
GENERAL COMMENTS

Grade 12 Essential Mathematics Achievement Test (June 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: 59.3%)

Conceptual Knowledge

Many students thought that house insurance was based on the value of a home rather than the replacement cost. When calculating property tax, many students added tax credits rather than subtracting the credits. When calculating the Municipal tax, students often used the total value of the house instead of the portioned assessment. When calculating the Gross Debt Service Ratio, many students used annual income rather than gross monthly income. Students continued to struggle when using a mill rate in a calculation, and continued to believe that, when it comes to a rental property, the renter can leave at any time and the renter does not pay for damages.

Procedural Skill

Students struggle to calculate Land Transfer Tax on amounts in excess of \$200 000. Students would often calculate the Land Transfer Tax within a question but insert a different number within a given chart. Students were able to correctly determine the down payment on a house but were not subtracting that amount to find the amount borrowed.

Communication

Many students demonstrated rounding errors when calculating the Gross Debt Service Ratio, changing 0.35 to 35%, instead of 34.59%. Students continued to give insufficient responses when asked to explain or describe a concept.

Unit: Vehicle Finance (provincial mean: 61.6%)

Conceptual Knowledge

Students continued to struggle to understand the differences between buying and leasing a car. When calculating the amount financed for a vehicle, students often added the down payment to the purchase price rather than subtracting.

Procedural Skill

When asked to calculate taxes on repairs to a vehicle, many students did not include taxes on labour costs. Students struggled to use the simple interest formula correctly. When calculating the total amount paid for a car, students would often calculate taxes first, and then subtract their trade-in value. While students understood when they needed to use the formula to calculate fuel economy, it appeared that they did not understand how to manipulate the formula to use it appropriately. When asked to calculate the amount of depreciation in the first year, students would calculate it correctly but then continue to calculate the value at the end of the first year. When assessing additional costs to pay when purchasing a used vehicle privately, students would often mistakenly add taxes to the cost of a lien search.

Communication

Students often provided underdeveloped, insufficient, or incorrect answers, which seemed to stem from misreading the question. When presenting a final answer for fuel economy, many students had unit or rounding errors. In multi-part questions, students continue to present work in the wrong section of the question.

Unit: Precision Measurement (provincial mean: 44.3%)

Conceptual Knowledge

Students demonstrated limited understanding that the nominal value is the mid-point value. Students demonstrated a general lack of clarity in differentiating among the terms minimum value, nominal value, tolerance, and uncertainty. There is an apparent lack of knowledge of fractions (e.g., rulers presented in inches generated confusion [e.g., precision is $1/15''$ or $1/10''$]). Students assumed that precision is the label on the instrument with no regard for the actual tick marks presented.

Procedural Skill

Many students did not include units in the final answer. Students were unable to calculate uncertainty with multiple measurements; they did not find the sum of the individual uncertainties. While students could easily find the individual maximum or minimum values, they lacked the ability to complete operations based on the context of a question. Students were unable to subtract a negative number within a question (e.g., $0.12 - (-0.06) = 0.18$, but instead calculated $0.12 - 0.6$).

Communication

Students struggled to clearly explain concepts that relate to a given situation. They provided acceptable components but contradicted themselves in subsequent statements. Students would often report that “increments were too small” when they meant that the “increments were too large” when referring to precision.

Unit: Probability (provincial mean: 46.0%)

Conceptual Knowledge

Students often struggled with discerning between experimental and theoretical probability. Many did not know that 0.2 is not the same as 0.2%. Students also struggled with converting between probabilities and odds. Many students could calculate the odds in a given context.

Procedural Skill

In problems that had three possible outcomes, students struggled when calculating expected value. Many students knew how to convert from probabilities in fraction form to decimal form.

Communication

Students often expressed probabilities in the form of odds, or odds in the form of probability.

Unit: Geometry and Trigonometry (provincial mean: 52.8%)**Conceptual Knowledge**

Students often incorrectly named an equilateral triangle as isosceles. Instead of stating the measure of the angles in an equilateral triangle, students often stated the side length. Students correctly identified the missing side length of a parallelogram, but struggled to state the measure of the adjacent angle. They often stated the measure of the opposite angle instead. Many students used Pythagorean Theorem instead of cosine law to solve for a non-right triangle.

Procedural Skill

Many students used sine law properly, but instead of using the inverse to find the angle measure, they multiplied by 100 (e.g., $\sin A = 0.6298 = 62.98^\circ$). Students also left their answers as 0.63. Although students seemed to know where a central angle is located in a regular octagon, many labelled it incorrectly or not at all. Many drew some of the diagonals instead. When calculating the measure of an interior angle of a regular octagon, many calculated the sum instead, or they divided one of the interior angles in half. Many students set up the sine law formula correctly, but would forget to write “sin” in front of the angle. Students also at times forgot to divide when using the sine law.

Communication

Students often rounded degrees for an angle to a whole number rather than rounding to two decimal places. Students occasionally represented their answer as $\sin \angle A = 39.04^\circ$ instead of $\angle A = 39.04^\circ$.

Unit: Statistics (provincial mean: 51.1%)**Conceptual Knowledge**

When calculating percentile rank, students confused the number of items on the list with the values of the items on the list. When calculating weighted mean, students did not include both weights in their calculations. When calculating trimmed mean, students sometimes struggled with following the instructions for how many items to trim, and how many items would be left.

Procedural Skill

Students could calculate the mean and the trimmed mean quite well. They could follow and execute the formula for percentile rank. They sometimes struggled with calculating a weighted mean using percentage values.

Communication

When calculating percentile rank, many students did not express their answers as whole numbers. Students struggled to explain their knowledge of how the median might be affected when changing values in the data set.

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, 35.8% of the test booklets sampled were given nearly identical total scores. In 35.8% of the cases, local marking resulted in a higher score than those given at the department; in 28.5% of the cases, local marking resulted in a lower score. On average, the difference was approximately 0.9% with local marking resulting in the slightly lower 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	40.7%
E2	Notation	12.8%
E3	Transcription/Transposition	11.7%
E4	Whole Units	25.0%
E5	Units	64.0%
E6	Rounding	50.9%

Survey Results

Teachers who supervised the Grade 12 Essential Mathematics Achievement Test in June 2018 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:

- 97.5% of the teachers indicated that the questions reflected the curriculum outcomes.
- 94.4% of teachers indicated that the reading level of the test was appropriate and 95.9% of them indicated the difficulty level of the test was appropriate.
- 86.7% of the teachers indicated that the time allotted to write the test was adequate.
- 84.3% of the teachers indicated that their students used a study sheet throughout the semester and 88.2% of teachers indicated that their students used a study sheet during the test.