
GENERAL COMMENTS

Grade 12 Essential Mathematics Achievement Test (January 2018)

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).

Unit: Home Finance (provincial mean: 50.9%)

Conceptual knowledge

Students struggled with insurance terminology and concepts (deductible vs. premium), and with the correct application of property tax credits. Students were able to properly apply a down payment percentage.

Procedural skill

Students understood how to apply and calculate the GDSR formula. They could also calculate the total amount paid over the life of a mortgage, given the mortgage payment. They could use frontage measurements to calculate local improvement taxes. Students struggled with knowing whether to add or subtract a deductible in insurance situations.

Communication

When asked to provide explanations, students struggled. Sometimes they would only give one or two word responses. Other times they would provide two contradictory explanations. They often made errors in rounding decimals.

Unit: Vehicle Finance (provincial mean: 59.1%)

Conceptual knowledge

Students often included taxes in a calculation when they were specifically told that a cost was “after taxes”. Students would often divide litres by dollars instead of dollars by litres when calculating the average cost of fuel per litre. When calculating the total cost of a vehicle, given the monthly payments and the down payment, many students subtracted the down payment instead of adding it. When asked about the factors that affect the cost of insurance, many students indicated that the age of the driver was a factor. Many students believed that tax (PST + GST) was 12%. Students had difficulty finding the total amount borrowed when given the price of a vehicle, the trade-in value, the tax, and the down payment.

Procedural skill

Many students knew that a vehicle lease was cheaper, but were not able to articulate how. They did not go on to explain whether they were referring to cheaper payments or whether it was cheaper to buy.

Communication

Fuel economy calculations were often written to one decimal place instead of two. Many students made rounding errors (e.g., \$110.175 was rounded to \$110.17).

Unit: Precision Measurement (provincial mean: 48.7%)

Conceptual knowledge

Most students demonstrated a good understanding of the concept of precision, and were far more likely to demonstrate an understanding of precision when given a diagram or picture, as opposed to just being given a word problem. A significant number of students had difficulty distinguishing between the notions of tolerance and uncertainty. In several questions, when asked for the tolerance, students would give the uncertainty and vice versa. Students demonstrated a good understanding of calculating minimum values.

Procedural skill

While students were able to demonstrate the concept of determining uncertainty, a significant number of students had difficulty calculating it when given a measurement. Students recognized they needed to ‘divide by 2’ but often substituted incorrect values. While students demonstrated a good understanding calculating minimum values, again they often substituted incorrectly, such as subtracting the precision rather than the uncertainty.

Communication

Students demonstrated a reasonably good understanding of determining minimum values and tolerance, however, many students had difficulty presenting it. Several students, when determining the minimum value, stated it as a measurement, and when determining the tolerance, were unable to present it in a specific form, or would present it as a measurement, or as a maximum and a minimum value. Finally, explanation questions were most often vague and insufficient to receive a score.

Unit: Probability (provincial mean: 54.3%)

Conceptual knowledge

Students struggled with the relationship between probability and odds. Difficulties were seen when students had to convert a probability to odds.

Procedural skill

Students recognized that a probability of 1 or 100 is possible, however, didn’t know when to use either. They tended to interchange these values in calculations.

Communication

The use of the percent symbol continues to present a challenge for students. They know that $50\% = 0.5$, but often misrepresent the value as 0.5% .

Unit: Geometry and Trigonometry (provincial mean: 48.3%)

Conceptual Knowledge

Generally, students correctly identified when sin law and cosine law were to be used to solve for a value in a triangle. When a needed angle was not provided, but had to be calculated, many students struggled. Many students were unable to correctly draw diagonals; instead, they drew a line from the centre to the tick mark rather than to the corner. Many students double counted the diagonals, (i.e., drew 3 diagonals and said there were 6).

Procedural Skill

Although students correctly substituted for cosine law, many were unable to correctly solve for the angle measurement. Instead of taking the inverse cos (even having it written down), many multiplied by 100 to get the measurement of the angle. Most students correctly solved for an unknown value using sin law, even if they had substituted incorrectly. Many students were unable to solve for the number of sides in a polygon, given the sum of the angles. Many students simply divided the sum of the angles by 180 degrees, or they subtracted 2 rather than adding 2. Some students made order of operations errors when using the diagonal formula.

Communication

Many students described all sides being parallel in a parallelogram rather than saying that opposite sides are parallel. Many said that parallelograms do not have congruent sides. Many students rounded too soon or did not round their answers to 2 decimal places.

Unit: Statistics (provincial mean: 57.6%)

Conceptual Knowledge

Students understood the concepts of mean and median. However, manipulating negative integers was problematic.

Procedural Skill

On percentile rank questions, students did not seem clear about the relationship between percentile rank and percentage score. Many equated the two (i.e., $PR_{75} = 75\%$).

Communication

Many students incorrectly used percentages to describe percentile rank scores. Students also struggled when working with negative integers when calculating a mean.

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, 43.0% of the test booklets sampled were given nearly identical total scores. In 41.4% of the cases, local marking resulted in a higher score than those given at the department; in 15.7% of the cases, local marking resulted in a lower score. On average, the difference was approximately 1.3% 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	Final Answer	35.3%
E2	Notation	14.5%
E3	Transcription/Transposition	13.1%
E4	Whole Units	6.5%
E5	Units	56.0%
E6	Rounding	57.9%

Survey Results

Teachers who supervised the Grade 12 Essential Mathematics Achievement Test in January 2018 were invited to provide comments regarding the test and its administration. A total of 196 teachers responded to the survey. A summary of their comments is provided below.

After adjusting for non-responses:

- 91.0% of the teachers indicated that the questions reflected the curriculum outcomes.
- 87.4% of teachers indicated that the reading level of the test was appropriate and 86.9% of them indicated the difficulty level of the test was appropriate.
- 87.3% of the teachers indicated that the time allotted to write the test was adequate.
- 87.8% of the teachers indicated that their students used a study sheet throughout the semester and 93.9% of teachers indicated that their students used a study sheet during the test.