
GENERAL COMMENTS

Grade 12 Essential Mathematics Achievement Test (January 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)

January 2017	June 2016	January 2016	June 2015	January 2015	June 2014
58.3%	59.9%	59.7%	57.0%	55.9%	57.1%

Unit: Home Finance (provincial mean: 61.9%)

Conceptual Knowledge

Students continue to struggle with land transfer tax. They find it difficult to enter the correct remaining portion to be taxed. Many students identified a land survey as an on-going cost of home ownership. Students continue to believe that it is always “cheaper” to rent an apartment. Many mistake maintenance/upkeep/repairs (which are the responsibility of the owner) and damages (which are the responsibility of the tenant). Still others believe you can “leave whenever you want.”

Although students are able to calculate 5% of a home’s price, many students do not subtract this down payment from the cost of the home to arrive at the mortgage amount. Students are able to calculate the total amount paid but are not subtracting it from the original mortgage amount.

When calculating the difference in cost between furnace/heating options, many students did not subtract the costs of each. Students are not recognizing long-term saving (more than 5 years).

Procedural Skill

When calculating GDSR many students recognize that formula values need to be monthly but were unable to recognize that values that were given were already stated as monthly values. Some students tried to calculate GDSR by making all values yearly but did not keep gross annual income as yearly.

When asked to calculate the amount of interest paid, students continue to confuse total amount of interest paid with interest paid in one month ($I = Prt$). They then went on to create formula combinations where all the numbers were used.

When calculating land transfer tax, they simply take the values in the table and calculate the tax (calculating $\$50\,000 \times 1.5\%$ as indicated in the table, even though the portioned value is $\$42\,000$).

Communication

The percent unit was often forgotten, and there were many rounding errors. Some students put answers in the boxes provided in the land transfer table but then continued their calculations in the space below, often resulting in erroneous extraneous information being provided. When asked to provide an explanation, answers were often vague and lacked details.

Unit: Vehicle Finance (provincial mean: 66.0%)

Conceptual Knowledge

When asked to calculate the total cost of a car, students would often add taxes to the price of the vehicle prior to deducting the trade-in value. Some students added taxes to only the base price, and not the options, and others did not add the options to the base price. When calculating residual value, students would take 40% of the total cost of leasing, rather than 40% of the original value of the car. In performing the calculation, students would often subtract \$0.40, rather than multiplying by the residual rate of 0.4. When calculating the depreciation amount, students would often calculate the value of the vehicle after depreciation rather than the depreciation amount after 1 year. Students would also convert the depreciation amount (e.g., 30%) to a dollar amount (e.g., \$0.30). When calculating the total cost of a tune-up, students continued to struggle with the application of taxes. Also, students would simply add up the cost of items without multiplying by the number of items.

Procedural Skill

When calculating the cost of fuel, many students would stop after calculating the number of litres and would present that as the total cost of gas. Students would also add taxes to the cost of gas, not recognizing that the taxes were already built into the cost.

Communication

When asked to explain a response, answers were often underdeveloped and lacked detail.

Unit: Precision Measurement (provincial mean: 58.7%)

Conceptual Knowledge

Given a picture of a measuring device, many students were able to correctly identify the precision. If errors were made, students tended to write the uncertainty instead. Students are able to correctly find the minimum and maximum by subtracting or adding an amount to the nominal value, and seem to understand that tolerance is the range (max–min). Most students know that uncertainty is half of precision and how to write tolerance when the nominal value is the midpoint.

Procedural Skill

Many students did not demonstrate understanding when the nominal value is the minimum measurement. Many students are not including the correct number of decimal places when identifying the maximum or minimum. (e.g., 5 instead of 5.0 cm.)

Communication

Many students have difficulty representing tolerance in the required form. They seem to understand the concept of tolerance being a range of acceptable measurements, but struggle to write the measurement in any other form besides: nominal value \pm ($\frac{1}{2}$ tolerance). When asked to explain a concept given a scenario, students often simply define the term (e.g., accuracy or tolerance) or reword the information given in the scenario.

Unit: Probability (provincial mean: 64.4%)

Conceptual Knowledge

Students demonstrated knowledge of fractions and the difference between odds and probability. They did struggle to differentiate between experimental and theoretical probabilities. Students struggled to correctly solve the expected value question.

Procedural Skill

No procedural issues were noted.

Communication

Students regularly wrote odds as a fraction.

Unit: Geometry and Trigonometry (provincial mean: 49.1%)

Conceptual Knowledge

Many students struggled to understand how to determine the number of sides of a polygon when given the sum of interior angles. Many students did not understand the concept of a “Regular Polygon”, saw a 90° angle on the diagram and used SOH CAH TOA, when mathematically it was not 90° and also would only indicate the length of one side of a triangle or one angle of a triangle; they would not address all sides.

Procedural Skill

Many students struggled to understand that they needed to calculate the angle which was used in the sine law or cosine law. Many students struggled to substitute values into the appropriate places in the sine law or cosine law. Also, many students forgot to apply the negative sign when used in a formula.

Communication

Incorrect rounding and not expressing the answer to two decimals were seen often.

Unit: Statistics (provincial mean: 57.8%)

Conceptual Knowledge

Students could accurately calculate the mean, median, and mode when given a set of numbers, and also were able to correctly calculate a trimmed mean. Students were able to calculate a percentile rank, but struggled to calculate a mark as a percentage when given the information. When given income amounts and percentile rank, students struggled to calculate the percentage of people who earned between certain amounts.

Procedural Skill

When asked to calculate a weighted mean, students did not divide by the total population in their calculation.

Communication

Students often rounded the median weight to a whole number. Students also left a percentile rank calculation in percentage form. When asked to justify whether a standard mean or a trimmed mean was more appropriate given a context, responses were incorrect or underdeveloped.

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, 55.5% of the test booklets sampled were given nearly identical total scores. In 31.3% of the cases, local marking resulted in a higher score than those given at the department; in 13.2% 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 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	58.6%
E2	Units	72.6%
E3	Transcription/Transposition	18.9%
E4	Final Answer	71.6%
E5	Whole Units	10.8%

Survey Results

Teachers who supervised the Grade 12 Essential Mathematics Achievement Test in January 2017 were invited to provide comments regarding the test and its administration. A total of 175 teachers responded to the survey. A summary of their comments is provided below.

After adjusting for non-responses:

- 95.4% of the teachers indicated that the test content was consistent with the learning outcomes as outlined in the curriculum document.
- 95.4% of teachers indicated that the reading level of the test was appropriate and 93.6% of them indicated the difficulty level of the test was appropriate.
- 84.4% of the teachers indicated that students were able to complete the entire test in the allotted time.
- 99.5% of the teachers indicated that their students used a study sheet throughout the semester and 99.5% of teachers indicated that their students used a study sheet during the test.