Grade 12
Applied Mathematics
Achievement Test

Marking Guide

Use in conjunction with *Exemplars*

June 2024

Manitoba

Grade 12 applied mathematics achievement test.
Marking guide. June 2024

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This resource will be available on the Manitoba Education and Early Childhood Learning website at www.edu.gov.mb.ca/k12/assess/archives/index.html.

Websites are subject to change without notice.

Disponible en français.

While the department is committed to making its publications as accessible as possible, some parts of this document are not fully accessible at this time.

Available in alternate formats upon request.

Contents

General Marking Instructions

Please ensure that

- the student booklet number matches the number on the *Scoring Sheet*
- **only a pencil is used to complete the *Scoring Sheet***
- the final test mark is recorded on the *Scoring Sheet*
- the *Scoring Sheet* is complete and a copy has been made for school records

Do not make any marks in the student booklets. Booklets may be selected by Manitoba Education and Early Childhood Learning for sample marking.

Once marking is completed, please forward the *Scoring Sheets* to Manitoba Education and Early Childhood Learning using the envelope provided (for more information, see the administration manual).

Marking

To receive full marks for a question, a student's response must be complete and correct. Partial marks may be awarded for an "appropriate strategy" with execution errors. **An appropriate strategy is defined as one that is consistent with the learning outcomes and mathematical processes associated with the question and, if properly executed, would lead to the correct answer.**

Some questions require a form of explanation or justification from students. Explanation or justification can be given through a labelled diagram, in words, by showing mathematical operations for answer verification, or by providing output from a technological tool. For this reason, appropriate flexibility is required when marking student responses.

Students are expected to round all final answers to two decimal places unless otherwise indicated in the question, or if the answer terminates to a whole number or one decimal place. More than two decimal places are acceptable if rounded correctly, except for monetary values or when the context of the question implies whole units be used (e.g., people, cans of paint).

Errors

Marks are deducted if conceptual or communication errors are committed. A 0.5 mark deduction will also apply each time a student makes one of the following errors:

- an arithmetic error
- a procedural error (not a conceptual error)
- a lack of clarity in the explanation, the description, or the justification

Conceptual Errors

As a guiding principle, students should only be penalized once for each error committed in the context of a test question. For example, students may choose an inappropriate strategy for a question, but carry it through correctly and arrive at an incorrect answer. In such cases, students should be penalized for having selected an inappropriate strategy for the task at hand, but should be given credit for having arrived at an answer consistent with their choice of strategy.

Communication Errors

Communication errors are errors that are not related to the concepts and are tracked on the *Scoring Sheet* in a separate section. There is a 0.5 mark deduction for each type of communication error committed, with a maximum deduction of 3 marks from the total test mark. Each communication error can only be deducted once per test and committing a second error of the same type does not further affect a student's mark.

E1 Final Answer

- does not include a percent sign
- does not identify the answer (e.g., TVM solver, Venn diagram)
- does not use the given contextual variables
- incorrectly states the final answer

E2 Notation

- does not include braces when using set notation
- does not include a box when using a Venn diagram
- does not include one of the following in the equation: "$y =$", "sin", "ln", or "x", or writes parameters separately from the equation
- does not change "$y \sim$" to "$y =$" when writing an equation

E3 Transcription/Transposition

- makes a transcription error (inaccurate transferring of information)
- makes a transposition error (changing order of digits)
- inaccurately plots one point on a scatter plot

E4 Whole Units

- does not use whole units for materials purchased in design and measurement questions
- does not use whole units in contextual questions involving discrete data (e.g., people)

E5 Units

- does not include the dollar sign for monetary values
- uses incorrect units of measure
- does not include the units in the final answer
- confuses square and cubic units (e.g., cm^2 instead of cm^3, or vice versa)
- does not include units with labels on a graph

E6 Rounding

- rounds incorrectly
- rounds too soon
- does not express the answer to the appropriate number of decimal places, including monetary values to two decimal places

When a given response includes multiple types of communication errors, deductions are indicated in the order in which the errors occur in the response. No communication errors are recorded for work that has not been awarded marks. The total deduction may not exceed the marks awarded.

Scoring

The marks allocated to questions are based on the concepts associated with the learning outcomes in the curriculum. For each question, shade in the circle on the *Scoring Sheet* that represents the mark awarded based on the concepts. A total of these marks will provide the preliminary mark.

The student's final mark is determined by subtracting the communication errors from the preliminary mark.

Example:

A student has a preliminary mark of 46. The student committed one E1 error (0.5 mark deduction) and three E6 errors (0.5 mark deduction).

E1	E2	E3	E4	E5	E6
Final Answer	Notation	Transcription/ Transposition	Whole Units	Units	Rounding

$$\text{Preliminary Mark} - (\text{Number of error types} \times 0.5) = \text{Final Mark}$$

$$46 - (2 \times 0.5) = 45$$

Irregularities in Provincial Tests

During the administration of provincial tests, supervising teachers may encounter irregularities. Markers may also encounter irregularities during local marking sessions. Appendix B provides examples of such irregularities as well as procedures to follow to report irregularities.

If a *Scoring Sheet* is marked with "0" only (e.g., student was present but did not attempt any questions) please document this on the *Irregular Test Booklet Report*.

Assistance

If any issue arises that cannot be resolved locally during marking, please call Manitoba Education and Early Childhood Learning at the earliest opportunity to advise us of the situation and seek assistance if necessary.

You must contact the Assessment Consultant responsible for this project before making any modifications to the marking keys.

Nadia Binda-Moir
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Grade 12 Applied Mathematics
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Email: nadia.bindamoir@gov.mb.ca

Marking Keys

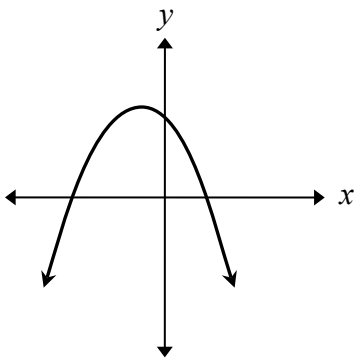
Please note that this *Marking Guide* contains
screen captures taken from a TI–84 Plus graphing calculator.

RELATIONS AND FUNCTIONS

Question 1 — Total: 1 mark

Learning Outcome: 12.A.R.1 — **Question Type: Selected Response**

Select the equation represented by the graph.



A) $y = -4x^2 - 6x - 10$

B) $y = -4x^2 - 6x + 10$

C) $y = 4x^2 - 6x - 10$

D) $y = 4x^2 - 6x + 10$

Question 2 — Total: 1 mark

Learning Outcome: 12.A.R.2 — **Question Type: Selected Response**

Select the end behaviour of the graph of the function $y = \ln x$.

A) from quadrant IV to quadrant I

B) from quadrant II to quadrant I

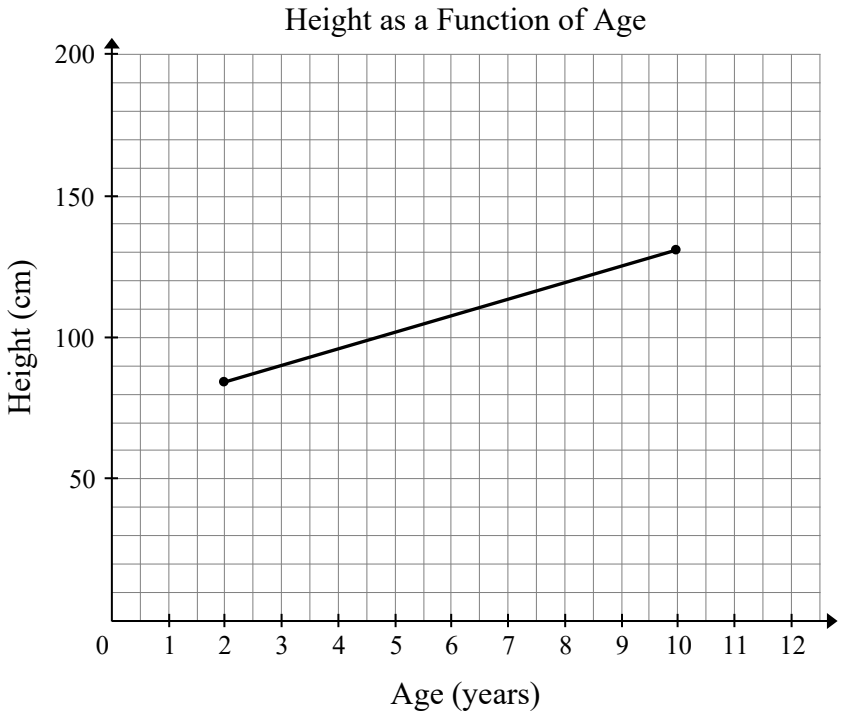
C) from quadrant III to quadrant I

D) from quadrant III to quadrant IV

Question 3 — Total: 1 mark

Learning Outcome: 12.A.R.1 — **Question Type: Constructed Response**

Given the following graph, state the domain.



Domain: $\{2 \leq x \leq 10\}$

OR

$[2, 10]$

OR

The domain is between 2 and 10 years inclusively.

Marking Key	
❶	*0.5 mark for upper and lower bounds of the domain*
❷	*0.5 mark for inclusivity of both upper and lower bounds*

Question 4 — Total: 1 mark

Learning Outcome: 12.A.R.1 — **Question Type: Constructed Response**

The number of students enrolled in a business program at a Canadian university can be modelled by the following equation:

$$y = 7.05x^3 - 77.36x^2 + 1069.99x + 7208.23$$

where x represents the time in years
and y represents the number of students enrolled.

The university would like to achieve an enrolment of 19 000 students in this program. State how long it will take for the enrolment to reach 19 000 students. Round to the nearest whole year.

OR

Graphing Calculator:

$Y_2 = 19\ 000$

CALC 5: intersect

$x = 10.999$

Desmos:

$(10.999, 19\ 000)$

It will take 11 years.

Marking Key	
❶	*1 mark for answer*

Question 5 — Total: 3 marks

Learning Outcome: 12.A.R.3 — **Question Type: Constructed Response**

Vern and Joanne are at an amusement park. They go on The Pirate Ship, a ride which acts like a giant pendulum swing.

- The starting position is 5 feet above the ground.
- The ride reaches a maximum height of 64 feet.
- The ride takes 4 seconds to go from the starting position to the maximum height.

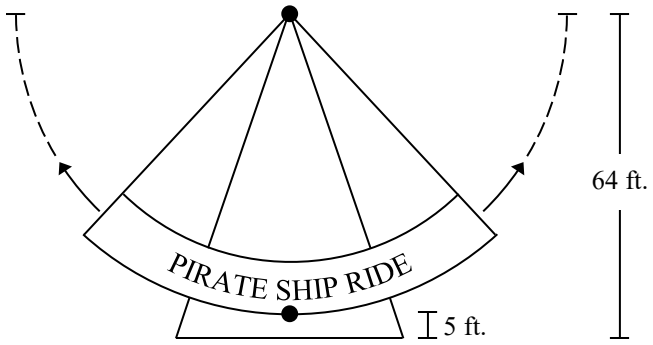


Diagram is not drawn to scale.

a) Determine a sinusoidal regression equation that models this situation. Show your work. You may use the table below.

(2 marks)

Time (s)	Height (ft.)
0	5
2	34.5
4	64
6	34.5
8	5

$$y = 29.5\sin\left(0.79x - 1.57\right) + 34.5$$

Other equations are possible.

b) State how many times Vern and Joanne reach the maximum height during the first 65 seconds.

(1 mark)

They reach the maximum height 8 times during the first 65 seconds.

Marking Key	
❶	*1 mark for appropriate work in (a)*
❷	*0.5 mark for two consistent values in the equation in (a)*
❸	*0.5 mark for remaining two consistent values in the equation in (a)*
❹	*1 mark for consistent answer in (b)*

Question 6 — Total: 3 marks

Learning Outcome: 12.A.R.2 — **Question Type: Constructed Response**

Google gives some pages on the web a score which is a rough measure of the importance of a website. The table below demonstrates how Google creates its scoring system.

Page Visits (per day)	100	1000	1 000 000	10 000 000
Google Score	1	2	4	5

a) State a logarithmic regression equation that models this situation.

(1 mark)

$$y = -0.44 + 0.33 \ln(x)$$

Other equations are possible.

b) A certain website averages 870 visits per day. A shoe company is willing to advertise on this website if it can reach a Google score of 2.4 or greater. Determine how many more visits the website needs to get per day. Show your work.

(2 marks)

$y = 2.4$ Google score

$x = 5192.597$ visits

$$5192.597 - 870 = 4322.597$$

The website needs to get 4323 more visits per day.

Marking Key	
❶	*1 mark for answer in (a)*
❷	*1 mark for consistent x-value in (b)*
❸	*1 mark for consistent difference in (b)*

Question 7 — Total: 6 marks

Learning Outcomes: 12.A.R.2, 12.A.FM.1 — **Question Type: Constructed Response**

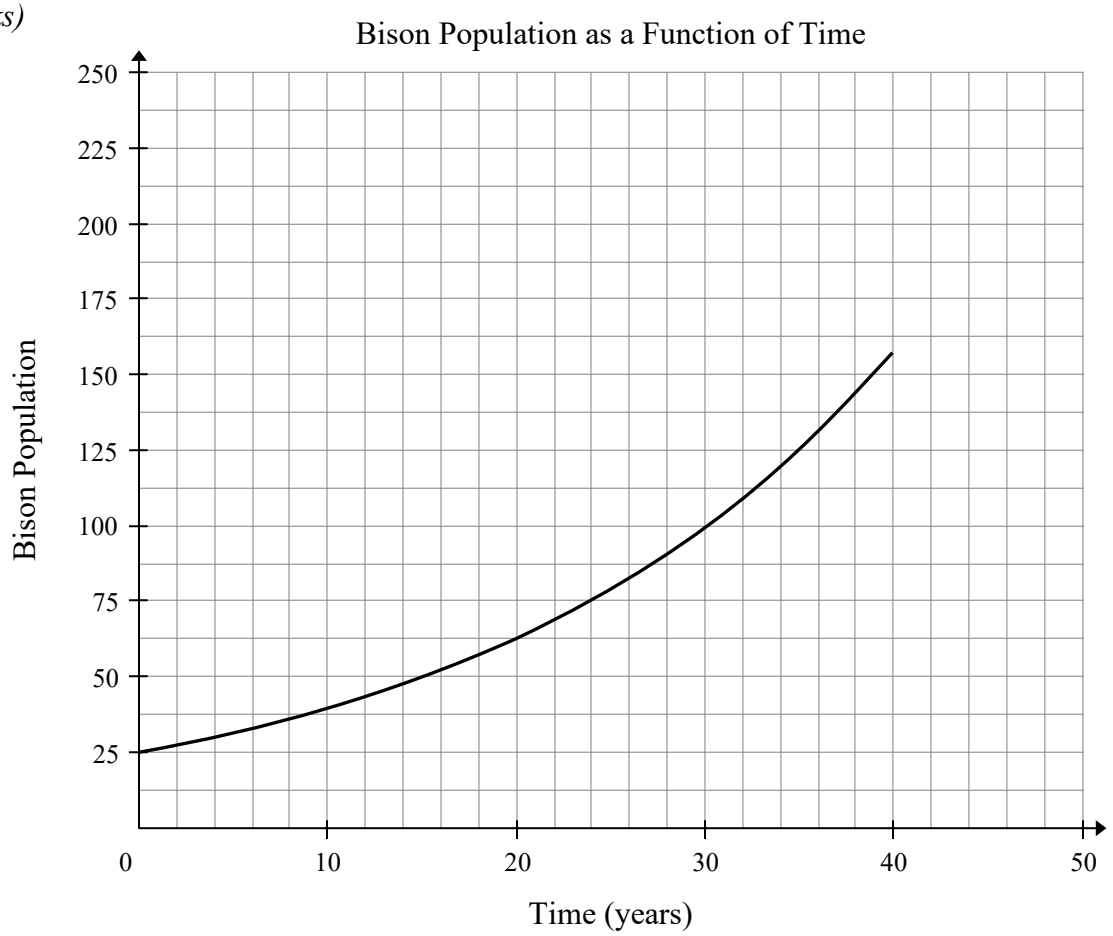
A farmer starts a bison farm where the population can be predicted by the following exponential equation:

$$P = 25(1.047)^t$$

where P represents the bison population
and t represents the time (in years).

a) Create a clearly labelled graph of the predicted bison population over the next 40 years.

(3 marks)



b) State the predicted bison population at 30 years.

(1 mark)

$x = 30$

$y = 99.160...$

The bison population is 99.

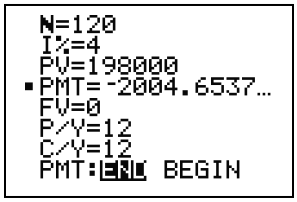
c) The farmer operates the farm for 30 years and then retires.

- She sells the bison for \$2000.00 each.
- She invests the money in an account with an interest rate of 4.00%, compounded monthly.
- She withdraws an equal amount monthly for 10 years until there is no money left.

Determine the amount of money that she withdraws monthly. Show your work.

(2 marks)

$99 \times \$2000.00 = \$198\,000.00$



She withdraws \$2004.65 monthly.

Marker Note(s):
→ *Award mark ❷ if the graph continues correctly beyond 40 years.*

Marking Key	
❶	*1 mark for communicating the context of the graph with appropriate title and/or labels in (a)*
❷	*1 mark for using an appropriate domain and range (i.e., window settings/grid range) for the context of the question in (a)*
❸	*1 mark for an appropriate shape that illustrates key characteristics of the function (e.g., maximum, minimum, asymptotes, intercepts) in (a)*
❹	*1 mark for bison population in (b)*
❺	*1 mark for appropriate work in (c)*
❻	*1 mark for consistent answer in (c)*

Question 8 — Total: 1 mark

Learning Outcome: 12.A.FM.2 — **Question Type: Selected Response**

Select the asset that is most likely to appreciate in value.

A) cellphone

B) car

C) **house**

D) boat

Question 9 — Total: 1 mark

Learning Outcome: 12.A.FM.3 — **Question Type: Selected Response**

John's investment had a value of $64 000 when he was 60 years old. Over the term of the investment, the interest rate was 4.00%.

Using the Rule of 72, select the amount of the initial investment made when John was 24 years old.

A) **$16 000**

B) $32 000

C) $128 000

D) $256 000

Question 10 — Total: 2 marks

Learning Outcome: 12.A.FM.3 — **Question Type: Constructed Response**

Jin has a portfolio that contains three investments which were valued in 2019 and 2024.

Type of Investment	2019	2024	Gain/Loss
GIC	\$5000.00	\$5500.00	**+\$500.00**
TFSA	\$30 000.00	\$38 000.00	**+\$8000.00**
Stocks	\$80 000.00	\$75 000.00	**–\$5000.00**
Total	**\$115 000.00**	**\$118 500.00**	**+\$3500.00**

Calculate the rate of return. Show your work. You may use the table above.

$$\text{Rate of return (\%)} = \frac{\left(\begin{array}{c}\text{Current value}\\ \text{of portfolio}\end{array} - \begin{array}{c}\text{Previous value}\\ \text{of portfolio}\end{array}\right)}{\text{Previous value of portfolio}} \times 100$$

$$= \frac{(\$118\,500.00 - \$115\,000.00)}{\$115\,000.00} \times 100$$

$$= 3.043...$$

The rate of return is 3.04%.

Marking Key	
❶	*1 mark for appropriate work*
❷	*1 mark for consistent answer*

Question 11 — Total: 4 marks

Learning Outcome: 12.A.FM.2 — **Question Type: Constructed Response**

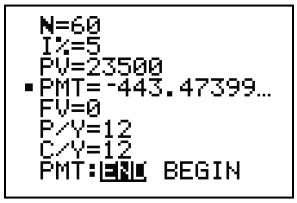
Raphael needs a car. He is deciding between buying or leasing a car that costs $23 500.00 (taxes included), and has the following options:

Option 1: Bank financing at an interest rate of 5.00%, compounded monthly, over 5 years.

Option 2: Leasing at $316.00 per month over 60 months then buying the car for $8000.00 at the end of the lease.

a) Determine the monthly payment if Raphael chooses Option 1. Show your work.

(2 marks)



The monthly payment would be $443.47.

b) Determine the total cost of each option.

(1.5 marks)

Option 1	Option 2
$\$443.47 \times 60 = \$26\ 608.20$	$(\$316.00 \times 60) + \$8000.00 = \$26\ 960.00$
The total cost of Option 1 is $26 608.20.	The total cost of Option 2 is $26 960.00.

c) Explain which option Raphael should choose.

(0.5 mark)

Raphael should choose Option 1 because there is no large payment at the end.

OR

Raphael should choose Option 2 because monthly payments are lower.

Other explanations are possible.

Marker Note(s):
→ *Award mark ❸ for $26 608.44; answer reflects non-rounded payment in (b).*

Marking Key	
❶	*1 mark for appropriate work in (a)*
❷	*1 mark for consistent answer in (a)*
❸	*0.5 mark for consistent cost of Option 1 in (b)*
❹	*0.5 mark for adding $8000.00 to Option 2 in (b)*
❺	*0.5 mark for consistent cost of Option 2 in (b)*
❻	*0.5 mark for appropriate explanation in (c)*

Question 12 — Total: 4 marks

Learning Outcome: 12.A.FM.1 — **Question Type: Constructed Response**

Paul wants to purchase a new house valued at $265 000.00. He has $35 000.00 to use as a down payment. He gets approval for:

- monthly payments
- an interest rate, compounded semi-annually
- a 25-year amortization period

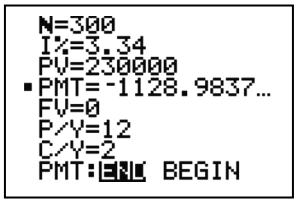
Bank 1: offers an interest rate of 3.34%

Bank 2: offers an interest rate of 3.09%

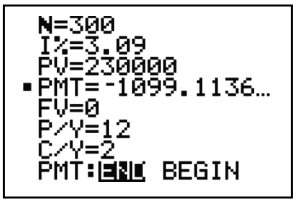
a) Determine the monthly mortgage payment at each bank. Show your work.

(3 marks)

Bank 1



Bank 2



The monthly mortgage payment at Bank 1 is $1128.98.
The monthly mortgage payment at Bank 2 is $1099.11.

b) Determine the difference between the total amounts paid to the banks after 25 years of payments.

(1 mark)

$$\$1128.98 \times 300 = \$338\ 694.00$$
$$\$1099.11 \times 300 = \$329\ 733.00$$

$$\$338\ 694.00 - \$329\ 733.00 = \$8961.00$$

The difference between the total amounts paid is $8961.00.

Marking Key	
❶	*1 mark for appropriate work for Bank 1 in (a)*
❷	*1 mark for consistent answer for Bank 1 in (a)*
❸	*1 mark for consistent answer for Bank 2 in (a)*
❹	*0.5 mark for consistent total amounts in (b)*
❺	*0.5 mark for consistent difference in (b)*

Question 13 — Total: 1 mark

Learning Outcome: 12.A.FM.1 — **Question Type: Constructed Response**

Abdul wants to buy a house. He has the option of making biweekly or monthly payments.

Explain one advantage of making biweekly payments.

He pays less total interest.

Other explanations are possible.

Marking Key	
❶	*1 mark for appropriate explanation*

Question 14 — Total: 2 marks

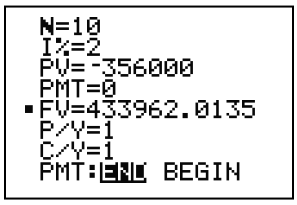
Learning Outcome: 12.A.FM.2 — **Question Type: Constructed Response**

Kamil bought a house for $300 000.00. Before moving in, he built an addition which increased the value of the house by $56 000.00.

If the house appreciates at an annual rate of 2.00%, determine the value of the house after 10 years. Show your work.

$$\$300\,000.00 + \$56\,000.00 = \$356\,000.00$$

OR



$$\$356\,000.00 \times (1.02)^{10}$$
$$= \$433\,962.01$$

The value of the house will be $433 962.01.

Marking Key	
❶	*1 mark for appropriate work*
❷	*1 mark for consistent answer*

PROBABILITY

Question 15 — Total: 1 mark

Learning Outcome: 12.A.P.1 — **Question Type: Selected Response**

There is a 17% probability of precipitation.

Select the odds in favour of precipitation.

A) $17:100$

B) $83:100$

C) **$17:83$**

D) $83:17$

Question 16 — Total: 1 mark

Learning Outcome: 12.A.P.5 — **Question Type: Selected Response**

Maren has rented a karaoke machine for their birthday party. They selected 8 different songs that they want to sing but time only allows for them to sing 4 songs.

Select the expression that represents the number of ways that they can order these songs.

A) $4!$

B) $8!$

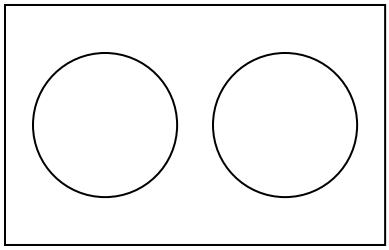
C) ${}_8C_4$

D) **${}_8P_4$**

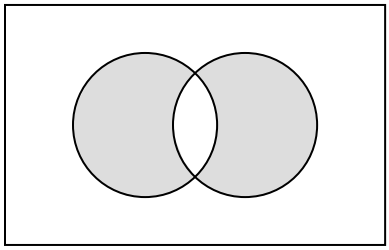
Question 17 — Total: 1 mark

Learning Outcome: 12.A.P.2 — **Question Type: Constructed Response**

Draw a Venn diagram showing mutually exclusive events.



OR



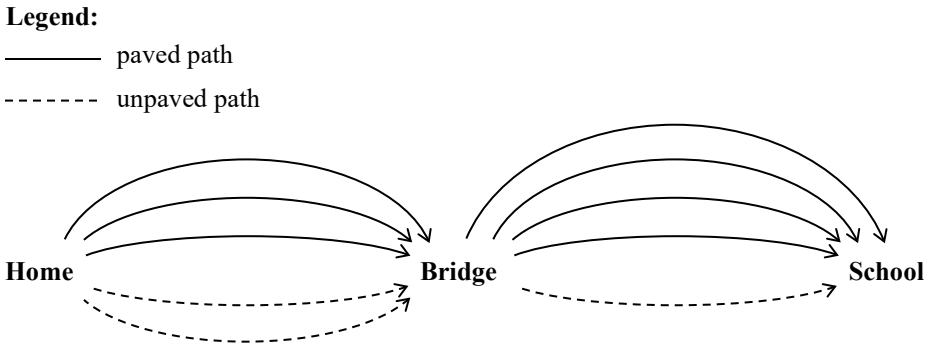
Other answers are possible.

Marking Key	
❶	*1 mark for showing mutually exclusive events*

Question 18 — Total: 2 marks

Learning Outcomes: 12.A.P.3, 12.A.P.4 — **Question Type: Constructed Response**

Silas is biking from home to school and must cross a bridge. On one side of the bridge, there are 3 paved paths and 2 unpaved paths. On the other side of the bridge, there are 4 paved paths and 1 unpaved path that lead to Silas' school.



a) Determine the total number of routes Silas could take from home to school.

(1 mark)

$$5 \times 5 = 25$$

There are 25 routes.

b) Determine the probability that Silas takes only paved paths from home to school.

(1 mark)

$$3 \times 4 = 12$$

$$\frac{12}{25} \text{ or } 0.48 \text{ or } 48\%$$

The probability is $\frac{12}{25}$, 0.48, or 48%.

Marking Key	
❶	*1 mark for answer in (a)*
❷	*0.5 mark for number of routes on only paved paths in (b)*
❸	*0.5 mark for consistent probability in (b)*

Question 19 — Total: 3 marks

Learning Outcome: 12.A.P.6 — **Question Type: Constructed Response**

Avra is knitting a blanket for her niece. She has 5 balls of yarn that are different shades of blue and 7 balls of yarn that are different shades of purple.

a) State the number of ways Avra could randomly choose 6 balls of yarn for the blanket.

(1 mark)

$${}_{12}C_6 = 924$$

There are 924 different ways.

b) Determine the number of ways Avra could randomly choose 6 balls of yarn if she wants 2 shades of blue and 4 shades of purple. Show your work.

(2 marks)

$${}_5C_2 \times {}_7C_4$$
$$= 10 \times 35$$
$$= 350$$

There are 350 different ways.

Marker Note(s):

→ *Award a maximum of 2 marks if student consistently uses permutations instead of combinations.*

Marking Key	
❶	*1 mark for answer in (a)*
❷	*0.5 mark for ${}_5C_2$ in (b)*
❸	*0.5 mark for ${}_7C_4$ in (b)*
❹	*1 mark for consistent product in (b)*

Question 20 — Total: 2 marks

Learning Outcome: 12.A.P.5 — **Question Type: Constructed Response**

Determine the number of ways the letters in the name OPASKWAYAK can be arranged.
Show your work.

$$\frac{10!}{3!2!} = 302\ 400$$

There are 302 400 ways.

Marking Key	
❶	*0.5 mark for 10!*
❷	*0.5 mark for 3!*
❸	*0.5 mark for 2!*
❹	*0.5 mark for consistent quotient*

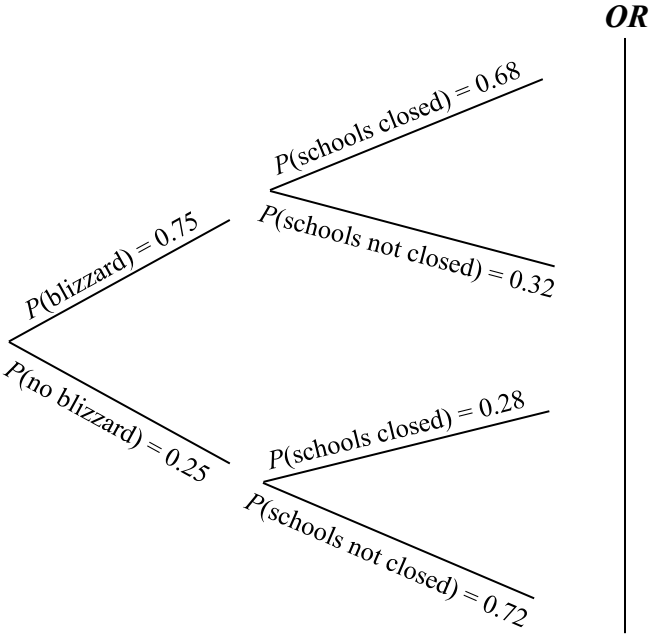
Question 21 — Total: 3 marks

Learning Outcomes: 12.A.P.2, 12.A.P.3 — **Question Type: Constructed Response**

On January 30, there is a 75% probability of blizzard conditions. If there is a blizzard, there is a 68% probability that schools will be closed. If there is not a blizzard, there is still a 28% probability schools will be closed (due to the cold).

a) Use a graphic organizer to show all possible outcomes for this situation.

(1 mark)



OR

Possible Outcomes:

- blizzard, schools closed
- blizzard, schools not closed
- no blizzard, schools closed
- no blizzard, schools not closed

Other graphic organizers are possible.

b) Determine the probability that schools will be closed January 30. Show your work.

(2 marks)

$$\begin{aligned} P(\text{schools closed}) &= P(\text{blizzard, schools closed}) + P(\text{no blizzard, schools closed}) \\ &= (0.75)(0.68) + (0.25)(0.28) \\ &= 0.51 + 0.07 \\ &= 0.58 \end{aligned}$$

The probability is $\frac{29}{50}$, 0.58, or 58%.

Marker Note(s):

→ *Award mark ❶ for a list of all possible outcomes without probability values.*

Marking Key	
❶	*1 mark for appropriate graphic organizer in (a)*
❷	*0.5 mark for P(blizzard, schools closed) in (b)*
❸	*0.5 mark for P(no blizzard, schools closed) in (b)*
❹	*1 mark for consistent sum in (b)*

Question 22 — Total: 3 marks

Learning Outcomes: 12.A.P.4, 12.A.P.5 — **Question Type: Constructed Response**

A pre-school class has 12 children. The children stand in a row for their class picture.

a) State the number of different arrangements for the picture.

(1 mark)

$$12! = 479\ 001\ 600$$

There are 479 001 600 different arrangements.

OR

$${}_{12}P_{12} = 479\ 001\ 600$$

There are 479 001 600 different arrangements.

b) Determine the number of arrangements in which two children, Acakos and Písim, stand beside each other. Show your work.

(2 marks)

$$2!11! = 79\ 833\ 600$$

There are 79 833 600 arrangements.

OR

$$\boxed{2 \times 1}\ \underline{10} \times \underline{9} \times \underline{8} \times \underline{7} \times \underline{6} \times \underline{5} \times \underline{4} \times \underline{3} \times \underline{2} \times \underline{1}$$
$$11$$

There are 79 833 600 arrangements.

Marking Key	
❶	*1 mark for answer in (a)*
❷	*0.5 mark for 2! or ${}_2P_2$ in (b)*
❸	*0.5 mark for 11! or ${}_{11}P_{11}$ in (b)*
❹	*1 mark for consistent product in (b)*

DESIGN AND MEASUREMENT

Question 23 — Total: 1 mark

Learning Outcome: 12.A.D.1 — **Question Type: Selected Response**

Select the measurement that is not equivalent to the other measurements.

A) 0.009 km^2

B) 9 m^2

C) 90 000 cm^2

D) 9 000 000 mm^2

Question 24 — Total: 3 marks

Learning Outcome: 12.A.D.1 — **Question Type: Constructed Response**

Arianna bought a new soccer ball. It is completely flat and she wants to inflate it.

- When the ball is inflated, it has a diameter of 22 cm.
- The pump she is using produces 0.000 3 m^3 of air per pump.

Determine the minimum number of pumps Arianna will need to inflate the ball to a diameter of 22 cm. Show your work.

$$\begin{aligned}\text{Volume of soccer ball} &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3}\pi(11)^3 \\ &= 5575.279\ 763...\ \text{cm}^3\end{aligned}$$

$$\begin{aligned}\text{Volume of air per pump} &= 0.000\ 3\ \text{m}^3 \times 100^3 \\ &= 300\ \text{cm}^3\end{aligned}$$

$$\begin{aligned}\text{Number of pumps} &= \frac{5575.279\ 763...}{300} \\ &= 18.584\ 265\ 88...\end{aligned}$$

Arianna will need 19 pumps.

Marker Note(s):
→ *Award mark ❸ for non-rounded number of pumps.*

Marking Key	
❶	*1 mark for volume of soccer ball*
❷	*1 mark for unit conversion*
❸	*1 mark for consistent number of pumps*

Question 25 — Total: 3 marks

Learning Outcome: 12.A.D.1 — **Question Type: Constructed Response**

Mancole is a company that manufactures tents.
Fabric tents include four sides and a floor.
One particular tent has the following dimensions:

- a height of 8 ft.
- a slant height of 10 ft.
- a 12 ft. × 18 ft. floor

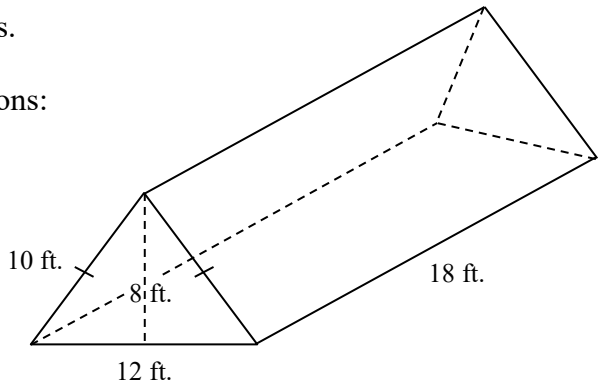


Diagram is not drawn to scale.

a) Determine the amount of fabric required to make one tent if an extra 30 ft^2 of fabric is needed for sewing.

(1 mark)

$$\text{Floor: } (12 \times 18) = 216$$

$$\text{Sides: } (10 \times 18) \times 2 = 360$$

$$\text{Front/Back: } \left(\frac{12 \times 18}{2}\right) \times 2 = 96$$

$$216 + 360 + 96 + 30 = 702 \text{ ft}^2$$

The amount of fabric required is 702 ft^2.

b) Each tent requires 18 poles. Each pole costs \$24.00 and the fabric costs \$3.00/ft^2.
Determine the total cost of the tent, plus GST and PST. Show your work.
(Note: GST = 5%, PST = 7%)

(2 marks)

$$\text{Cost of poles: } 18 \times \$24.00 = \$432.00$$

$$\text{Cost of fabric: } 702 \text{ ft}^2 \times \$3.00/\text{ft}^2 = \$2106.00$$

$$\text{Subtotal: } \$432.00 + \$2106.00 = \$2538.00$$

$$\text{GST} = \$126.90$$

$$\text{PST} = \$177.66$$

$$\text{Total} = \overline{\$2842.56}$$

The total cost of the tent is \$2842.56.

Marking Key	
❶	*0.5 mark for surface area of tent without extra fabric in (a)*
❷	*0.5 mark for consistent surface area of tent with extra fabric in (a)*
❸	*0.5 mark for cost of poles in (b)*
❹	*0.5 mark for consistent cost of fabric in (b)*
❺	*0.5 mark for consistent total cost before taxes in (b)*
❻	*0.5 mark for consistent total cost after taxes in (b)*

LOGICAL REASONING

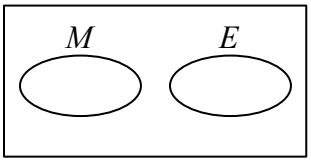
Question 26 — Total: 1 mark

Learning Outcome: 12.A.L.2 — **Question Type: Selected Response**

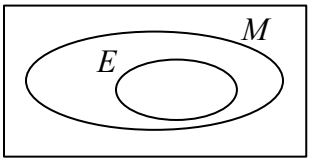
Cindy makes the following statement: "All the students in math class are also in the same English class."

If M represents the set of students in math class and E represents the set of students in English class, select the Venn diagram that best fits Cindy's statement.

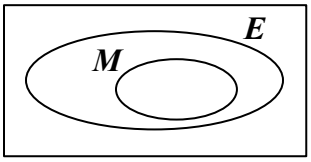
A)



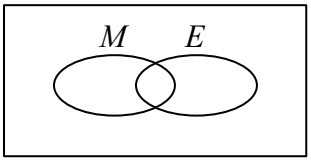
C)



B)



D)



Question 27 — Total: 1 mark

Learning Outcome: 12.A.L.2 — **Question Type: Selected Response**

Given $A = \{2, 3, 5, 6, 8, 11, 12, 15\}$ and $B = \{3, 6, 12\}$, select the statement that is true.

A) B is the complement of A

B) A and B are disjoint sets

C) $A \subset B$

D) $\boldsymbol{B \subset A}$

Question 28 — Total: 5 marks

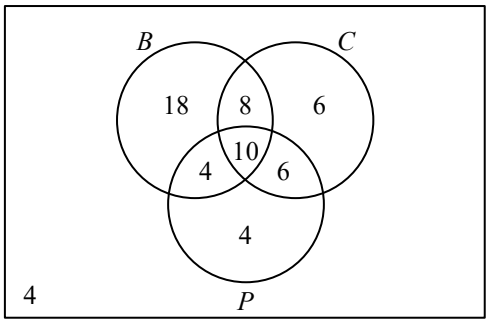
Learning Outcome: 12.A.L.2 — **Question Type: Constructed Response**

There are 60 Grade 12 students at a high school.

- 40 students take biology (B)
- 30 students take chemistry (C)
- 24 students take physics (P)
- 8 students take only biology and chemistry
- 4 students take only biology and physics
- 6 students take only chemistry and physics
- 4 students take physics only

a) Draw a Venn diagram to represent this situation.

(3 marks)



b) State the number of students who take only one science course.

(1 mark)

$18 + 6 + 4 = 28$

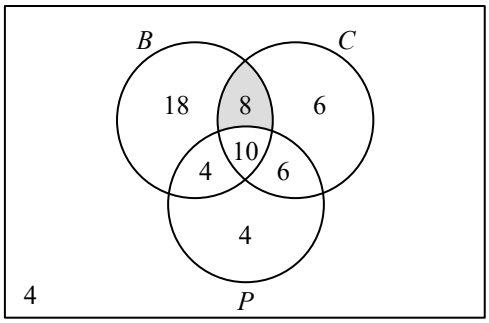
There are 28 students.

c) Explain what $B \cap C \cap \overline{P}$ means in this situation.

(1 mark)

The students who take only biology and chemistry.

OR



Marking Key	
❶	*1 mark for placing 10 students in all three science courses in (a)*
❷	*1 mark for consistent number of students in only one science course in (a)*
❸	*1 mark for consistent number of students in no science courses in (a)*
❹	*1 mark for consistent number of students in only one science course in (b)*
❺	*1 mark for appropriate explanation in (c)*

Question 29 — Total: 1 mark

Learning Outcome: 12.A.L.3 — **Question Type: Constructed Response**

Given the following statement:

"If a number is odd, then the number is prime."

State a counterexample to this statement.

A counterexample to the statement is 21.

Other answers are possible.

Marking Key	
❶	*1 mark for counterexample*

Question 30 — Total: 1 mark

Learning Outcome: 12.A.L.1 — **Question Type: Constructed Response**

A 3 × 3 KenKen puzzle uses the digits 1, 2, and 3 in each row and column exactly once.

- Each bold rectangle in the puzzle is called a "cage".
- In each cage, the number in the top-left corner is the result of the given operation.
- The numbers may be written in any order in the cage.

Example:

2 – 1	3

Complete the KenKen puzzle below.

3	2 ÷ **1**	**2**
6 × **2**	**3**	3 × **1**
3 + **1**	**2**	**3**

Marking Key	
❶	*1 mark for correctly completing the puzzle*

Question 31 — Total: 3 marks

Learning Outcome: 12.A.L.3 — **Question Type: Constructed Response**

Consider the following statement:

"Someone who plays drums is a musician."

a) Write a conditional statement using the statement above.

(1 mark)

"If you play drums, then you are a musician."

OR

"If you are a musician, then you play drums."

b) Write the converse of the conditional statement in (a).

(1 mark)

"If you are a musician, then you play drums."

OR

"If you play drums, then you are a musician."

c) Is the conditional statement in (a) biconditional? Explain.

(1 mark)

No. Both the conditional and converse statements must be true.
Not all musicians play drums.

Other explanations are possible.

Marking Key	
❶	*0.5 mark for including "if" and "then" in (a)*
❷	*0.5 mark for conditional statement in (a)*
❸	*0.5 mark for including "if" and "then" in (b)*
❹	*0.5 mark for consistent converse statement in (b)*
❺	*1 mark for consistent explanation in (c)*

Appendices

Appendix A:
Table of Questions by Unit and Learning Outcome

RELATIONS AND FUNCTIONS		
Question	**Learning Outcome**	**Mark**
1	12.A.R.1	1
2	12.A.R.2	1
3	12.A.R.1	1
4	12.A.R.1	1
5	12.A.R.3	3
6	12.A.R.2	3
7 a)	12.A.R.2	3
7 b)	12.A.R.2	1
		Total = 14
FINANCIAL MATHEMATICS		
Question	**Learning Outcome**	**Mark**
7 c)	12.A.FM.1	2
8	12.A.FM.2	1
9	12.A.FM.3	1
10	12.A.FM.3	2
11	12.A.FM.2	4
12	12.A.FM.1	4
13	12.A.FM.1	1
14	12.A.FM.2	2
		Total = 17
PROBABILITY		
Question	**Learning Outcome**	**Mark**
15	12.A.P.1	1
16	12.A.P.5	1
17	12.A.P.2	1
18	12.A.P.3, 12.A.P.4	2
19	12.A.P.6	3
20	12.A.P.5	2
21	12.A.P.2, 12.A.P.3	3
22	12.A.P.4, 12.A.P.5	3
		Total = 16
DESIGN AND MEASUREMENT		
Question	**Learning Outcome**	**Mark**
23	12.A.D.1	1
24	12.A.D.1	3
25	12.A.D.1	3
		Total = 7
LOGICAL REASONING		
Question	**Learning Outcome**	**Mark**
26	12.A.L.2	1
27	12.A.L.2	1
28	12.A.L.2	5
29	12.A.L.3	1
30	12.A.L.1	1
31	12.A.L.3	3
		Total = 12

Appendix B:
Irregularities in Provincial Tests

A Guide for Local Marking

During the marking of provincial tests, irregularities are occasionally encountered in test booklets. The following list provides examples of irregularities for which an *Irregular Test Booklet Report* should be completed and sent to the department:

- completely different penmanship in the same test booklet
- incoherent work with correct answers
- notes from a teacher indicating how he or she has assisted a student during test administration
- student offering that he or she received assistance on a question from a teacher
- student submitting work on unauthorized paper
- evidence of cheating or plagiarism
- disturbing or offensive content
- no responses provided by the student or only incorrect responses ("0")

Student comments or responses indicating that the student may be at personal risk of being harmed or of harming others are personal safety issues. This type of student response requires an immediate and appropriate follow-up at the school level. In this case, please ensure the department is made aware that follow-up has taken place by completing an *Irregular Test Booklet Report*.

Except in the case of cheating or plagiarism where the result is a provincial test mark of 0%, it is the responsibility of the division or the school to determine how they will proceed with irregularities. Once an irregularity has been confirmed, the marker prepares an *Irregular Test Booklet Report* documenting the situation, the people contacted, and the follow-up. The original copy of this report is to be retained by the local jurisdiction and a copy is to be sent to the department along with the test materials.

Irregular Test Booklet Report

Test: _____

Date marked: _____

Booklet number: _____

Problem(s) noted: _____

_____

_____

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_____

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Question(s) affected: _____

_____

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Action taken or rationale for assigning marks: _____

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Follow-up: _____

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Decision: _____

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_____

Marker's Signature: _____

Principal's Signature: _____

For Department Use Only—After Marking Complete

Consultant: _____

Date: _____