
TEST QUESTION ANALYSIS

Grade 12 Essential Mathematics Achievement Test (January 2020)

Introduction

This document provides information about students' performance on each of the questions in the provincial test and analysis of several questions that students found most challenging. Teachers are encouraged to use and share this information with students.

General information about provincial mathematics tests is available in the *Grade 12 Mathematics Achievement Tests: Information Bulletin*, posted on the Manitoba Education website at www.edu.gov.mb.ca/k12/assess/infobulls/.

Archived provincial mathematics tests and marking guides are available on the department's website at www.edu.gov.mb.ca/k12/assess/archives/.

Policies and procedures related to provincial Grade 12 tests are available on the department's website at www.edu.gov.mb.ca/k12/assess/docs/pol_proc/.

Student Performance by Test Question

The graph on the next page shows how well students performed on each test question, using a 0–100% scale. A score close to 100% means that students performed well on the question, approaching 100% of its mark value. A score closer to 0 means students performed poorly on the question. The horizontal line represents the mean for all of the test questions.

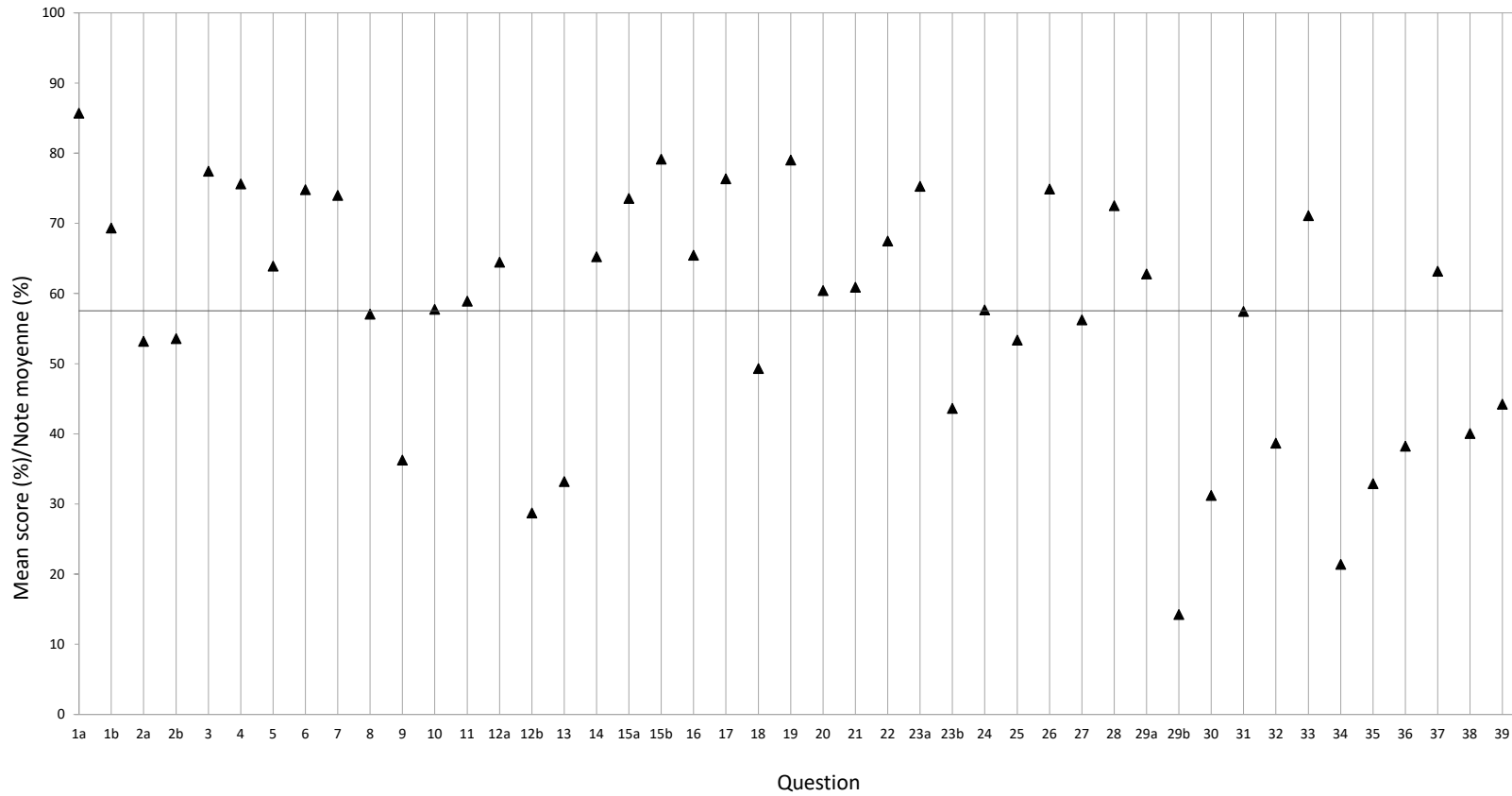
For example, Question 20 has a mean of 60.4%, meaning that the mean score for this question is 0.6 out of 1. Question 6 has a mean of 74.8%, but is worth 3 marks so the mean score for this question is 2.2 out of 3.

Analysis of Challenging Questions

On the pages following the graph, some test questions that students found most challenging are presented, with an analysis of common sources of confusion or conceptual misunderstanding.

Student Performance by Test Question—Graph

Grade 12 Essential Mathematics Achievement Test (January 2020)—Test Question Mean Scores
Test de réalisation, Mathématiques au quotidien, 12^e année (janvier 2020) — Notes moyennes par question de test



Note: The horizontal line represents the mean for all of the test questions.

Remarque : La ligne horizontale représente la moyenne pour toutes les questions de test.

Analysis of Challenging Questions—Details

Question: 12

Provincial Mean: (a) 64.5%, (b) 28.7%

Specific Learning Outcome(s): E6.P.1

- Analyze and interpret problems that involve probability.

Achievement Indicator(s):

- Explain, using examples, how decisions may be based on a combination of theoretical probability calculations, experimental results, and subjective judgments.

Question 12

Each year, a market gardener randomly grows either peas, beans, carrots, or onions.

The table below indicates which vegetable was grown each year for the past 10 years.

Year	Vegetable
2010	peas
2011	beans
2012	beans
2013	carrots
2014	onions
2015	peas
2016	carrots
2017	beans
2018	peas
2019	beans

- A) State the experimental probability that the gardener will grow beans in 2020. (1 mark)
- B) State the theoretical probability that the gardener will grow carrots in 2020. (1 mark)

Common Error(s):

- Almost all students who answered Part B incorrectly stated the experimental probability of growing carrots instead of the theoretical probability. The most common answer was an experimental probability of $\frac{2}{10}$ or 0.2.
- Many of these students stated an experimental probability in both Part A and Part B, although there were some students who stated a theoretical probability in Part A and then an experimental probability in Part B.
- Some students who stated an experimental probability in Part B added the year 2020 to the total number of outcomes, resulting in a denominator of 11.

Question: 13

Provincial Mean: 33.2%

Specific Learning Outcome(s): E6.P.1

- Analyze and interpret problems that involve probability.

Achievement Indicator(s):

- Determine the probability of an event, given the odds for or against.

Question 13

The odds **against** Nico randomly selecting a country song from a playlist are 345 : 105.

State the probability, as a fraction, of Nico **not** selecting a country song.

Common Error(s):

- Many students had difficulty converting from “odds against” to a probability of “not selecting.” They did not recognize that converting “odds against” to a probability of “not selecting” is more direct than converting “odds against” to a probability of “selecting”, or vice versa.
- The most common answer was stating the probability of selecting a country song (i.e., $\frac{105}{450}$).
- Some students stated the odds of selecting a country song as a fraction (i.e., $\frac{105}{345}$).

Question: 29 b)

Provincial Mean: 14.2%

Specific Learning Outcome(s): E5.P.1

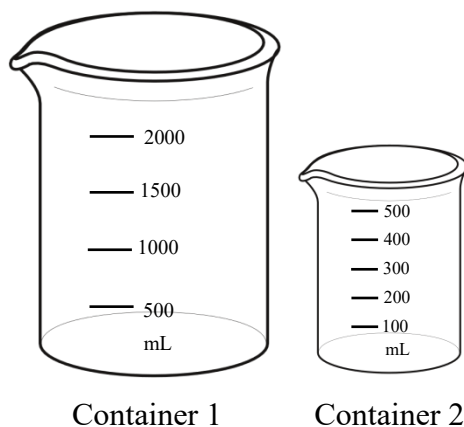
- Demonstrate an understanding of the limitations of measuring instruments, including precision, accuracy, uncertainty, and tolerance.

Achievement Indicator(s):

- Solve a problem that involves precision, accuracy, or tolerance.

Question 29

Ellen is preparing chain saw fuel by mixing oil with gas. She needs 600 mL of gas for the mixture.



B) Ellen uses the container you chose in Part A to measure the 600 mL of gas.

Calculate the total uncertainty of the measurement. (1 mark)

Common Error(s):

- Most students were able to correctly identify 50 mL as the uncertainty of Container 2, but they did not recognize that when using a measuring device twice, the uncertainty needs to be added twice. Thus, almost all students answered ± 50 mL as their final answer.

Question: 34

Provincial Mean: 21.4%

Specific Learning Outcome(s): E5.S.2

- Analyze and describe percentiles.

Achievement Indicator(s):

- Explain, using examples, the difference between percent and percentile rank.

Question 34

Jorge is a soccer goalie. This year, he saved 92% of shots on net. This puts him in the 10th percentile of goalies in the league.

Justify, referring to percentile rank, whether Jorge was one of the best goalies in the league this year.

Common Error(s):

- Many students struggled to recognize that a high percentage could result in a low percentile rank.
- It seemed as though students saw 92% and automatically assumed Jorge was one of the best goalies. They not did consider the rest of the given information (i.e., a percentile rank of 10).