrect cost for 4 hours of labour were used by a number of students. When asked for one response, some students provided 2 or 3 answers with some responses correct and some not. Rounding incorrectly was also an issue for some students.

## **Unit: Precision Measurement (provincial mean: 50.1%)**

### **Conceptual Knowledge**

Students knew to add and subtract from a nominal value to calculate the maximum and minimum values. Students knew to divide precision in half to get uncertainty. On measurement scales, some students inferred precision from the labelled (numbered) scale markers rather than from the smallest increment.

### **Procedural Skill**

Students did not know to cut tolerance in half to find maximum and minimum values. Students could calculate uncertainty from a given precision, but struggled if they had to calculate the precision first. Many students confused accuracy and precision. Very few students could add or subtract uncertainties.

### **Communication**

Students struggled with making a choice and then justifying the choice. Students struggled with communicating why a measuring device is more precise; they could identify which device is more precise, but not why.

## **Unit: Probability (provincial mean: 55.7%)**

### **Conceptual Knowledge**

When using expected value in decision making, students were indicating that a particular scenario should not be continued as an expected value of \$0.02 is not enough to warrant doing the work. Whenever an expected value is positive, it is expected that they should continue as it will yield a large positive result over many repetitions.

### **Procedural Skill**

When calculating the “\$ gain” portion of the expected value formula, many students did not subtract the “\$ loss” portion from that value before using it in the formula. Students also struggled when asked to convert probability from odds.

### **Communication**

While students understood the concept of expected value, they were not able to express it properly. They indicated that the person may gain or lose but did not make the connection to the expected value being positive or negative.

## **Unit: Geometry and Trigonometry (provincial mean: 49.0%)**

### **Conceptual Knowledge**

Students struggled to justify why an obtuse triangle would be the best type to use for a ramp. Often, they referred to the given apex angle rather than the base angles in their justifications. Students understood the properties of squares and were able to identify other parallelograms. Occasionally, students made mistakes substituting into the sine law formula, and used the information given in the triangle but forgot to calculate the required third angle. When asked to state the measure of an interior angle, occasionally students calculated the measure of the central angle instead.

### **Procedural Skill**

Occasionally, students used basic trigonometry ratios instead of cosine law or sine law. Order of operations was done incorrectly in some instances, even though values were substituted correctly into the cosine law formula. The sine law formula was executed correctly, even if the substitutions weren't correct. Generally, students were able to calculate the sum of the interior angles using the formula provided.

### **Communication**

Quite commonly, students referred to a rhombus as a kite or diamond. Students tended to simply state the properties of a square rather than using these properties to explain why a square is a parallelogram.

## **Unit: Statistics (provincial mean: 51.1%)**

### **Conceptual Knowledge**

Many students made the mistake of calculating an arithmetic mean when asked to calculate a weighted mean. When looking for the best way to increase a test mark based on a weighted mean, many students referred to the category that had the lowest mark as the category in which to improve, ignoring the weights. Consideration of the weights of each category was necessary to make an appropriate decision. Students could identify mean, median, and mode, but had difficulty with identifying those terms as a “measure of central tendency”.

### **Procedural Skill**

When calculating percentile rank, many students only indicated their final answer with no work shown. When questions use “calculate” as a directing word, work must be shown.

### **Communication**

Students used “75 %” instead of “PR = 75, 75th, or PR75” when indicating percentile rank. When asked to express 0.63 as a fraction, many students wrote either 5/8 or 12/13.

### **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, 39.5% of the test booklets sampled were given nearly identical total scores. In 46.8% of the cases, local marking resulted in a higher score than those given at the department; in 13.7% of the cases, local marking resulted in a lower score. On average, the difference was approximately 2.0% with local marking resulting in the slightly higher average score.

### **Survey Results**

Teachers who supervised the Grade 12 Essential Mathematics Achievement Test in January 2016 were invited to provide comments regarding the test and its administration. A total of 171 teachers responded to the survey. A summary of their comments is provided below.

After adjusting for non-responses:

- 96.9% of the teachers indicated that the test content was consistent with the learning outcomes as outlined in the curriculum document.
- 94.4% of teachers indicated that the reading level of the test was appropriate and 94.4% of them indicated the difficulty level of the test was appropriate.
- 92.5% of the teachers indicated that students were able to complete the entire test in the allotted time.
- 83.0% of the teachers indicated that their students used a study sheet throughout the semester and 90.6% of teachers indicated that their students used a study sheet during the test.