GENERAL COMMENTS

Grade 12 Essential Mathematics Achievement Test (June 2017)

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).

Summary of Test Results (Province)

June 2017	January 2017	June 2016	January 2016	June 2015	January 2015
53.7%	58.3%	59.9%	59.7%	57.0%	55.9%

Unit: Home Finance (provincial mean: 59.5%)

Conceptual knowledge

Students did not know how to calculate annual property taxes. They did not correctly calculate the total education taxes, they did not know what to do with the mill rates, and many did not understand the tax credit, and added it to the amount to be paid. When identifying energy efficient upgrades, most students provided either energy efficient or cost saving solutions, but not both. Students could read insurance table values, but often did not understand what to do with the values they extracted from the table. Several students incorrectly calculated the taxes, and many found unrealistic annual premiums. Students confused one-time costs with on-going costs. For the GDSR, students did not calculate the monthly property tax value, using the annual value instead. Students often confused decreasing amortization time with increasing it.

Procedural skill

Students were able to read a table and identify a correct table value. Many students used an incorrect order of operations (calculations were done on a calculator, without brackets for the numerator in a fraction). Many students did not change the annual property tax to a monthly amount for substitution into the GDSR formula. This affected their final answer in calculating the GDSR. Many students improperly used mill rates, and added a property tax credit rather than subtracting it.

Communication

Students were able to identify table values by circling or underlining them, even though they didn't know what to do with them. Often, more than one response was given when only one was asked for, and often one of the responses was incorrect, resulting in a mark deduction. On all three "state" questions, a significant number of students gave one-word, insufficient responses that were too vague to receive credit. Many students poorly communicated their final responses. Currency often lacked dollar signs and correct number of decimals, GDSR lacked the percentage sign or was stated as money, and rounding was an issue in many questions.

Unit: Vehicle Finance (provincial mean: 46.3%)

Conceptual knowledge

Students had difficulty recognizing that depreciation calculation is based on the previous year. Taxes on labour and repairs continue to be calculated incorrectly. Students demonstrated a limited understanding of the costs associated with owning a car. Students struggled with the $I = Prt$ formula when the time period is not a full year.

Procedural skill

While students were able to calculate a total payment, they did not subtract the original value of the vehicle when calculating the amount of interest paid over the life of the loan.

Communication

Despite bolding the critical task, students failed to follow the instructions in the question. It seemed that many students did not use the information in the table provided.

Unit: Precision Measurement (provincial mean: 53.2%)

Conceptual knowledge

Students struggled to find the uncertainty when given a measurement. Many students would simply divide the measurement by 2. Tolerance was often written as uncertainty. Students calculated the maximum value when asked for the minimum value.

Procedural skill

Students struggled to identify the precision of a device which does not start at 0, yet included "tick marks" to note the increment. Students often presented the maximum or minimum value as the nominal value when asked for "nominal value +/- ½ (tolerance)".

Communication

Students often forgot to provide the unit of measurement when calculating the minimum value or the tolerance. Students struggled when writing a measurement in the form of "measurement +/- ½ tolerance". Students referenced the time frame rather than the oven's temperature when asked to explain when the tolerance of an oven's temperature needs to be considered when baking a cake. Students should be encouraged to read the questions in full prior to responding to the question.

Unit: Probability (provincial mean: 70.8%)

Conceptual knowledge

Given the odds of an event occurring, students had difficulty indicating the probability for and against. Students struggled with identifying if a situation was using theoretical or experimental probability.

Procedural skill

When asked for a discrete value, for example the number of defective light bulbs in a given manufacturing day, many students gave the probability. Many students incorrectly calculated expected value as the gain portion of the calculation was stated incorrectly.

Communication

Many students did not round appropriately.

Unit: Geometry and Trigonometry (provincial mean: 46.0%)

Conceptual knowledge

Many students were able to identify a triangle as obtuse or isosceles. When solving for base angles some students used cosine law rather than sine law. Many students recognized that equilateral triangles have 60 degree angles. Students were able to solve for unknown sides using either cosine or sine law even if they had substituted an incorrect value.

Procedural skill

Students generally knew how to use sine law and cosine law to solve for an unknown side. Many students incorrectly identified a supplementary angle. Students could correctly solve for a central angle, but some went too far and found the measure of one interior angle.

Communication

Some students rounded too soon when using cosine law so their answers were not communicated correctly. Students also forgot to include units in their final answer.

Unit: Statistics (provincial mean: 62.3%)

Conceptual Knowledge

Given a set of names and scores, students were unable to properly calculate the percentile rank of a particular student. Some students confused arithmetic mean with weighted mean. When asked to support why the mode is a better indicator of central tendency in a given situation, many students ignored mode and argued why the mean is a better indicator.

Procedural Skill

Many students did not present percentile rank as a whole number. Given a weighted mean and asked to find a missing score correct to two decimals, students incorrectly used the guess and check method to arrive at an estimated answer.

Communication

Many students incorrectly used the percent unit to describe percentile rank scores and also did not present their answers as a whole number.

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 include a chart comparing the local marking results to the results from the departmental re-marking of sample test booklets. Provincially, 50.5% of the test booklets sampled were given nearly identical total scores. In 28.6% of the cases, local marking resulted in a higher score than those given at the department; in 20.9% of the cases, local marking resulted in a lower score. On average, the difference was approximately 0.3% with local marking resulting in the slightly higher average score.

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 indicated the percentage of students who had at least one error for each type.

E1	Rounding	45.9%
E2	Units	68.0%
E3	Transcription/Transposition	9.2%
E4	Final Answer	54.7%
E5	Whole Units	7.0%

Survey Results

Teachers who supervised the Grade 12 Essential Mathematics Achievement Test in June 2017 were invited to provide comments regarding the test and its administration. A total of 193 teachers responded to the survey. A summary of their comments is provided below.

After adjusting for non-responses:

- 94.5% of the teachers indicated that the test content was consistent with the learning outcomes as outlined in the curriculum document.
- 92.9% of teachers indicated that the reading level of the test was appropriate and 80.1% of them indicated the difficulty level of the test was appropriate.
- 84.6% of the teachers indicated that students were able to complete the entire test in the allotted time.
- 83.9% of the teachers indicated that their students used a study sheet throughout the semester and 92.7% of teachers indicated that their students used a study sheet during the test.