Grade 12
Applied Mathematics
Achievement Test

Local Marking Training Workbook

January 2020

Manitoba

Manitoba Education
Winnipeg, Manitoba, Canada

This resource is available on the Manitoba Education website at www.edu.gov.mb.ca/k12/assess/local_marking/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.

Exemplar 1

Question 3 — Total: 3 marks

At the Manitoba provincial track and field meet, an athlete is competing in the javelin event. On the athlete's first attempt

- the javelin was thrown at a starting height of 1.6 m
- the javelin reached a height of 4 m at a horizontal distance of 7.2 m from the athlete
- the javelin hit the ground 38 m away from the athlete

a) Determine a quadratic regression equation that models the height of the javelin as a function of the horizontal distance from the athlete. Show your work.

(2 marks)

Horizontal Distance (m)	Height (m)
0	1.6
7.2	4
38	0

STAT → CALC → QuadReg

$y = ax^2 + bx + c$ ✓ $y = -0.01x^2 + 0.42x + 1.6$

b) Determine the maximum height reached by the javelin.

(1 mark)

STAT → Maximum ✓

$x = 2.13$

$y = 2.04\text{ m}$

Exemplar 1

Question 3—Relations and Functions

Mark(s): 2/3

❶ → 1 mark for appropriate work in (a)
❷ → 1 mark for consistent equation in (a)

Exemplar 2

Question 3 — Total: 3 marks

At the Manitoba provincial track and field meet, an athlete is competing in the javelin event. On the athlete's first attempt

- the javelin was thrown at a starting height of 1.6 m
- the javelin reached a height of 4 m at a horizontal distance of 7.2 m from the athlete
- the javelin hit the ground 38 m away from the athlete

a) Determine a quadratic regression equation that models the height of the javelin as a function of the horizontal distance from the athlete. Show your work.

(2 marks)

L1 x y L2

Horizontal Distance (m)	Height (m)
0	1.6
7.2	4
38	0

b) Determine the maximum height reached by the javelin.

(1 mark)

2nd -> trace -> maximum
x = 17.27 y = 5.24

maximum height is 5.24 m

Exemplar 2

Question 3—Relations and Functions

Mark(s): 2/3

❶ → 1 mark for appropriate work in (a)
❸ → 1 mark for consistent answer in (b)

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Exemplar 1

Question 4 — Total: 4 marks

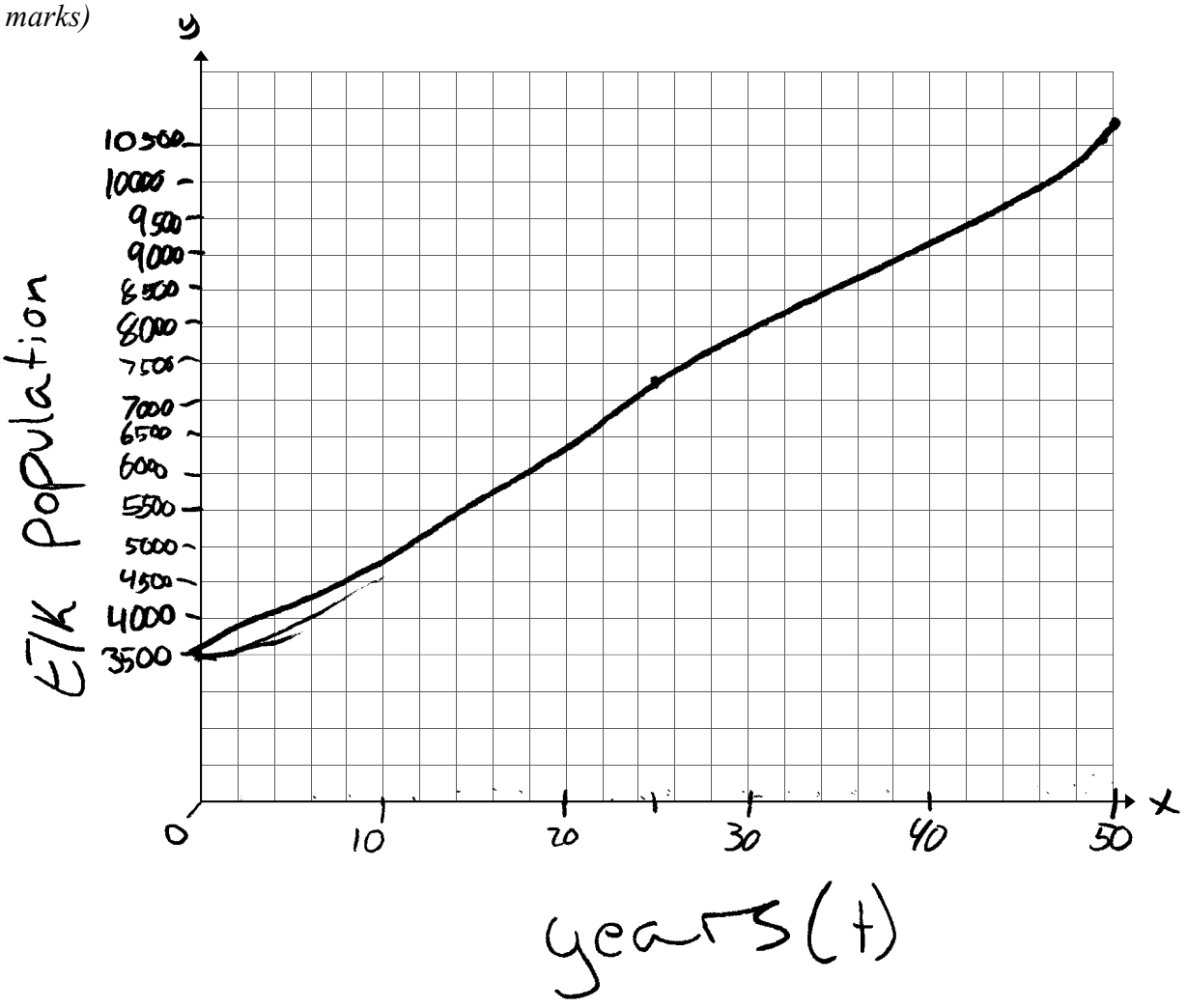
In 2020, the elk population in Riding Mountain National Park can be predicted by the following exponential equation:

$$P = 3500(1.03)^t$$

where P represents the elk population
and t represents the time (in years) starting in January 2020.

a) Create a clearly labelled graph of the predicted elk population over the next 50 years.

(3 marks)



Exemplar 1 (continued)

b) Assume that Riding Mountain National Park can support a maximum population of 16 000 elk. Using the exponential equation, determine in what year the population will reach 16 000.

(1 mark)

$x = 51.42$ years

$y = 16000$

Exemplar 1

Question 4—Relations and Functions

Mark(s): 1.5/4

❶ → 1 mark for communicating the context of the graph with appropriate title and/or labels in (a)
❹ → 0.5 mark for correct *x*-value in (b)

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Exemplar 2

Question 4 — Total: 4 marks

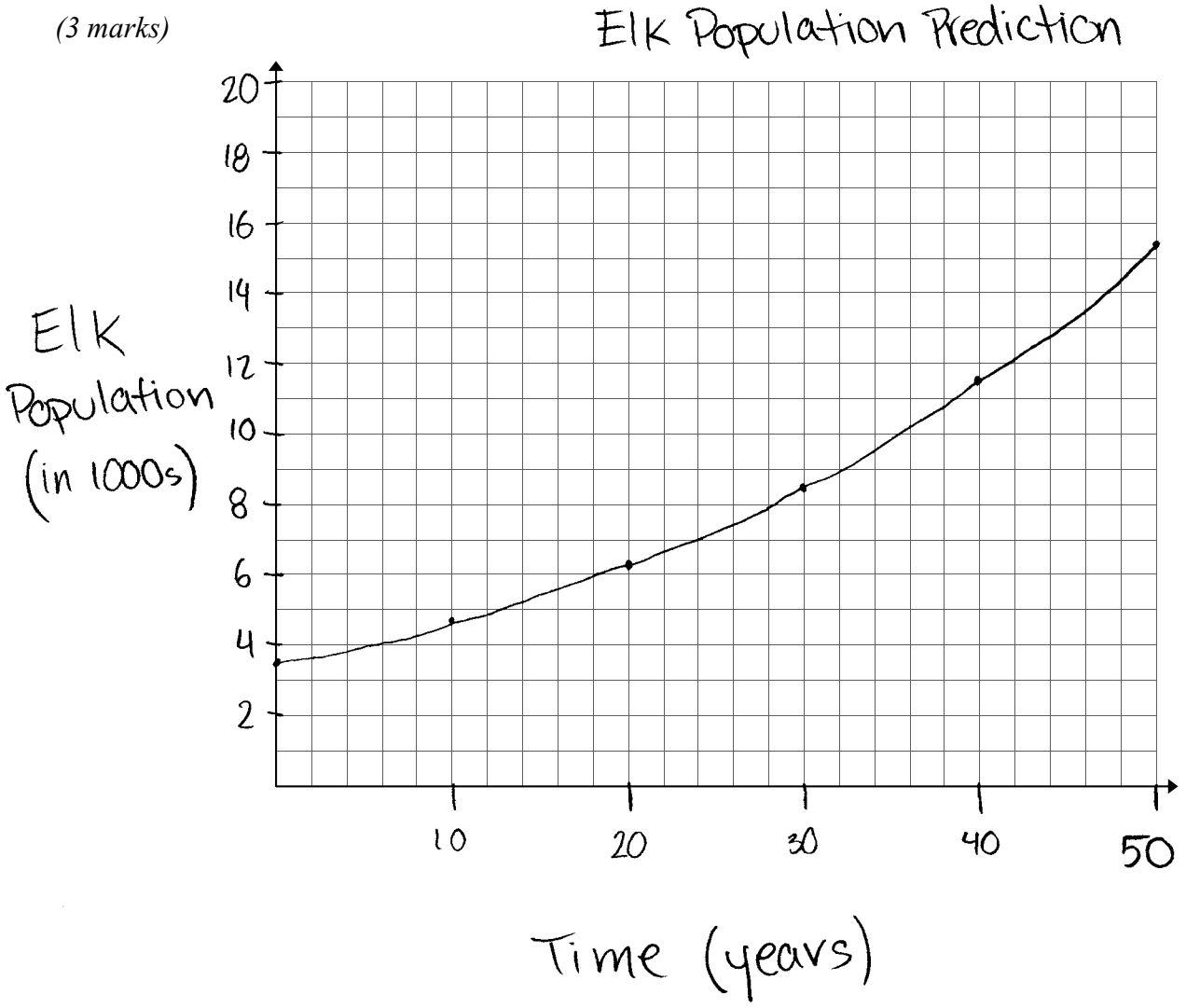
In 2020, the elk population in Riding Mountain National Park can be predicted by the following exponential equation:

$$P = 3500(1.03)^{t}$$

where P represents the elk population
and t represents the time (in years) starting in January 2020.

a) Create a clearly labelled graph of the predicted elk population over the next 50 years.

(3 marks)



Exemplar 2 (continued)

b) Assume that Riding Mountain National Park can support a maximum population of 16 000 elk. Using the exponential equation, determine in what year the population will reach 16 000.

(1 mark)

$y_2 = 16000$

calc #5 $x = 51.42$

Sometime during year 51

Exemplar 2

Question 4—Relations and Functions

Mark(s): 3.5/4

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 → 0.5 mark for correct x-value in (b)

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Exemplar 1

Question 5 — Total: 4 marks

An observer collects data for the sea level in Churchill, Manitoba. The sea level rises and falls twice daily. The data is shown below:

Time (h)	Sea Level (m)
0	4.31
3	2.41
6	0.51
9	2.41
12	4.31

a) Determine a sinusoidal regression equation that models this data.

(1 mark)

$Y = 1.1000 \sin(1.5708X + (-4.71239)) + 2.4106$

b) Determine the sea level at 5.5 hours.

(1 mark)

1.066 m

Exemplar 1 (continued)

c) State the range and explain its meaning in this situation.

(2 marks)

(0.51, 4)

It means how high the sea level gets, and how low the sea level gets.

Exemplar 1

Question 5—Relations and Functions

Mark(s): 2.5/4

❶ → 0.5 mark for two correct values in (a)
❸ → 1 mark for consistent answer in (b)
❻ → 1 mark for correct explanation in (c)

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Exemplar 2

Question 5 — Total: 4 marks

An observer collects data for the sea level in Churchill, Manitoba. The sea level rises and falls twice daily. The data is shown below:

Time (h)	Sea Level (m)
0	4.31
3	2.41
6	0.51
9	2.41
12	4.31

a) Determine a sinusoidal regression equation that models this data.

(1 mark)

$y = 0x^3 + 0.0905x^2 - 1.0857x + 4.4186$

b) Determine the sea level at 5.5 hours.

(1 mark)

$y = 1.18\text{m}$

Exemplar 2 (continued)

c) State the range and explain its meaning in this situation.

(2 marks)

$[1.161, \infty)$

It means the lowest the sea level would go is 1.161m and the highest is infinite

Exemplar 2

Question 5—Relations and Functions

Mark(s): 3/4

❸ → 1 mark for consistent answer in (b)
❹ → 0.5 mark for consistent upper and lower bounds of the range in (c)
❺ → 0.5 mark for inclusivity of both upper and lower bounds in (c)
❻ → 1 mark for correct explanation in (c)

Exemplar 1

Question 6 — Total: 4 marks

A patient has his blood pressure monitored for 16 hours. During this period, his blood pressure can be modelled by the following cubic function:

$$P = -0.05t^3 + 1.28t^2 - 7.46t + 101$$

where P represents the blood pressure (in mm of mercury)
and t represents the amount of time his blood pressure is monitored (in hours).

a) Determine his lowest blood pressure during this period, in mm of mercury.

(1 mark)

at hour 1 his blood pressure was at 22.8a

2nd calc min

his blood Pressure (y) is 88.387 or about 88.4 at 3.73h

b) Determine how long his blood pressure is at 99 mm of mercury or below. Show your work.

(2 marks)

y=99

2nd intersect

starts at X=0.28h

ends X= 8.39 or 8.4h

8.39 + 0.28 = 8.67 hs

Exemplar 1

Question 6 (a) and (b)—Relations and Functions

Mark(s): 2/3

❶ → 1 mark for correct answer in (a)
❷ → 0.5 mark for correct first x-value in (b)
❸ → 0.5 mark for correct second x-value in (b)
Ⓔ6 → rounds incorrectly

Exemplar 2

Question 6 **Total: 4 marks**

A patient has his blood pressure monitored for 16 hours. During this period, his blood pressure can be modelled by the following cubic function:

$$P = -0.05t^3 + 1.28t^2 - 7.46t + 101$$

where P represents the blood pressure (in mm of mercury)
and t represents the amount of time his blood pressure is monitored (in hours).

a) Determine his lowest blood pressure during this period, in mm of mercury.

(1 mark)

2nd - trace -> Value -> X=0

lowest blood is 3.46 mm

12.934866

b) Determine how long his blood pressure is at 99 mm of mercury or below. Show your work.

(2 marks)

y2= 99 2nd - trace - inter

X=8.39

X=16.92

16.92-8.39

8.53 hours

Exemplar 2

Question 6 (a) and (b)—Relations and Functions

Mark(s): 1.5/3

❷ → 0.5 mark for correct first x-value in (b)
❹ → 1 mark for consistent difference in (b)

Exemplar 1

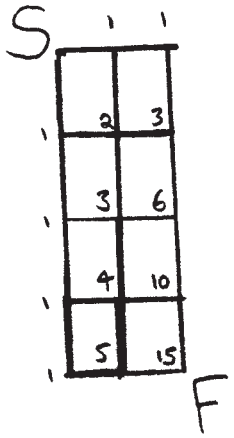
Question 8 — Total: 2 marks

A student enters a maze and needs to make 4 turns. She must turn left or right at each intersection.

Determine how many different paths are possible if she makes either 1 or 2 right turns.
Use a graphic organizer to show your work.

S = Start of maze

F = Finish



Exemplar 1

Question 8—Probability

Mark(s): 0/2

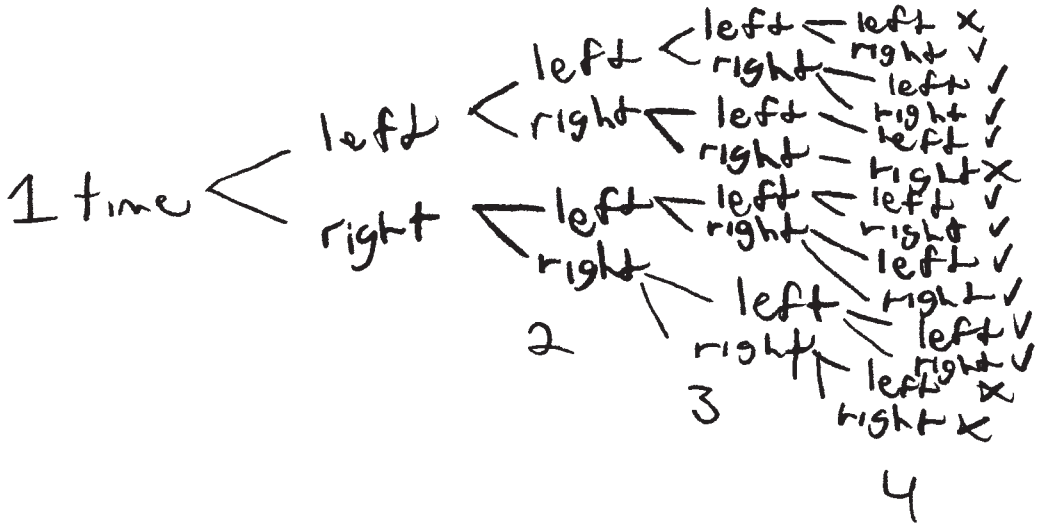
→ no criteria met

Exemplar 2

Question 8 — Total: 2 marks

A student enters a maze and needs to make 4 turns. She must turn left or right at each intersection.

Determine how many different paths are possible if she makes either 1 or 2 right turns. Use a graphic organizer to show your work.



$$P = \frac{10}{14}$$

Exemplar 2

Question 8—Probability

Mark(s): 1.5/2

❶ → 1 mark for appropriate work
❷ → 1 mark for consistent answer
PE → 0.5 mark deduction for procedural error
E1 → incorrectly states the final answer

Exemplar 1

Question 9 — Total: 2 marks

Students at a high school were surveyed about their use of online television services.

The survey results showed the following:

- 48% of students use Service A
- 40% of students use Service B
- the remaining students do not use any service
- no student uses both services

a) According to the survey results, is the use of online television services mutually exclusive? Justify your reasoning.

(1 mark)

No they aren't because no students use both services

b) According to the survey results, determine the odds against a student using an online television service.

(1 mark)

40:100 → service B

48:100 → service A

48
+40
88

88:100 or 22:25

Exemplar 1

Question 9—Probability

Mark(s): 0/2

→ no criteria met

Exemplar 2

Question 9 — Total: 2 marks

Students at a high school were surveyed about their use of online television services.

The survey results showed the following:

- 48% of students use Service A
- 40% of students use Service B
- the remaining students do not use any service
- no student uses both services

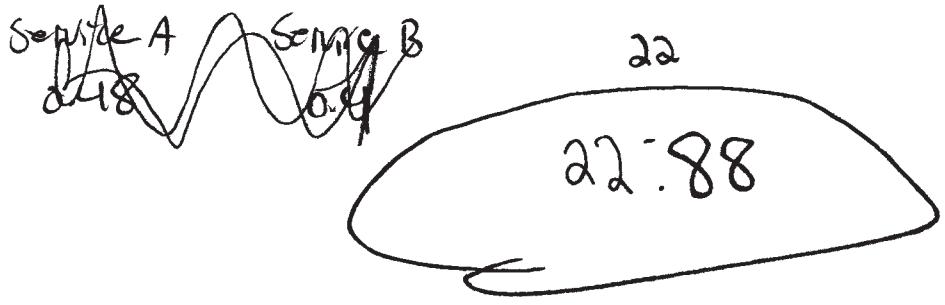
a) According to the survey results, is the use of online television services mutually exclusive? Justify your reasoning.

(1 mark)

Not Mutually exclusive because
u Students are just a small portion
of the population Meaning
they should survey others also

b) According to the survey results, determine the odds against a student using an online television service.

(1 mark)



Exemplar 2

Question 9—Probability

Mark(s): 0.5/2

❷ → 1 mark for correct answer in (b)
AE → 0.5 mark deduction for arithmetic error

Exemplar 1

Question 10 **Total: 2 marks**

Twenty cards numbered 11 to 30 are placed in a box.

Determine the probability of selecting one card from the box that is a multiple of 3 or a multiple of 4. Show your work.

19 cards

Multiple of 3: 12, 15, 18, 21, 24, 27, 30
multiple of 4: 12, 16, 20, 24, 28

12 cards multiples of 3 or 4

$$\frac{12}{19}$$

Exemplar 1

Question 10—Probability

Mark(s): 1/2

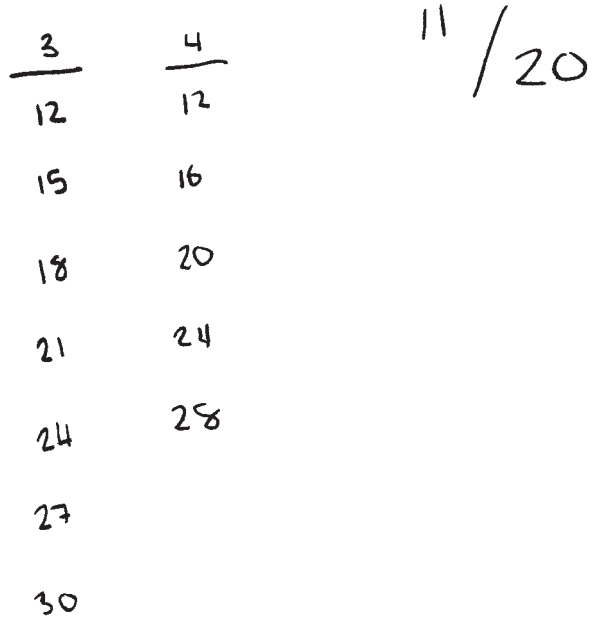
❶ → 0.5 mark for multiples of 3
❷ → 0.5 mark for multiples of 4

Exemplar 2

Question 10 — Total: 2 marks

Twenty cards numbered 11 to 30 are placed in a box.

Determine the probability of selecting one card from the box that is a multiple of 3 or a multiple of 4. Show your work.



Exemplar 2

Question 10—Probability

Mark(s): 1.5/2

❶ → 0.5 mark for multiples of 3
❷ → 0.5 mark for multiples of 4
❹ → 0.5 mark for consistent answer using 20 as the total number of outcomes

Exemplar 1

Question 11 — Total: 3 marks

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)

$_{23}C_4$

$= 35\,960$ ways

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)

$$\frac{(_2C_2)(_{22}C_2)}{_{23}C_4}$$

$$= 0,64$$

Exemplar 1

Question 11—Probability

Mark(s): 1.5/3

❶ → 1 mark for correct answer in (a)
❸ → 1 mark for consistent probability in (b)
PE → 0.5 mark deduction for procedural error
E1 → does not include a percent sign

Exemplar 2

Question 11 — Total: 3 marks

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)

$_{23}C_4$

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)

$\frac{2}{23}$ or 8.69%

Exemplar 2

Question 11—Probability

Mark(s): 0.5/3

❶ → 1 mark for correct answer in (a)
PE → 0.5 mark deduction for procedural error

Exemplar 1

Question 12 — Total: 4 marks

A dance studio has 9 students: 4 students are ballet dancers and 5 students are hip-hop dancers. They are arranging themselves in a row for a year-end photo.

a) Determine how many ways the dancers can be arranged for the photo if they must alternate between their type of dance. Show your work.

(2 marks)

x = 5 groups
x_1 = 4 (HB, BH)
x_2 = 1 (H)

$P_{groups} = 5!4!$
$= 2880$ ways

there are 2880 ways the dancers can be alternatively rearranged.

b) Determine how many ways the dancers can be arranged for the photo if the ballet dancers must all stand together. Show your work.

(2 marks)

x = 2 groups
x_1 = 4 Students
x_2 = 5 Students

$P_{groups} = 2!.4!5!$
$= 5760$ ways

there are 5760 ways the dancers can be arranged

Exemplar 1

Question 12—Probability

Mark(s): 3.5/4

❶ → 0.5 mark for permutation of ballet dancers in (a)
❷ → 0.5 mark for permutation of hip-hop dancers in (a)
❸ → 1 mark for consistent product of the permutations in (a)
❹ → 0.5 mark for 4! in (b)
❻ → 1 mark for consistent product in (b)

Exemplar 2

Question 12 **Total: 4 marks**

A dance studio has 9 students: 4 students are ballet dancers and 5 students are hip-hop dancers. They are arranging themselves in a row for a year-end photo.

a) Determine how many ways the dancers can be arranged for the photo if they must alternate between their type of dance. Show your work.

(2 marks)

5 4 4 3 3 2 2 1 1 2880ways

b) Determine how many ways the dancers can be arranged for the photo if the ballet dancers must all stand together. Show your work.

(2 marks)

4! 5!

_ _ _ _ _ 5 4 3 2 1 = 2880ways

Exemplar 2

Question 12—Probability

Mark(s): 3.5/4

❶ → 0.5 mark for permutation of ballet dancers in (a)
❷ → 0.5 mark for permutation of hip-hop dancers in (a)
❸ → 1 mark for consistent product of the permutations in (a)
❹ → 0.5 mark for 4! in (b)
❻ → 1 mark for consistent product in (b)

Exemplar 1

Question 13 **Total: 4 marks**

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.

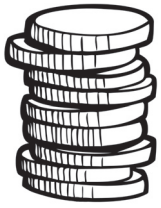
(2 marks)

6 loonies 5 loonies
11 coins 10 coins
6/11 5/10
.545 x .5 = .2725

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)

$\frac{9!}{6!3!}$ = 3024 ways to stack coins



Exemplar 1

Question 13—Probability

Mark(s): 2.5/4

❶ → 0.5 mark for demonstrating the dependency of loonies in (a)
❷ → 0.5 mark for demonstrating the dependency of the total number of coins in (a)
❸ → 1 mark for consistent product in (a)
❹ → 0.5 mark for 9! in (b)
❼ → 0.5 mark for consistent quotient in (b)
PF → 0.5 mark deduction for procedural error
E6 → rounds too soon

Exemplar 2

Question 13 **Total: 4 marks**

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)

toonies loonies quarters

2 6 3 2+6+3=11

$\frac{6}{11} = 0.5454545...$

$\frac{5}{10} = 0.5$

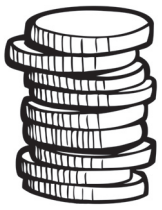
$\times$ $\times 100 = 27.27\%$

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)

toonies loonies quarters

2+4+3=9 2 4 3



$(2!)(4!)(3!) = 288$

get rid of the multiples?

$9! = 362880$

multiples of the same thing?

Exemplar 2

Question 13—Probability

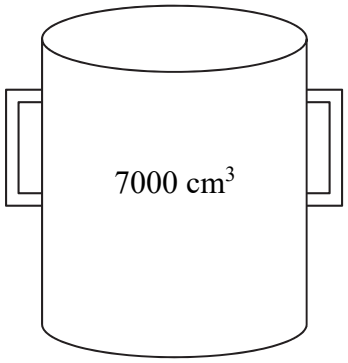
Mark(s): 3.5/4

❶ → 0.5 mark for demonstrating the dependency of loonies in (a)
❷ → 0.5 mark for demonstrating the dependency of the total number of coins in (a)
❸ → 1 mark for consistent product in (a)
❹ → 0.5 mark for 9! in (b)
❺ → 0.5 mark for 4! in (b)
❻ → 0.5 mark for 2!3! in (b)

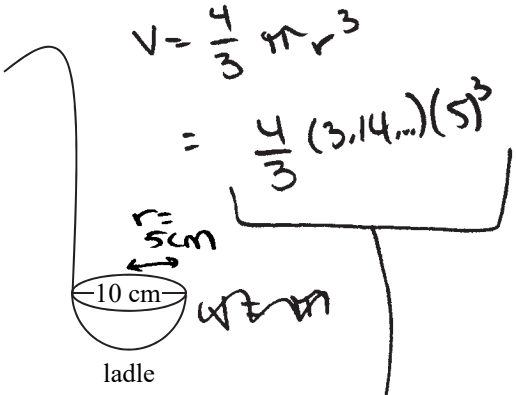
Exemplar 1

Question 15 **Total: 2 marks**

Sarah has prepared 7000 cm^3 of soup in a pot. She uses a ladle, in the shape of a hemisphere, to serve the soup into bowls. The ladle has a diameter of 10 cm.



pot



Determine the number of full ladles of soup that she can serve. Show your work.

$V = \frac{4}{3}\pi r^3$

$= \frac{4}{3}(3.14\ldots)(5)^3$

$104.72 \div 2$

$= 52.36\ cm^3$

$\frac{7000\ cm^3}{52.36\ cm^3}$

$= 133.69$ ladles of soup

∴ = 133 ladles of soup she can serve.

Exemplar 1

Question 15—Design and Measurement

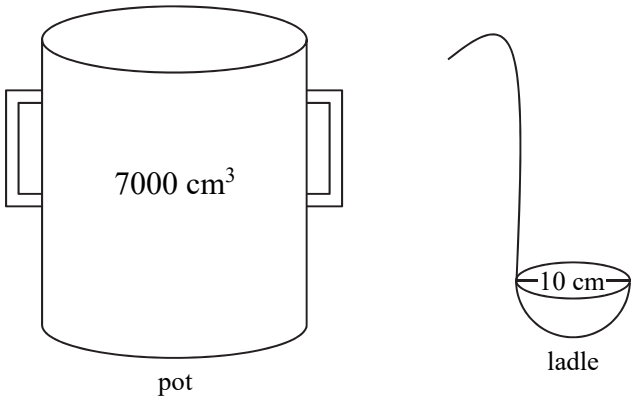
Mark(s): 1.5/2

❶ → 0.5 mark for correct substitution of radius in formula
❷ → 0.5 mark for consistent volume of ladle
❸ → 0.5 mark for dividing volume of pot by volume of ladle
❹ → 0.5 mark for consistent answer
PE → 0.5 mark deduction for procedural error

Exemplar 2

Question 15 — Total: 2 marks

Sarah has prepared 7000 cm^3 of soup in a pot. She uses a ladle, in the shape of a hemisphere, to serve the soup into bowls. The ladle has a diameter of 10 cm.



Determine the number of full ladles of soup that she can serve. Show your work.

FIND V of ⊖

$V = \frac{1}{2}\left(\frac{4\pi r^2}{3}\right)$

$= \frac{1}{2}\left(\frac{4\pi 5^2}{3}\right)$

$= 52.36\ cm^3$

$\frac{7000}{52.36} =$ 133 full ladles

Exemplar 2

Question 15—Design and Measurement

Mark(s): 1/2

❸ → 0.5 mark for dividing volume of pot by volume of ladle
❹ → 0.5 mark for consistent answer

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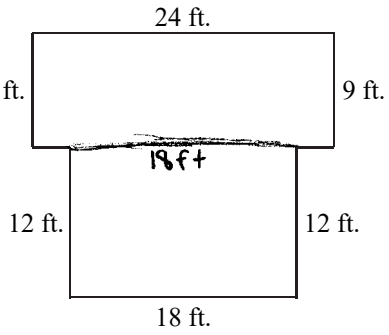
Exemplar 1

Question 16 — Total: 6 marks

Nashida wants to build an outdoor kitchen.

She is going to place patio stones in the layout shown to the right. The patio stones

- are in the shape of a square with 18-inch sides
- cost $3.00 each



a) Determine the number of patio stones Nashida needs. Show your work.

(2 marks)

$A = Lw \quad A = (24)(9) \quad A = 216$

$A = lw \quad A = (18)(12) \quad A = 216$) + $= 432 ft^2$

$\frac{432 ft}{1 ft} = \frac{x}{12 in}$

$432 ft^2 = 5184 in^2$

$\frac{5184}{18} = 288$ patio stones

$288 \times 3 = \$864$

Nashida must buy a grill, a countertop, and a patio set for the outdoor kitchen. She has the following options:

Grill		Countertop		Patio Set	
Propane	$1400.00	Granite	$2700.00	Basic	$600.00
Pellet	$3000.00	Soapstone	$3600.00	Elegant	$1000.00

She also plans to buy **three** of the following items:

Side Burner		Fridge		Cabinet		Sink		Warming Drawer	
Single	$400.00	Small	$800.00	30-inch	$700.00	Single	$350.00	Small	$800.00
Double	$650.00	Large	$1100.00	42-inch	$1250.00	Double	$500.00	Large	$1300.00

Exemplar 1 (continued)

b) Nashida can spend a maximum of $11 000.00, taxes included. Calculate the total cost, plus GST and PST, of the patio stones and components of the outdoor kitchen. Show your work. (Note: GST = 5%, PST = 7%)

(2 marks)

$1400.00
$2700.00
$600.00
$400.00
$800.00
$700.00
$350.00
$800.00
$7750.00
+ $864.00
$8614.00

$8614.00(0.05)(0.07) = 30.15

$8614.00 + 30.15 =

$8644.15

c) Nashida is financing the outdoor kitchen with a financial institution that gives her an interest rate of 5.00%, compounded monthly. She wants to make $300.00 monthly payments on the loan. Calculate how many payments it will take Nashida to pay off the loan. Show your work.

(2 marks)

- N=12 = 27.3 → 28 months
I%=5
PV=0
PMT=-300
FV=8644.15
P/Y=12
C/Y=12

Exemplar 1

Question 16—Design and Measurement & Financial Mathematics

Mark(s): 3/6

❶ → 0.5 mark for correct area of layout in (a)
❹ → 0.5 mark for consistent number of patio stones in (a)
❺ → 0.5 mark for indicating required components and costs in (b)
❼ → 0.5 mark for consistent subtotal including all components in (b)
❿ → 1 mark for consistent answer in (c)

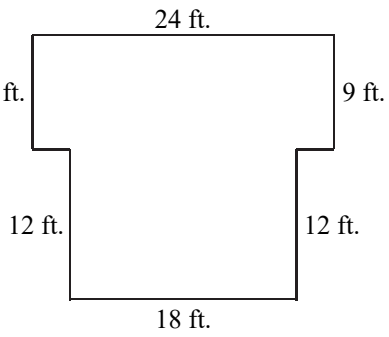
Exemplar 2

Question 16 — Total: 6 marks

Nashida wants to build an outdoor kitchen.

She is going to place patio stones in the layout shown to the right. The patio stones

- are in the shape of a square with 18-inch sides
- cost $3.00 each



feet = $\frac{18}{12}$ = 1.5 feet

a) Determine the number of patio stones Nashida needs. Show your work.

(2 marks)

On graph paper

144 stones are needed

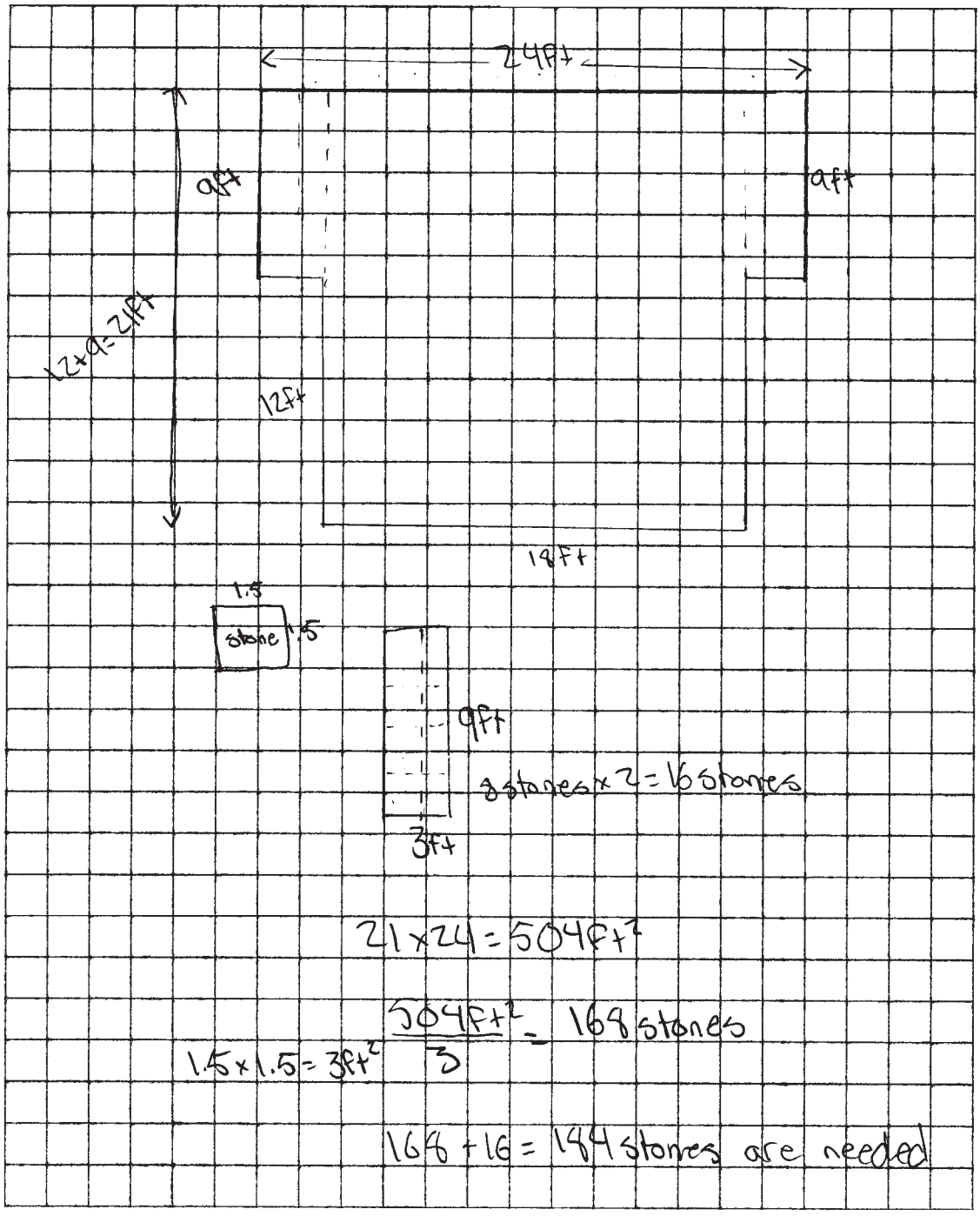
Nashida must buy a grill, a countertop, and a patio set for the outdoor kitchen. She has the following options:

Grill		Countertop		Patio Set	
Propane	$1400.00	Granite	$2700.00	Basic	$600.00
Pellet	$3000.00	Soapstone	$3600.00	Elegant	$1000.00

She also plans to buy **three** of the following items:

Side Burner		Fridge		Cabinet		Sink		Warming Drawer	
Single	$400.00	Small	$800.00	30-inch	$700.00	Single	$350.00	Small	$800.00
Double	$650.00	Large	$1100.00	42-inch	$1250.00	Double	$500.00	Large	$1300.00

Exemplar 2 (continued)



Exemplar 2 (continued)

b) Nashida can spend a maximum of $11 000.00, taxes included. Calculate the total cost, plus GST and PST, of the patio stones and components of the outdoor kitchen. Show your work. (Note: GST = 5%, PST = 7%)

(2 marks)

item	Quantity	unit cost	subtotal
Patio stones	144	$3.00	$552.00
Grill	1	$1400.00	$1400.00
Cosntertop	1	$2700.00	$2700.00
Patio set	1	$1000.00	$1000.00
Fridge	1	$800.00	$800.00
Sink	1	$500.00	$500.00
Cabinets	2	$700.00	$1400.00
		PST 7%	$544.50
		GST 5%	$417.50
		Total	$9352.00

PST calculation (552+1400+2700+1000+800+500+1400) * 0.07
= $350 * 0.07
= $544.50

GST: $350 * 0.05
= 417.50

c) Nashida is financing the outdoor kitchen with a financial institution that gives her an interest rate of 5.00%, compounded monthly. She wants to make $300.00 monthly payments on the loan. Calculate how many payments it will take Nashida to pay off the loan. Show your work.

(2 marks)

Transaction Type
○ Investment ○ Retirement Plan ◉ Loan (?)

Payment Frequency (per year)
○ 1 ○ 2 ○ 4 ◉ 12 ○ 24 ○ 26 ○ 365 (?)

Compound Frequency (per year)
○ 1 ○ 2 ○ 4 ◉ 12 ○ 24 ○ 26 ○ 365 (?)

Financial Details

Initial Loan Amount:	9352.00	○
Final Loan Balance:	0.00	○
Monthly Payment:	300.00	○
Interest Rate (%):	5.00	○
# Years:	2.79	◉

Make Payment at: ○ Start or ◉ End of Period

c) 2.79 x 12 = 33.48

She would have to make 33.48 payments to pay off the loan.

Exemplar 2

Question 16—Design and Measurement & Financial Mathematics

Mark(s): 3.5/6

❷ → 0.5 mark for correct area of one patio stone in (a)
❸ → 0.5 mark for correct unit conversion in (a)
❺ → 0.5 mark for indicating required components and costs in (b)
❽ → 0.5 mark for consistent total cost, including taxes, less than $11 000.00 in (b)
❾ → 1 mark for appropriate work in (c)
❿ → 1 mark for consistent answer in (c)
PE → 0.5 mark deduction for procedural error
E4 → does not use whole units in contextual questions involving discrete data

Exemplar 1

Question 17 — Total: 1 mark

Kazoo is looking for a house. He has the following options:

Option 1: He can buy a house with a monthly mortgage payment of $1150.00 amortized over 25 years.

Option 2: He can rent a similar house for $1150.00 per month.

State which option Kazoo should choose. Provide one reason for your choice.

Option 2: -> he could get out of the rent if he didnt want to liv there

Exemplar 1

Question 17—Financial Mathematics

Mark(s): 0.5/1

❶ → 1 mark for appropriate reason
LC → 0.5 mark deduction for lack of clarity

Exemplar 2

Question 17 — Total: 1 mark

Kazoo is looking for a house. He has the following options:

Option 1: He can buy a house with a monthly mortgage payment of $1150.00 amortized over 25 years.

Option 2: He can rent a similar house for $1150.00 per month.

State which option Kazoo should choose. Provide one reason for your choice.

- Kazoo should choose Option 1 because if he buys a house and continues to pay for it monthly he would obtain a good credit

Exemplar 2

Question 17—Financial Mathematics

Mark(s): 0/1

→ no criteria met

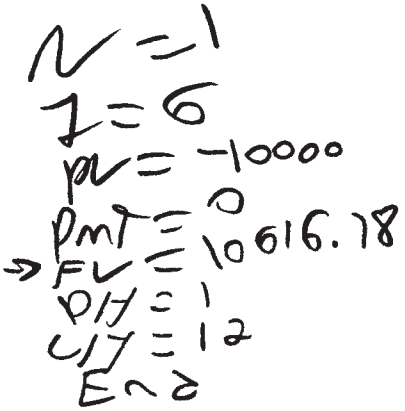
Exemplar 1

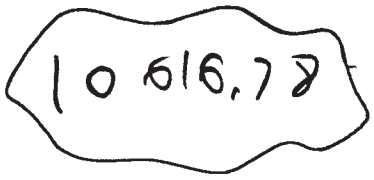
Question 18 **Total: 6 marks**

Ham and Sylvie each had $10 000.00 to invest.

a) Ham invested $10 000.00 in a mutual fund at an interest rate of 6.00%, compounded monthly. Determine the value of the mutual fund at the end of the first year. Show your work.

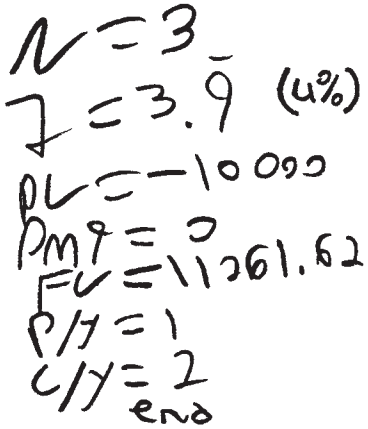
(2 marks)

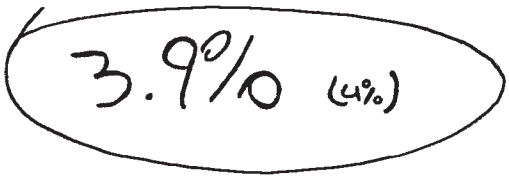




b) Sylvie invested $10 000.00 in a guaranteed investment certificate (GIC) with interest compounded semi-annually. The value of the GIC was $11 261.62 at the end of the third year. Determine the interest rate for the GIC. Show your work.

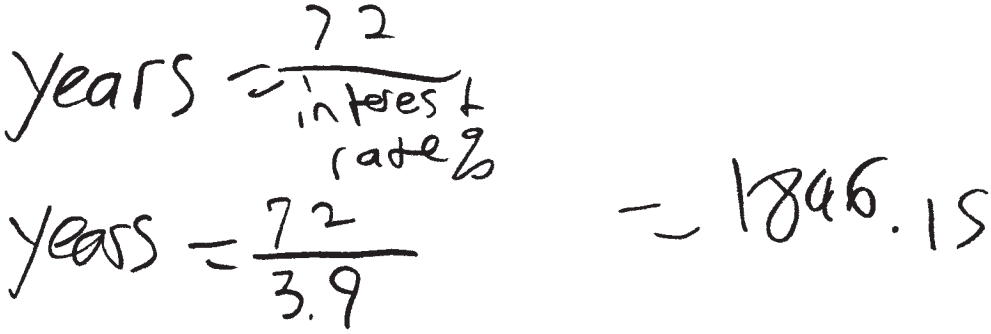
(2 marks)





c) Using the Rule of 72, determine approximately how much longer it will take for Sylvie's GIC to reach a value of $40 000.00 compared to Ham's mutual fund. Show your work.

(2 marks)



Exemplar 1

Question 18—Financial Mathematics

Mark(s): 4/6

❶ → 1 mark for appropriate work in (a)
❷ → 1 mark for consistent answer in (a)
❸ → 1 mark for appropriate work in (b)
❹ → 1 mark for consistent answer in (b)
❻ → 0.5 mark for correctly using Rule of 72 on GIC in (c)
PF → 0.5 mark deduction for procedural error
E5 → does not include the dollar sign for monetary values
E6 → rounds incorrectly

Exemplar 2

Question 18 **Total: 6 marks**

Ham and Sylvie each had $10 000.00 to invest.

a) Ham invested $10 000.00 in a mutual fund at an interest rate of 6.00%, compounded monthly. Determine the value of the mutual fund at the end of the first year. Show your work. Tvm solver

(2 marks)

N: 1
I: 6
PV: -10000
PMT 0
FV: ? → Alpha enter = 10616.78
P/Y: 1
C/Y 12

b) Sylvie invested $10 000.00 in a guaranteed investment certificate (GIC) with interest compounded semi-annually. The value of the GIC was $11 261.62 at the end of the third year. Determine the interest rate for the GIC. Show your work.

(2 marks)

N: 3
I: ? → 3.99 → 4,00%
PV: -10 000
PMT: 0
FV: 11261.62
P/Y: 1
C/Y: 2 ?

c) Using the Rule of 72, determine approximately how much longer it will take for Sylvie's GIC to reach a value of $40 000.00 compared to Ham's mutual fund. Show your work.

(2 marks)

Ham

N: ? → 23,16
I: 6
PV: -10000
PMT: 0
FV: 40 000
P/Y: 1
C/Y: 12

Sylivil

N: 35.00
I: 3.99
PV: -10 000
PMT: 0
FV: 40 000
P/Y 1
C/Y: 2

= 35 years
- 23,16
= 11.84 years
longer

Exemplar 2

Question 18—Financial Mathematics

Mark(s): 5/6

❶ → 1 mark for appropriate work in (a)
❷ → 1 mark for consistent answer in (a)
❸ → 1 mark for appropriate work in (b)
❹ → 1 mark for consistent answer in (b)
❼ → 0.5 mark for doubling twice in (c)
❽ → 0.5 mark for consistent subtraction in (c)
Ⓔ5 → does not include the dollar sign for monetary values

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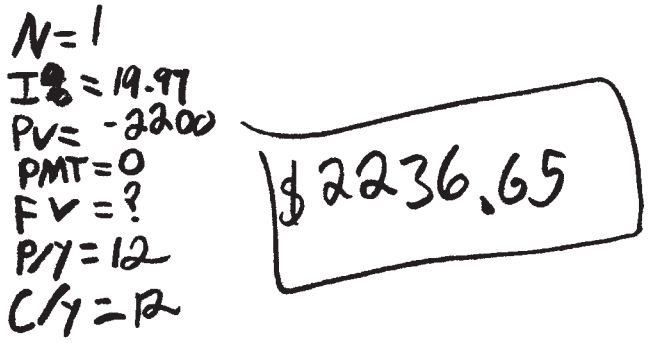
Exemplar 1

Question 19 — Total: 6 marks

Simba wants to purchase a bed for $2200.00 (taxes included). The store offers him a promotion of 0% interest with no payments for one year. If Simba does not pay the amount in full within one year, interest will be charged from the date of purchase at an interest rate of 19.99%, compounded monthly.

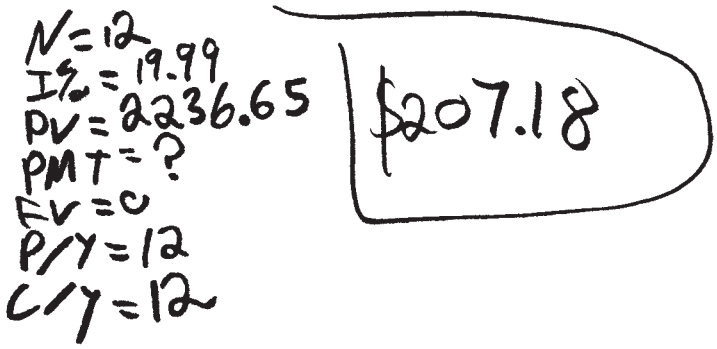
a) If Simba does not make any payments during the first year, calculate the amount the store will bill him one year after the date of purchase. Show your work.

(2 marks)



b) If Simba makes monthly payments over the second year to pay off the amount calculated in (a), determine his monthly payment. Show your work.

(2 marks)



Exemplar 1 (continued)

c) Using your answer in (b), calculate the interest Simba would pay over the two-year period. Show your work.

(1.5 marks)

207.18 × 12 = 2486.16
2236.65 − 2486.16 = $249.51

d) Give one reason why Simba would buy his bed using the promotion.

(0.5 mark)

if he is in despret need of a bed

Exemplar 1

Question 19—Financial Mathematics

Mark(s): 3.5/6

❷ → 1 mark for consistent answer in (a)
❸ → 1 mark for appropriate work in (b)
❹ → 1 mark for consistent answer in (b)
❺ → 0.5 mark for the total amount paid during the second year in (c)

Exemplar 2

Question 19 **Total: 6 marks**

Simba wants to purchase a bed for $2200.00 (taxes included). The store offers him a promotion of 0% interest with no payments for one year. If Simba does not pay the amount in full within one year, interest will be charged from the date of purchase at an interest rate of 19.99%, compounded monthly.

a) If Simba does not make any payments during the first year, calculate the amount the store will bill him one year after the date of purchase. Show your work.

(2 marks)

- The bill will be $2682.40

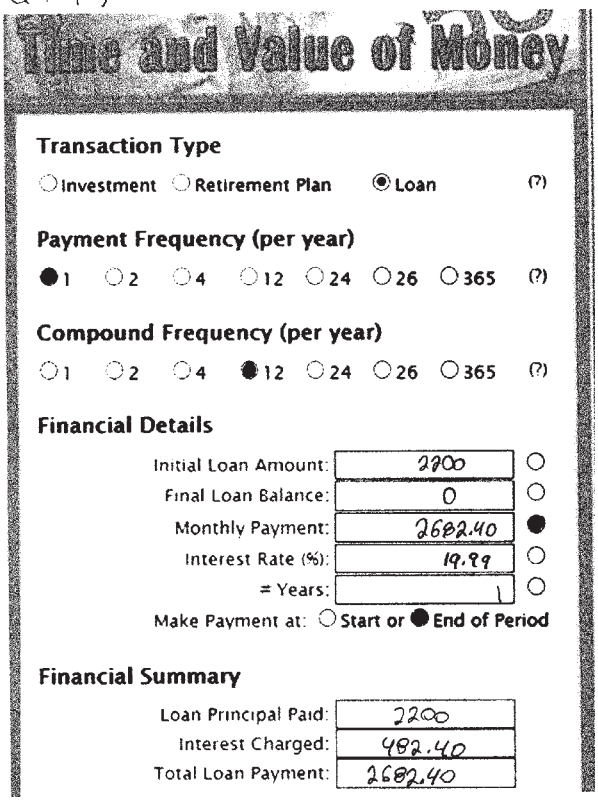
b) If Simba makes monthly payments over the second year to pay off the amount calculated in (a), determine his monthly payment. Show your work.

(2 marks)

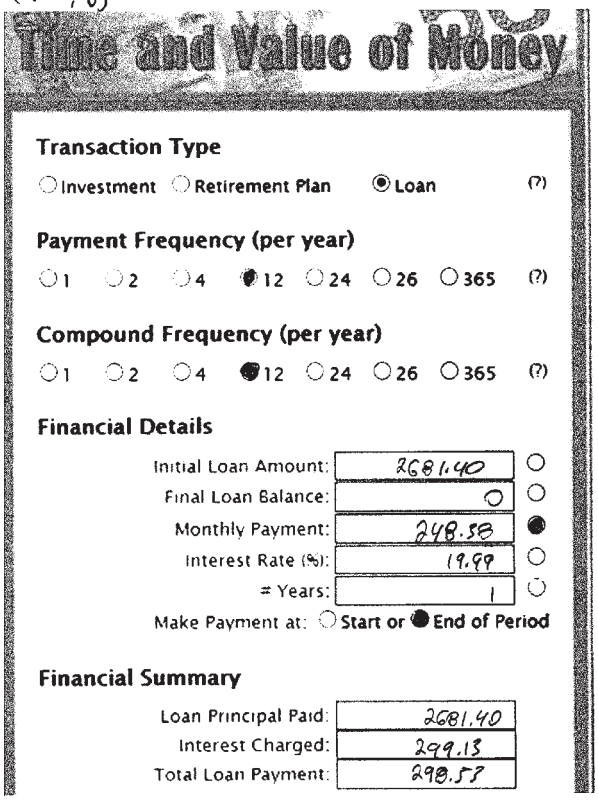
- monthly payments of 248.58.

Exemplar 2 (continued)

Q19. c)



Q19. b)



Exemplar 2 (continued)

c) Using your answer in (b), calculate the interest Simba would pay over the two-year period. Show your work.

(1.5 marks)

first year $482.48
Second year $299.13
$781.53

d) Give one reason why Simba would buy his bed using the promotion.

(0.5 mark)

Because he can save up his money during the year and then pay it off before interst oplise

Exemplar 2

Question 19—Financial Mathematics

Mark(s): 6/6

❶ → 1 mark for appropriate work in (a)
❷ → 1 mark for consistent answer in (a)
❸ → 1 mark for appropriate work in (b)
❹ → 1 mark for consistent answer in (b)
❺ → 0.5 mark for the total amount paid during the second year in (c)
❻ → 0.5 mark for considering the initial cost of the bed in (c)
❼ → 0.5 mark for consistent answer in (c)
❽ → 0.5 mark for appropriate reason in (d)
Ⓔ3 → makes a transcription error (inaccurate transferring of information)
Ⓔ5 → does not include the dollar sign for monetary values

Exemplar 1

Question 20 **Total: 3 marks**

The Ramilo family moved to The Pas. They bought a house with a purchase price of $229 000.00 and made a down payment of $20 000.00. Their mortgage has an interest rate of 3.15%, compounded semi-annually, and is amortized over 25 years.

a) Calculate their monthly mortgage payment. Show your work.

(2 marks)

N = 25 × 2
I = 3.15
PV = 209000
PMT = $6070.89 is the monthly mortgage payment.
FV = 0
P/Y = 2
C/Y = 2

b) Calculate the balance owing on the mortgage after 10 years if they have been making regular monthly payments.

(1 mark)

Bal(yrs x p/y)
Bal(10 x 2) = $144259.23 owing after 10yrs.

Exemplar 1

Question 20—Financial Mathematics

Mark(s): 2/3

❷ → 1 mark for consistent answer in (a)
❸ → 1 mark for consistent answer in (b)

Exemplar 2

Question 20 **Total: 3 marks**

The Ramilo family moved to The Pas. They bought a house with a purchase price of $229 000.00 and made a down payment of $20 000.00. Their mortgage has an interest rate of 3.15%, compounded semi-annually, and is amortized over 25 years.

a) Calculate their monthly mortgage payment. Show your work.

(2 marks)

N = 25 x 12 = 300
I = 3.15
PV = 229000
PMT = -1101.43
FV = 0
P/Y = 12
C/Y = 2

$1101.43 a month

b) Calculate the balance owing on the mortgage after 10 years if they have been making regular monthly payments.

(1 mark)

N = 10 x 12
I = 3.15
PV = Solve
PMT = -1101.43
FV = 0
P/Y = 12
C/Y = 2

$ 113363.16 is the remaining balance

Exemplar 2

Question 20—Financial Mathematics

Mark(s): 1/3

❷ → 1 mark for consistent answer in (a)

Exemplar 1

Question 21 — Total: 2 marks

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.

$$\frac{425\,000 - 325\,000}{325\,000} \times 100 =$$

$$= 30.80 \text{ or } 30.80\%.$$

Exemplar 1

Question 21—Financial Mathematics

Mark(s): 0/2

→ no criteria met

Exemplar 2

Question 21 **Total: 2 marks**

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.

2009 - 325 000.00

2019 - 425000.00

10%

N = 10
I = 2.72%
PV = -325000
PMT = 0
FV = 425000
P/Y = 1
C/Y = 1

*

7.6%
FV = -676,092

.76 5.2
FV = 539,561

3.1% FV = 441,632

Exemplar 2

Question 21—Financial Mathematics

Mark(s): 2/2

❶ → 1 mark for appropriate work
❷ → 1 mark for consistent answer
Ⓔ1 → does not include a percent sign

Exemplar 1

Question 24 — Total: 2 marks

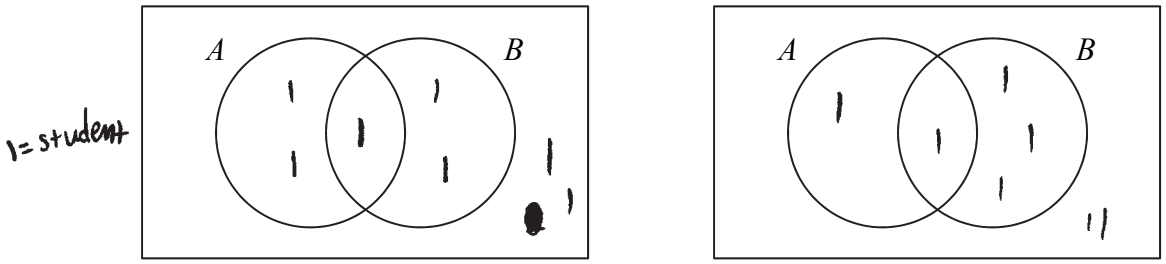
There are 7 students in Ms. Sanduk's class. She knows that some of her students have part-time jobs and some of her students participate in extra-curricular activities. However, 2 students neither have a part-time job nor participate in extra-curricular activities.

$A = \{\text{students with part-time jobs}\}$

$B = \{\text{students who participate in extra-curricular activities}\}$

$n(A \cap B) = 1$

Fill in the blank diagrams below to show two possibilities in this situation.



Exemplar 1

Question 24—Logical Reasoning

Mark(s): 2/2

❶ → 1 mark for first correct diagram
❷ → 1 mark for second correct diagram

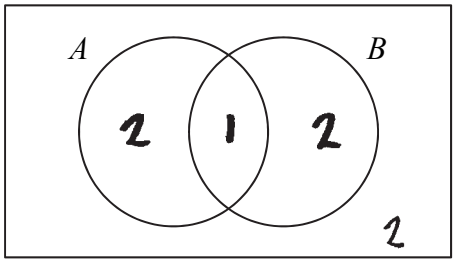
Exemplar 2

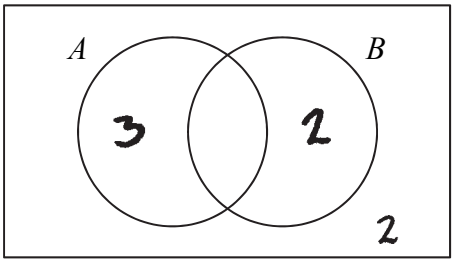
Question 24 — Total: 2 marks

There are 7 students in Ms. Sanduk's class. She knows that some of her students have part-time jobs and some of her students participate in extra-curricular activities. However, 2 students neither have a part-time job nor participate in extra-curricular activities.

$$A = \{\text{students with part-time jobs}\}$$
$$B = \{\text{students who participate in extra-curricular activities}\}$$
$$n(A \cap B) = 1$$

Fill in the blank diagrams below to show two possibilities in this situation.





Exemplar 2

Question 24—Logical Reasoning

Mark(s): 1/2

❶ → 1 mark for first correct diagram

Exemplar 1

Question 25 — Total: 2 marks

Complete the truth table, including the missing symbol in the box, based on the following logical statement:

A number is even if and only if a number is a multiple of two.

p	q	p ☐ q
True	True	True
True	False	False
False	True	False
False	False	True

Exemplar 1

Question 25—Logical Reasoning

Mark(s): 1/2

❷ → 1 mark for consistent values in the third column

Exemplar 2

Question 25 — Total: 2 marks

Complete the truth table, including the missing symbol in the box, based on the following logical statement:

A number is even if and only if a number is a multiple of two.

even multideof2

p	q	p [=] q
True	True	true
True	False	false
False	True	false
False	False	true

Exemplar 2

Question 25—Logical Reasoning

Mark(s): 1/2

❷ → 1 mark for consistent values in the third column

Exemplar 1

Question 26 **Total: 2 marks**

To form a group, 4 students are randomly chosen from 7 students. Jean writes the following conditional statement:

"If all 7 students have an equal chance of being chosen,
then there are 840 different groups that could be formed."

a) Write the contrapositive of the conditional statement.

(1 mark)

If there are not 840 different group that could be formed, all 7 students will not have equal chance of being chosen

b) Is the original conditional statement true? Justify your answer.

(1 mark)

False

There can be an equal chance of being chosen, it doesn't have to be 840 exact.

Exemplar 1

Question 26—Logical Reasoning

Mark(s): 0.5/2

❷ → 0.5 mark for correct contrapositive in (a)

Exemplar 2

Question 26 **Total: 2 marks**

To form a group, 4 students are randomly chosen from 7 students. Jean writes the following conditional statement:

"If all 7 students have an equal chance of being chosen,
then there are 840 different groups that could be formed."

a) Write the contrapositive of the conditional statement.

(1 mark)

There are not 840 different groups that can be formed if all 7 students do not have an equal chance of being chosen

b) Is the original conditional statement true? Justify your answer.

(1 mark)

no because ${}_7C_4 = 35$ different groups can be formed.

Exemplar 2

Question 26—Logical Reasoning

Mark(s): 1/2

❸ → 1 mark for correct justification in (b)