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# TEST QUESTION ANALYSIS

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## Grade 12 Applied 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/](http://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/](http://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/](http://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.

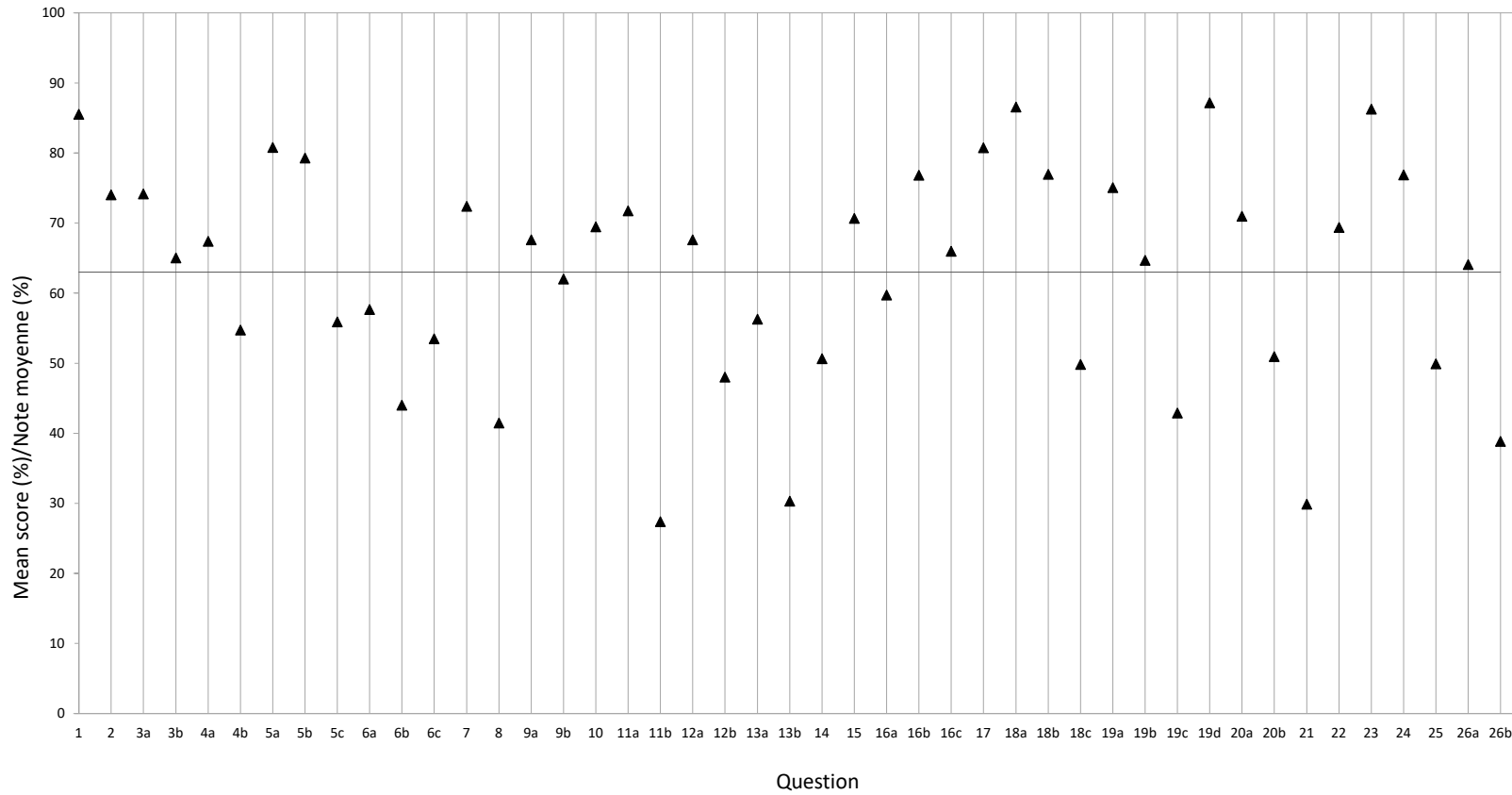
For example, Question 1 has a mean of 86%, meaning that the mean score for this question is 0.86 out of 1. Question 8 has a mean of 41%, but is worth 2 marks so the mean score for this question is 0.82 out of 2.

### 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 Applied Mathematics Achievement Test (January 2020)—Test Question Mean Scores  
Test de réalisation, Mathématiques appliquées, 12<sup>e</sup> 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:** 11

**Provincial Mean:** (a) 71.7%, (b) 27.4%

**Specific Learning Outcome(s):** 12.A.P.6

- Solve problems that involve combinations.

**Achievement Indicator(s):**

- Determine the number of combinations of  $n$  elements taken  $r$  at a time.
- Solve a contextual problem that involves probability and combinations.

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### Question 11

**Total: 3 marks**

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Your school requires a group of 4 actors for a play.

- a) Determine how many ways the group of 4 actors can be chosen from 23 interested students.

*(1 mark)*

- b) You and your best friend are 2 of the 23 interested students. Determine the probability that you both are chosen. Show your work.

*(2 marks)*

**Common Error(s):**

- Many students treated (b) as a separate question and provided incorrect answers (e.g.,  $\frac{2}{23}$  or  $\frac{2}{23} \times \frac{1}{22}$ ).
- In (b), many students did not write their answer as a probability.
- In (b), some students used permutations rather than combinations and used permutations incorrectly.

**Question: 13****Provincial Mean:** (a) 56.3%, (b) 30.3%**Specific Learning Outcome(s):** 12.A.P.3, 12.A.P.5

- Solve problems that involve the probability of independent and dependent events.
- Solve problems that involve permutations.

Students should be able to use strategies such as cases or grouping objects together to solve a contextual problem. Also, it is intended that circular permutations not be included.

**Achievement Indicator(s):**

- Determine the probability of an event, given the occurrence of a previous event.
- Create and solve a contextual problem that involves determining the probability of dependent or independent events.
- Determine the number of permutations of  $n$  elements taken  $n$  at a time where some elements are not distinct.

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**Question 13****Total: 4 marks**

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Kyla wants to buy a cup of tea for \$2. She has the following coins in her pocket:

- 2 identical toonies (\$2 coin)
- 6 identical loonies (\$1 coin)
- 3 identical quarters (25¢ coin)

- a) Determine the probability of randomly drawing 2 loonies, one after the other, if the first coin is not replaced in her pocket before drawing the second coin. Show your work.

(2 marks)

- b) Once she has paid for her tea using the 2 loonies, Kyla decides to stack all of the remaining coins in a tower. Determine the number of different ways she can stack the coins. Show your work.

(2 marks)

**Common Error(s):**

- In (b), many students did not include all types of coins (loonies, toonies, and quarters) in the denominator.
- In (b), many students did not recognize that there were identical objects within the set of 9 coins.
- In (b), some students multiplied the number of toonies by the number of quarters.

**Question:** 21

**Provincial Mean:** 50.6%

**Specific Learning Outcome(s):** 12.A.FM.1

- Solve problems that involve compound interest in financial decision making.

**Achievement Indicator(s):**

- Solve a contextual problem involving compound interest.

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**Question 21**

**Total: 2 marks**

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In 2009, the value of a cottage was \$325 000.00. In 2019, the same cottage had a value of \$425 000.00.

Determine the average annual appreciation rate. Show your work.

**Common Error(s):**

- Some students used the rate of return to calculate the appreciation rate for the cottage.
- Many students first calculated the rate of return and then divided it by 10. They did not know that appreciation is compounded. Many students incorrectly found the 10th root of a number.
- Many students divided the current value of the cottage by its previous value and treated it as the appreciation rate.
- Some students used the exponential equation where the 10 years would be the exponent. They did not do anything more than write down a formula.