Grade 12
Applied Mathematics
Achievement Test

Exemplars

Use in conjunction with *Marking Guide*

January 2026

Manitoba

Grade 12 Applied Mathematics Achievement Test:
Exemplars (January 2026)

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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.

Preamble

This document is one of a series of two documents.

- ***Grade 12 Applied Mathematics Achievement Test: Exemplars***
- *Grade 12 Applied Mathematics Achievement Test: Marking Guide*

The exemplars contained in this document are intended to improve marking accuracy and consistency. These exemplars include marks assigned by the test development committee, together with rationales for the marks.

Exemplar 1

Question 3 **Total: 3 marks**

A dog's lung volume at rest can be modelled by the following sinusoidal function:

$$V = 0.37\sin 1.57t + 0.45$$ r[0.08, 0.82]

where V represents the lung volume (in litres)
and t represents the time (in seconds).

a) State the dog's lung volume at 1.35 seconds.

(*1 mark*)

Calc | 1 Value

$x = 1.35$ $y = 0.20$ L

PE

b) Determine the period of the function.

(*1 mark*)

$Pd = \frac{2\pi}{b}$

$Pd = \frac{2\pi}{1.57}$

$Pd = 4.00$ E5

c) Explain what the period represents in this situation.

(*1 mark*)

When the dog is inhaling or exhaling to measure its lung capacity.

Mark(s): 1.5/3

1 1 mark for answer in (a)
PE 0.5 mark deduction for procedural error in (a)
2 0.5 mark for appropriate work in (b)
3 0.5 mark for consistent answer in (b)
E5 does not include the units in the final answer in (b)

Exemplar 2

Question 3 — Total: 3 marks

A dog's lung volume at rest can be modelled by the following sinusoidal function:

$$V = 0.37\sin 1.57t + 0.45$$

where V represents the lung volume (in litres)
and t represents the time (in seconds).

a) State the dog's lung volume at 1.35 seconds.

(*1 mark*)

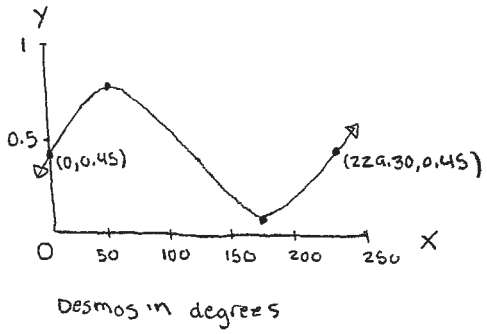
When $t = 1.35$, $v = 0.46$ ← PE

At 1.35 seconds, the dog's lung volume is **0.46 litres.**

b) Determine the period of the function.

(*1 mark*)

$P = \frac{360}{K}$ $P = \frac{360}{1.57} = 229.30$



Desmos in degrees

The period of the function is **229.30** ← E5

c) Explain what the period represents in this situation.

(*1 mark*)

The period represents one breath in this situation. ← LC

Mark(s): 1.5/3

- 1 — 1 mark for answer in (a)
- PE — 0.5 mark deduction for procedural error in (a)
- 3 — 0.5 mark for consistent answer in (b)
- 4 — 1 mark for appropriate explanation in (c)
- LC — 0.5 mark deduction for lack of clarity in (c)
- E5 — does not include the units in the final answer in (b)

Exemplar 3

Question 3 **Total: 3 marks**

A dog's lung volume at rest can be modelled by the following sinusoidal function:

$$V = 0.37\sin 1.57t + 0.45$$

V = y
t = x

where V represents the lung volume (in litres)
and t represents the time (in seconds).

a) State the dog's lung volume at 1.35 seconds.

(*1 mark*)

PE

2nd calc value x = 1.35 y = 0.95

The dogs lung volume is 0.95L

b) Determine the period of the function.

(*1 mark*)

$pd = \frac{b}{2}$ $pd = \frac{1.57}{2} = 0.785$

or 0.79

c) Explain what the period represents in this situation.

(*1 mark*)

The period represents the dog breathing in and out. How many seconds it takes to breath in and out.

Mark(s): 1.5/3

1 1 mark for answer in (a)

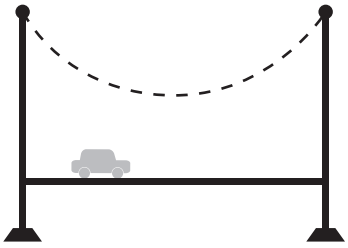
PE 0.5 mark deduction for procedural error in (a)

4 1 mark for appropriate explanation in (c)

Exemplar 1

Question 4 — Total: 4 marks

A car drives across a suspension bridge that has a support cable attached between two towers as shown in the diagram.



- The two towers are 480 m apart and have a height of 92 m above the road.
- When the car is 11 m from the left tower, the height of the cable is 85 m above the road.

a) Complete the table below.

(*1 mark*)

Horizontal Distance (m) (x)	Height (m) (y)
11	85
240	46
480	92

b) Determine the quadratic equation that models the shape of the cable, expressed to the nearest ten thousandth (four decimal places).

(*1 mark*)

Quadratic equation: $y = 0.0008x^2 - 0.3640 + 88.9100$ (E2) (E3)

c) Determine the height of the cable when the car is halfway between the two towers.

(*1 mark*)

$x = 240\text{m}$ $y = 46\text{m}$

d) State the range of the function in this situation.

(*1 mark*)

$[46, \infty)$

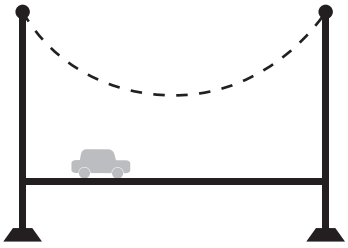
Mark(s): 2.5/4

- 2 1 mark for consistent equation in (b)
- 3 0.5 mark for appropriate work in (c)
- 4 0.5 mark for consistent height in (c)
- 6 0.5 mark for inclusivity of both upper and lower bounds in (d)
- E2 does not include one of the following in the equation: "$y =$", "sin", "ln", or "x", or writes parameters separately from the equation in (b)
- E3 makes a transcription error (inaccurate transferring of information) in (b)

Exemplar 2

Question 4 — Total: 4 marks

A car drives across a suspension bridge that has a support cable attached between two towers as shown in the diagram.



- The two towers are 480 m apart and have a height of 92 m above the road.
- When the car is 11 m from the left tower, the height of the cable is 85 m above the road.

a) Complete the table below.

(*1 mark*)

Horizontal Distance (m)	Height (m)
0	92
11	85
480	92

b) Determine the quadratic equation that models the shape of the cable, expressed to the nearest ten thousandth (four decimal places).

(*1 mark*)

PE

Quadratic equation: $y = 1.36x^2 - 0.65x + 92$

E6

c) Determine the height of the cable when the car is halfway between the two towers.

(*1 mark*)

13.85 meters

d) State the range of the function in this situation.

(*1 mark*)

$y \geq 13.85$

$13.85 \leq y \leq 92$ ← E2

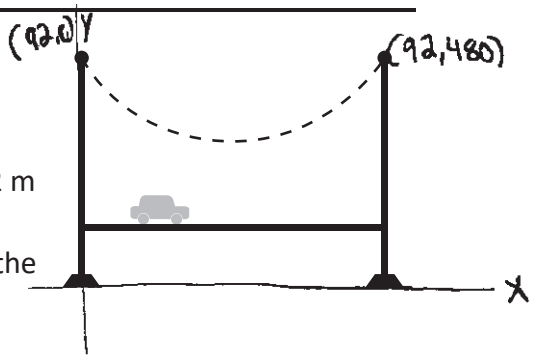
Mark(s): 3/4

1. 1 mark for correct table in (a)
2. 1 mark for consistent equation in (b)
- PE 0.5 mark deduction for procedural error in (b)
4. 0.5 mark for consistent height in (c)
5. 0.5 mark for consistent upper and lower bounds of the range in (d)
6. 0.5 mark for inclusivity of both upper and lower bounds in (d)
- E6 does not express the answer to the appropriate number of decimal places in (b)
- E2 does not include braces when using set notation in (d)

Exemplar 3

Question 4 — Total: 4 marks

A car drives across a suspension bridge that has a support cable attached between two towers as shown in the diagram.



- The two towers are 480 m apart and have a height of 92 m above the road.
- When the car is 11 m from the left tower, the height of the cable is 85 m above the road.

a) Complete the table below.

(*1 mark*)

Horizontal Distance (m)	Height (m)
11	85
480	92
0	92

b) Determine the quadratic equation that models the shape of the cable, expressed to the nearest ten thousandth (four decimal places).

(*1 mark*)

Quadratic equation: $y = 0.00135685x^2 - 0.651289x + 92$

c) Determine the height of the cable when the car is halfway between the two towers.

(*1 mark*)

$480 \div 2 = 240$ Using $y = 240$ in desmos, you get (240, 13.84532)

The height when the car is halfway across would be 13.84m.

E6

d) State the range of the function in this situation.

(*1 mark*)

range: $\{y \geq 13.84532 \mid y \in \mathbb{R}\}$

Mark(s): 3.5/4

1. 1 mark for correct table in (a)
2. 1 mark for consistent equation in (b)
3. 0.5 mark for appropriate work in (c)
4. 0.5 mark for consistent height in (c)
6. 0.5 mark for inclusivity of both upper and lower bounds in (d)

E6 rounds incorrectly in (c)

Exemplar 1

Question 5 **Total: 2.5 marks**

The following equation models the relationship between a tree's height and its age:

$$h = 6.01 + 6.30 \ln A$$

where h represents the height of the tree (in feet)
and A represents the age of the tree (in years).

a) State the height of the tree when it is 6 years old.

(*1 mark*)

$y = 6.01 + 6.30 \ln A$ 2nd I: value $x = 6$, $y = 10.91$ (PE)

The height of the tree when it's 6 yrs old is 10.91 ft.

b) The tree was planted in the year 2020. Determine in which year the tree will reach a height of 20 feet.

(*1.5 marks*)

$Y_2 = 20$ 2nd calc 5: intersect $x = 166.20$, $y = 20$

$2020 + 166.20$
$= 2186.2$

The tree will reach 20 ft in the year 2186.20. (E4)

Mark(s): 2/2.5

- (1) 1 mark for height of tree in (a)
- (PE) 0.5 mark deduction for procedural error in (a)
- (2) 0.5 mark for appropriate work in (b)
- (3) 0.5 mark for consistent age of the tree in (b)
- (4) 0.5 mark for consistent year in (b)
- (E4) does not use whole units in contextual questions involving discrete data in (b)

Exemplar 2

Question 5 — Total: 2.5 marks

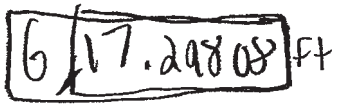
The following equation models the relationship between a tree's height and its age:

$$h = 6.01 + 6.30 \ln A$$

where h represents the height of the tree (in feet)
and A represents the age of the tree (in years).

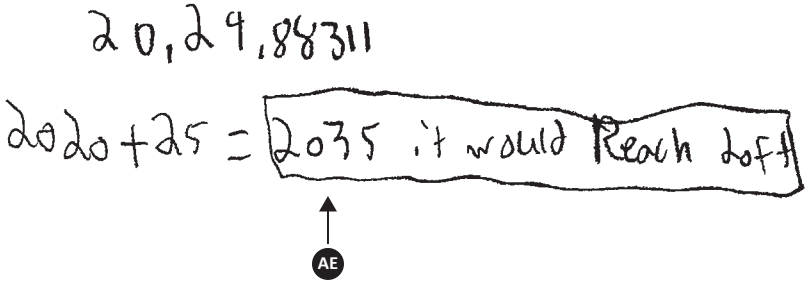
a) State the height of the tree when it is 6 years old.

(*1 mark*)



b) The tree was planted in the year 2020. Determine in which year the tree will reach a height of 20 feet.

(*1.5 marks*)



Mark(s): 1/2.5

- 1 mark for height of tree in (a)
- 4 0.5 mark for consistent year in (b)
- AE 0.5 mark deduction for arithmetic error in (b)

Exemplar 3

Question 5 — Total: 2.5 marks

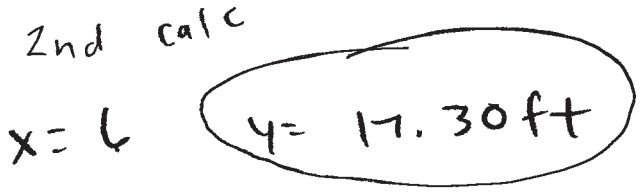
The following equation models the relationship between a tree's height and its age:

$$h = 6.01 + 6.30 \ln A$$

where h represents the height of the tree (in feet)
and A represents the age of the tree (in years).

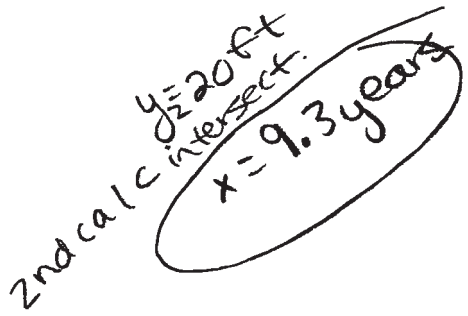
a) State the height of the tree when it is 6 years old.

(*1 mark*)



b) The tree was planted in the year 2020. Determine in which year the tree will reach a height of 20 feet.

(*1.5 marks*)



Mark(s): 1.5/2.5

1. 1 mark for height of tree in (a)
2. 0.5 mark for appropriate work in (b)

Exemplar 4

Question 5 — Total: 2.5 marks

The following equation models the relationship between a tree's height and its age:

$$h = 6.01 + 6.30 \ln A$$

where h represents the height of the tree (in feet)
and A represents the age of the tree (in years).

a) State the height of the tree when it is 6 years old.

(*1 mark*)

$6.01 + 6.30 \ln(6) = 17.30$ ft tall at 6yr old

b) The tree was planted in the year 2020. Determine in which year the tree will reach a height of 20 feet.

(*1.5 marks*)

year $\rightarrow 2029.213$

In 2030 the tree will reach 20ft.

E6

Mark(s): 1.5/2.5

1 1 mark for height of tree in (a)

4 0.5 mark for consistent year in (b)

E6 rounds incorrectly in (b)

Exemplar 1

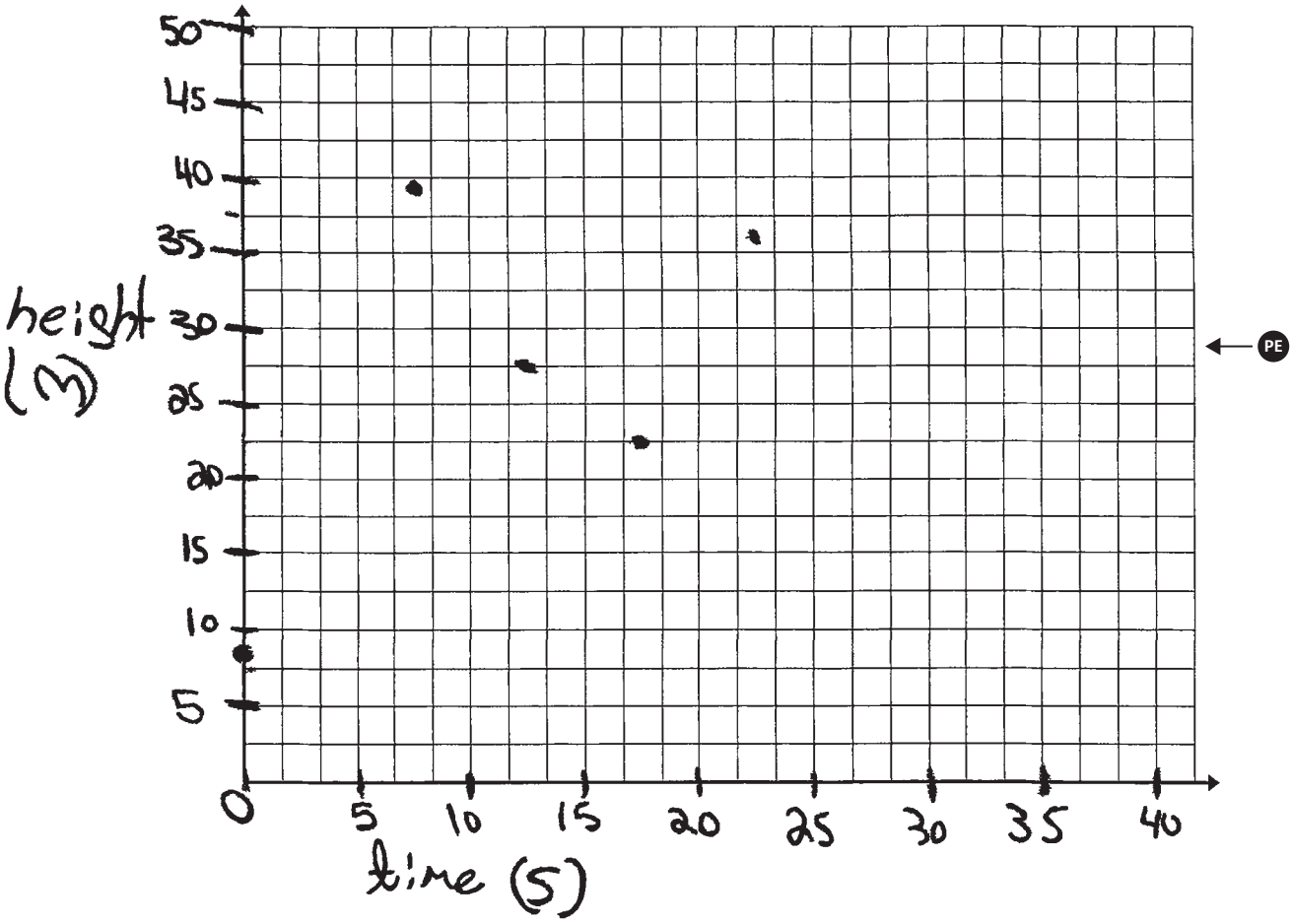
Question 6 — Total: 4 marks

For a science fair project, Jaelyn flies a model helicopter and records the following data.

Time (s)	0	7	13	18	22
Height (m)	8	38	27	22	36

a) Create a clearly labelled graph by plotting the given data. Draw a curve of best fit.

(*2 marks*)



b) State the cubic regression equation that models this situation.

(*1 mark*)

$Y = 0.03x^3 - 1.06x^2 + 10.24x + 8.02$

c) Determine the time when the model helicopter was at a height of 18 m, using the regression equation.

(*1 mark*)

$y = 18$

$x = 1.1\ s$

E6

Mark(s): 3.5/4

1. 0.5 mark for using an appropriate domain for the context of the question in (a)
2. 0.5 mark for using an appropriate range for the context of the question in (a)
3. 1 mark for plotting the data and appropriate shape of the cubic curve in (a)
- PE 0.5 mark deduction for procedural error in (a)
4. 1 mark for consistent cubic equation in (b)
5. 0.5 mark for appropriate work in (c)
6. 0.5 mark for consistent answer in (c)
- E6 does not express the answer to the appropriate number of decimal places in (c)

Exemplar 2

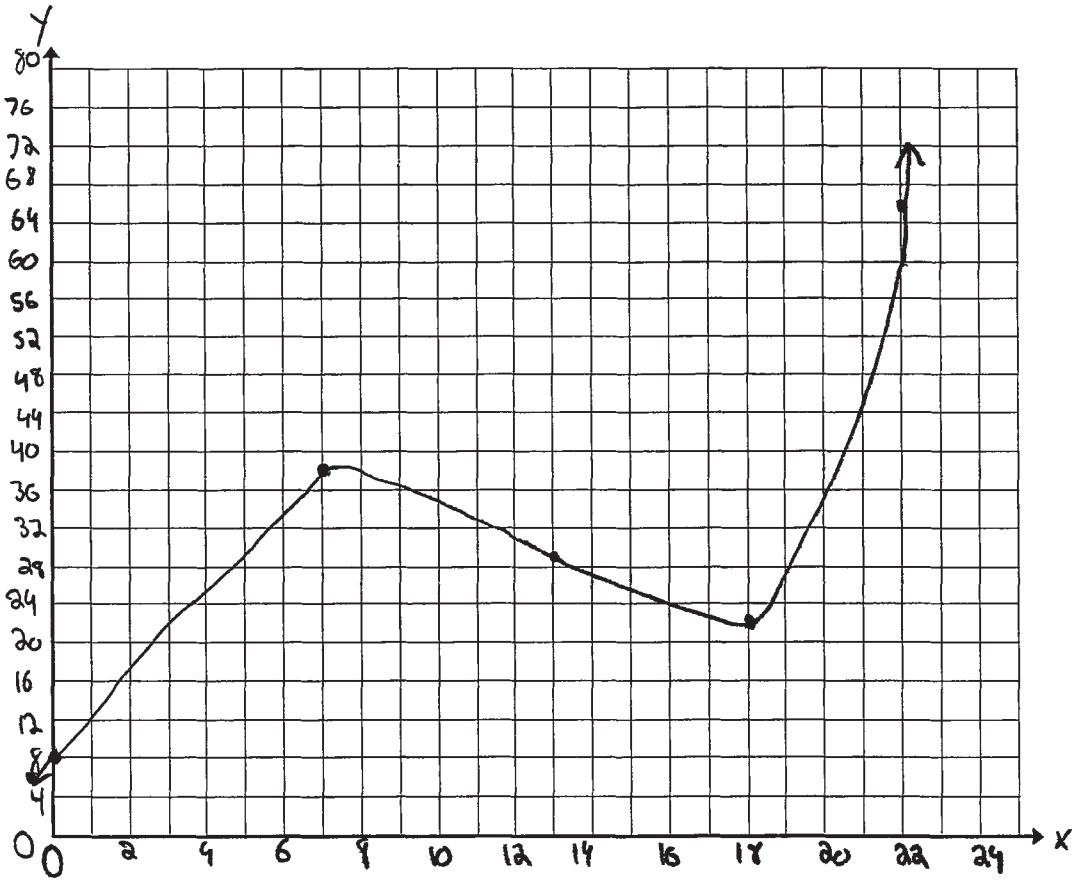
Question 6 — Total: 4 marks

For a science fair project, Jaelyn flies a model helicopter and records the following data.

Time (s)	0	7	13	18	22
Height (m)	8	38	27	22	36

a) Create a clearly labelled graph by plotting the given data. Draw a curve of best fit.

(*2 marks*)



b) State the cubic regression equation that models this situation.

(*1 mark*)

$y = 0.0487699x^3 - 1.54959x^2 + 13.09732x + 7.61145$

c) Determine the time when the model helicopter was at a height of 18 m, using the regression equation.

(*1 mark*)

25.53s

Mark(s): 1/4

4 1 mark for consistent cubic equation in (b)

Exemplar 3

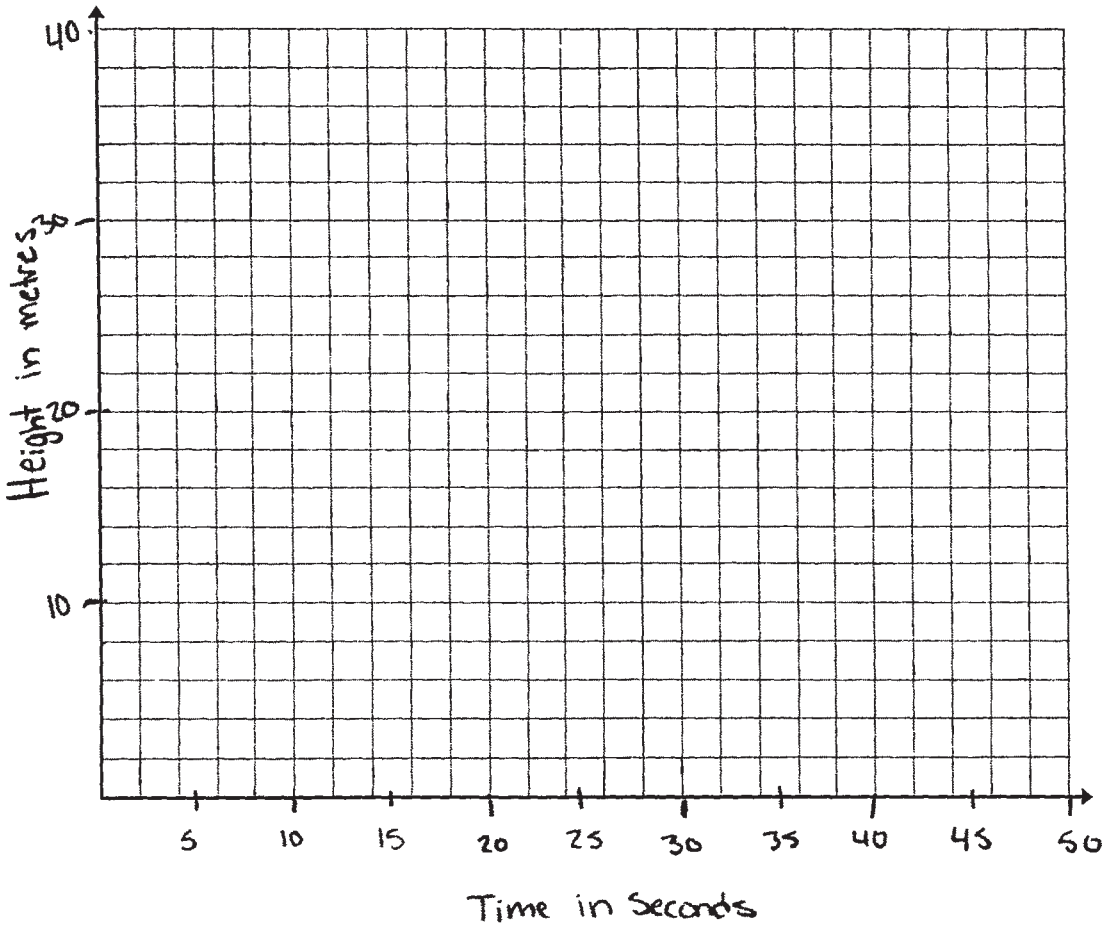
Question 6 — Total: 4 marks

For a science fair project, Jaelyn flies a model helicopter and records the following data.

Time (s)	0	7	13	18	22
Height (m)	8	38	27	22	36

a) Create a clearly labelled graph by plotting the given data. Draw a curve of best fit.

(*2 marks*)



b) State the cubic regression equation that models this situation.

(*1 mark*)

$y = 0.029644x^3 - 1.05956x^2 + 10.23671x + 8.0508$

PE

c) Determine the time when the model helicopter was at a height of 18 m, using the regression equation.

(*1 mark*)

E6

1.1 seconds was the time When the model helicopter was at 18m

Mark(s): 1/4

4 1 mark for consistent cubic equation in (b)

PE 0.5 mark deduction for procedural error in (b)

6 0.5 mark for consistent answer in (c)

E6 does not express the answer to the appropriate number of decimal places in (c)

Exemplar 4

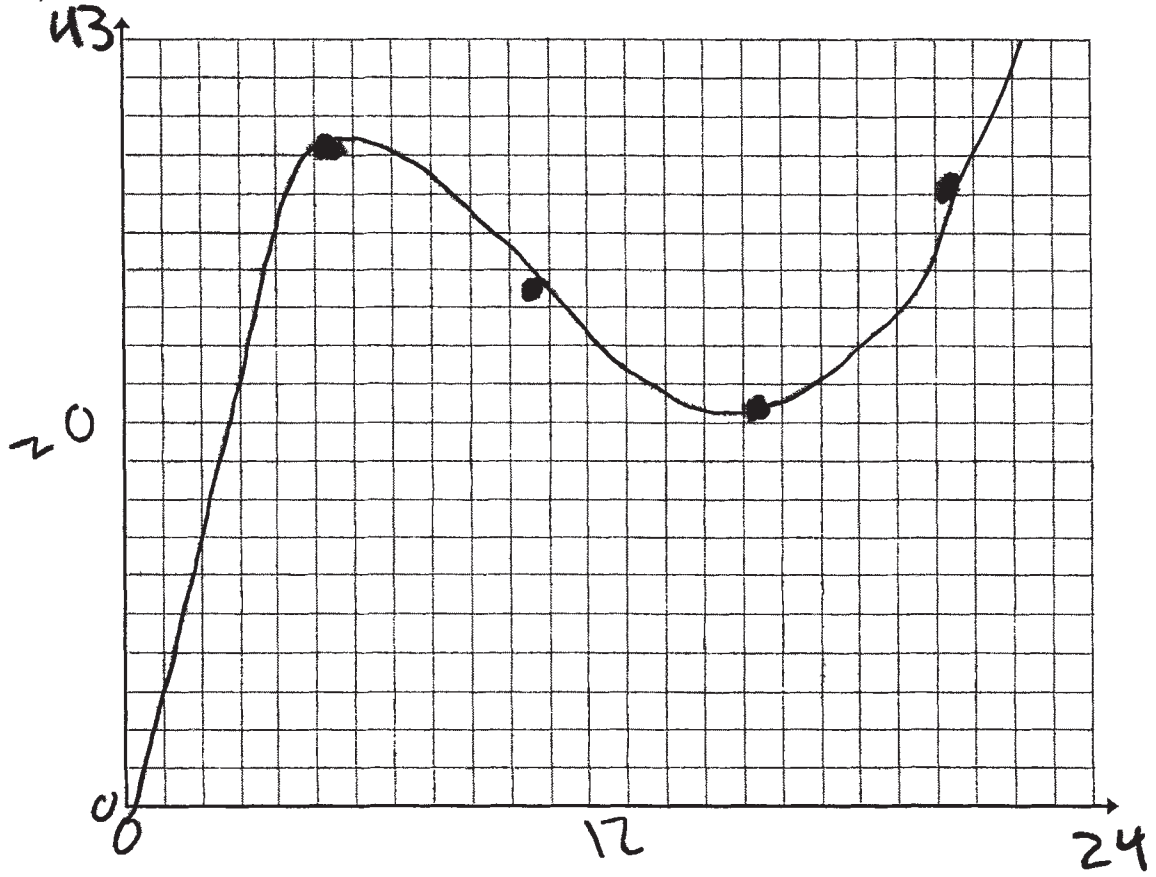
Question 6 — Total: 4 marks

For a science fair project, Jaelyn flies a model helicopter and records the following data.

Time (s)	0	7	13	18	22
Height (m)	8	38	27	22	36

a) Create a clearly labelled graph by plotting the given data. Draw a curve of best fit.

(*2 marks*)



b) State the cubic regression equation that models this situation.

(*1 mark*)

$1.03x^3 - 1.05x^2 + 10.24x + 8.02$

E2 E6

c) Determine the time when the model helicopter was at a height of 18 m, using the regression equation.

(*1 mark*)

$y_2 = 18$

$x = 1.095$

1.1 seconds

E6

Mark(s): 2/4

4 1 mark for consistent cubic equation in (b)

5 0.5 mark for appropriate work in (c)

6 0.5 mark for consistent answer in (c)

E2 does not include one of the following in the equation: "$y =$", "sin", "ln", or "x", or writes parameters separately from the equation in (b)

E6 rounds incorrectly in (b)

E6 does not express the answer to the appropriate number of decimal places in (c)

Exemplar 1

Question 8 **Total: 2 marks**

There are 4 green marbles, 3 red marbles, and 1 blue marble in a bag.

a) State the odds in favour of drawing a green marble from the bag.

(*1 mark*)

$\frac{4}{8}$

b) State the odds against drawing a blue marble from the bag.

(*1 mark*)

$\frac{7}{8}$

Mark(s): 1/2

❷ 1 mark for answer in (b)

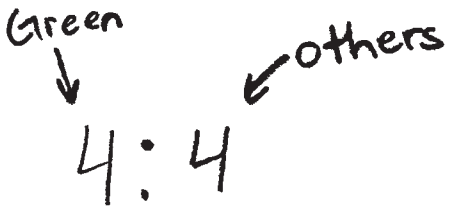
Exemplar 2

Question 8 **Total: 2 marks**

There are 4 green marbles, 3 red marbles, and 1 blue marble in a bag.

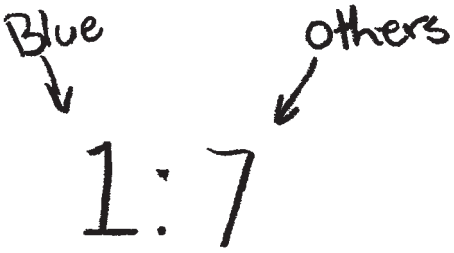
a) State the odds in favour of drawing a green marble from the bag.

(*1 mark*)



b) State the odds against drawing a blue marble from the bag.

(*1 mark*)



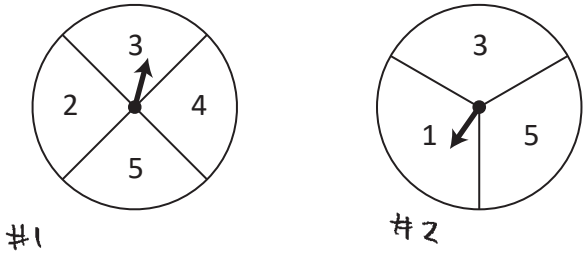
Mark(s): 1/2

1 1 mark for answer in (a)

Exemplar 1

Question 9 — Total: 3 marks

A student is playing a game using the two spinners shown below. The student spins each spinner once and adds the results.



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

(*2 marks*)

n(Co) = (2,1), (2,5), (2,3),
(3,3), (3,1), (3,5)
(4,3), (4,1), (4,5)
(5,3), (5,1), (5,5)

→ 12 possibilities in total

b) State the probability that the sum is 8.

(*1 mark*)

2/12

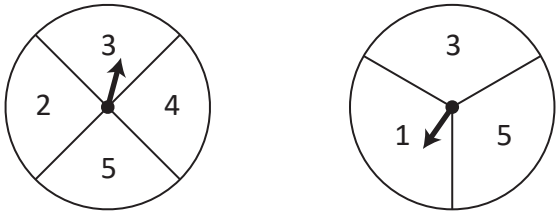
Mark(s): 2/3

1. 1 mark for appropriate graphic organizer in (a)
3. 1 mark for consistent answer in (b)

Exemplar 2

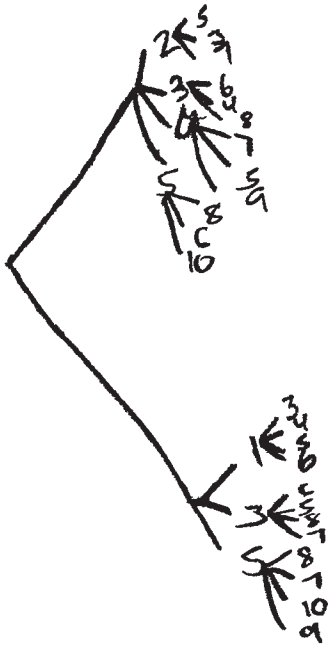
Question 9 — Total: 3 marks

A student is playing a game using the two spinners shown below. The student spins each spinner once and adds the results.



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

(*2 marks*)



There are 21 possible outcomes

b) State the probability that the sum is 8.

(*1 mark*)

Probability

$\frac{2}{21}$

(3, 5)

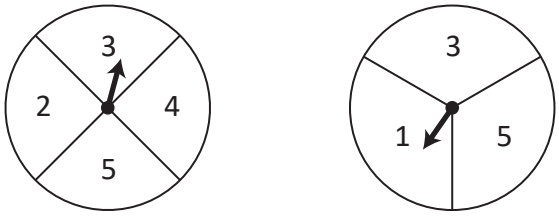
Mark(s): 1/3

❷ 1 mark for appropriate sums in (a)

Exemplar 3

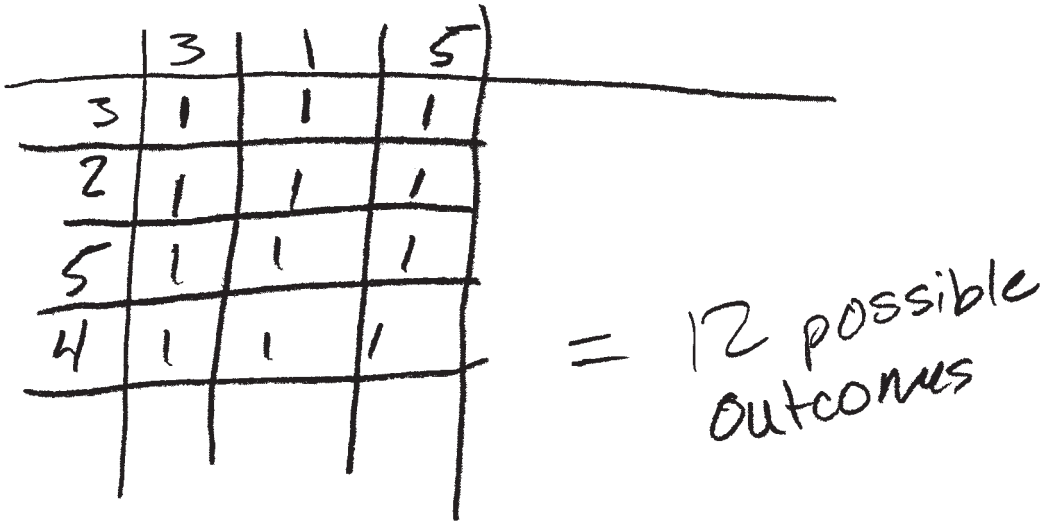
Question 9 — Total: 3 marks

A student is playing a game using the two spinners shown below. The student spins each spinner once and adds the results.



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

(*2 marks*)



b) State the probability that the sum is 8.

(*1 mark*)

16.67% chance

Mark(s): 2/3

1. 1 mark for appropriate graphic organizer in (a)
3. 1 mark for consistent answer in (b)

Exemplar 1

Question 10 — Total: 4.5 marks

In a group of 15 randomly selected students:

- 10 students are only signed up for the Applied math course
- 5 students are only signed up for the Essential math course

a) Determine the number of 6-person committees that can be made with exactly 2 Applied math students.

(*1.5 marks*)

$_{10}C_2 \times {}_5C_4 = 1120$

PE

b) Determine the number of 6-person committees that can be made with no more than 3 Essential math students.

(*3 marks*)

$_{15}C_6 = 5005$

$5005 - 1120 = \boxed{3885}$

Mark(s): 3/4.5

1. 0.5 mark for $_{10}C_2$ in (a)
2. 0.5 mark for $_5C_4$ in (a)
3. 0.5 mark for consistent product in (a)
- PE 0.5 mark deduction for procedural error in (a)
4. 1 mark for $_{15}C_6$ in (b) (Method A)
6. 0.5 mark for second consistent case in (b)
7. 0.5 mark for consistent difference in (b)

Exemplar 2

Question 10 **Total: 4.5 marks**

In a group of 15 randomly selected students:

- 10 students are only signed up for the Applied math course
- 5 students are only signed up for the Essential math course

a) Determine the number of 6-person committees that can be made with exactly 2 Applied math students.

(*1.5 marks*)

$_{10}P_2 \times {}_5P_4 = 10800$

b) Determine the number of 6-person committees that can be made with no more than 3 Essential math students.

(*3 marks*)

$_{15}P_6 = 3603600$

$_5P_4 \times {}_{10}P_2 = 10800$

$_5P_5 \times {}_{10}P_1 = 1200$

$3603600 - 10800 - 1200$

3591600

Mark(s): 3.5/4.5

3. 0.5 mark for consistent product in (a)
4. 1 mark for $_{15}C_6$ in (b) (Method A)
5. 1 mark for $_5C_5 \times {}_{10}C_1$ in (b)
6. 0.5 mark for second consistent case in (b)
7. 0.5 mark for consistent difference in (b)

Exemplar 3

Question 10 — Total: 4.5 marks

In a group of 15 randomly selected students:

- 10 students are only signed up for the Applied math course
- 5 students are only signed up for the Essential math course

a) Determine the number of 6-person committees that can be made with exactly 2 Applied math students.

(*1.5 marks*)

$_6C_2 = 15$

b) Determine the number of 6-person committees that can be made with no more than 3 Essential math students.

(*3 marks*)

$_6C_3 + {}_6C_2 + {}_6C_1 + {}_6C_0 =$

$20 + 15 + 6 + 1 = 42$

Mark(s): 2/4.5

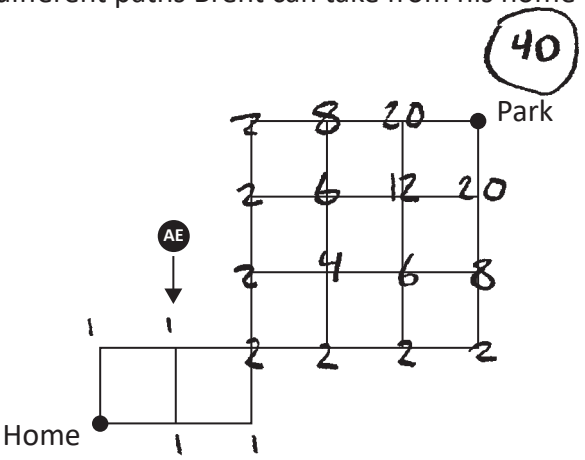
5. 0.5 mark for second consistent case in (b) (Method B)
6. 0.5 mark for third consistent case in (b)
7. 0.5 mark for fourth consistent case in (b)
8. 0.5 mark for consistent sum in (b)

Exemplar 1

Question 11 — Total: 2 marks

Brent is walking to the park to meet some friends.

Determine the number of different paths Brent can take from his home to the park if he can only travel North and East.



Brent can take 40 different paths.

Mark(s): 1.5/2

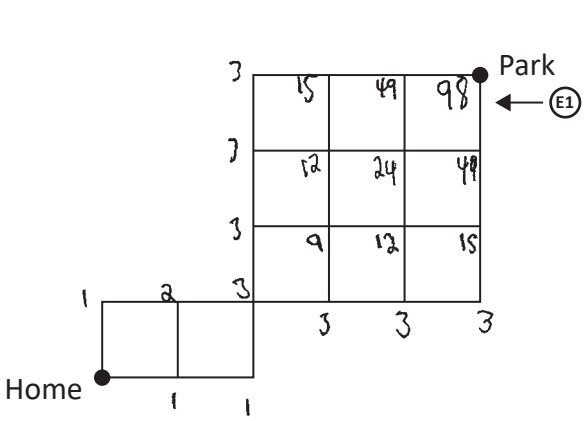
- 1 1 mark for appropriate work
- 2 1 mark for consistent answer
- AE 0.5 mark deduction for arithmetic error

Exemplar 2

Question 11 — Total: 2 marks

Brent is walking to the park to meet some friends.

Determine the number of different paths Brent can take from his home to the park if he can only travel North and East.



Mark(s): 1/2

2 1 mark for consistent answer

E1 does not identify the answer

Exemplar 1

Question 12 **Total: 3 marks**

Using the digits 2, 3, 5, 6, 7:

a) State how many different 3-digit numbers can be made if repetition is allowed.

(*1 mark*)

2,3,5,6,7 / 5 _ / 5 _ / 5 = 125 codes can be made

b) Determine how many different 3-digit numbers are greater than 650 if repetition is allowed.

(*1.5 marks*)

6,7 / 2 5,6,7 / 3 2,3,5,6,7 / 5 = 30 different numbers.

c) State the probability that a 3-digit number will be greater than 650 if repetition is allowed.

(*0.5 mark*)

Odds in Favour

30 : 95

= 125

Mark(s): 1.5/3

1. 1 mark for answer in (a)
2. 0.5 mark for a first case in (b)

Exemplar 2

Question 12 **Total: 3 marks**

Using the digits 2, 3, 5, 6, 7:

a) State how many different 3-digit numbers can be made if repetition is allowed.

(*1 mark*)

$5 \cdot 5 \cdot 5 = 5^3$

there is 125 possible 3 digit numbers

b) Determine how many different 3-digit numbers are greater than 650 if repetition is allowed.

(*1.5 marks*)

$2 \cdot 3 \cdot 5 = 30$ there is 30 possible 3 digit numbers over 650

c) State the probability that a 3-digit number will be greater than 650 if repetition is allowed.

(*0.5 mark*)

$\frac{30}{125} \div 5 = \frac{6}{25}$

$\frac{6}{25}$ 0.24 24%

Mark(s): 2/3

1. 1 mark for answer in (a)
2. 0.5 mark for a first case in (b)
5. 0.5 mark for consistent probability in (c)

Exemplar 3

Question 12 **Total: 3 marks**

Using the digits 2, 3, 5, 6, 7:

a) State how many different 3-digit numbers can be made if repetition is allowed.

(*1 mark*)

$5 \cdot 5 \cdot 5 = 125$

b) Determine how many different 3-digit numbers are greater than 650 if repetition is allowed.

(*1.5 marks*)

case 1 $1 \cdot 5 \cdot 5 = 25$

case 2 $1 \cdot 2 \cdot 5 = 10$

35 different

c) State the probability that a 3-digit number will be greater than 650 if repetition is allowed.

(*0.5 mark*)

$35 : 125$

Mark(s): 2.5/3

1. 1 mark for answer in (a)
2. 0.5 mark for a first case in (b)
4. 0.5 mark for consistent sum in (b)
5. 0.5 mark for consistent probability in (c)

Exemplar 1

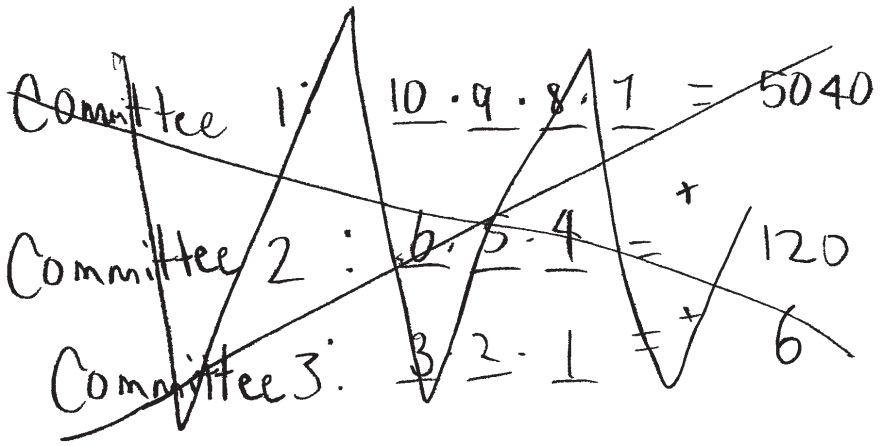
Question 13 **Total: 2 marks**

There are 10 people in an office. They are split into three committees.

- One committee has 4 people.
- Two committees have 3 people each.
- A person can only be on one committee.

Cases?

Determine the total number of ways these three committees can be formed.



Committee1: $_{10}C_4 = 210$

Committe 2: $_6C_3 = 20$ +

Committee 3: $_3C_3 = 1$ +

= 231 ways

Mark(s): 1.5/2

1. 0.5 mark for $_{10}C_4$ or $_{10}C_3$
2. 0.5 mark for committee 2
3. 0.5 mark for committee 3

Exemplar 2

Question 13 — Total: 2 marks

There are 10 people in an office. They are split into three committees.

- One committee has 4 people.
- Two committees have 3 people each.
- A person can only be on one committee.

Determine the total number of ways these three committees can be formed.

$\binom{10}{4}\binom{6}{3}\binom{3}{3}$

$210 \cdot 20 \cdot 1 = 4200$

Mark(s): 2/2

1. 0.5 mark for ${}_{10}C_4$ or ${}_{10}C_3$
2. 0.5 mark for committee 2
3. 0.5 mark for committee 3
4. 0.5 mark for consistent product of combinations

Exemplar 3

Question 13 — Total: 2 marks

There are 10 people in an office. They are split into three committees.

- One committee has 4 people.
- Two committees have 3 people each.
- A person can only be on one committee.

Determine the total number of ways these three committees can be formed.

$_{10}C_4 + {}_{10}C_3 + {}_{10}C_3 =$ 450 ways

Mark(s): 0.5/2

1. 0.5 mark for $_{10}C_4$ or $_{10}C_3$

Exemplar 1

Question 15 **Total: 1.5 marks**

Blaire's parents invest $10 000.00 when Blaire is born to use towards college. The investment has an annual interest rate of 8.00%.

Using the rule of 72, determine approximately how much money Blaire will have when they are 18 years old.

Rule of 72

$\frac{72}{\text{interest rate}} = \text{time to double (years)}$

$\frac{72}{0.08} = 900$

∴ Blair will have $900 when they are 18 years old.

Mark(s): 0/1.5

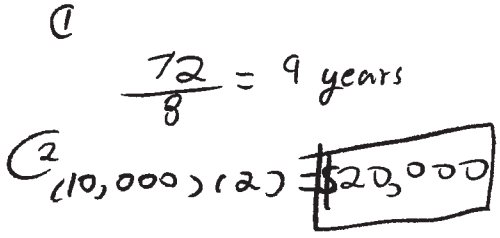
→ no criteria met

Exemplar 2

Question 15 **Total: 1.5 marks**

Blaire's parents invest $10 000.00 when Blaire is born to use towards college. The investment has an annual interest rate of 8.00%.

Using the rule of 72, determine approximately how much money Blaire will have when they are 18 years old.



Mark(s): 1/1.5

1. 0.5 mark for correct years to double the investment
2. 0.5 mark for doubling value

Exemplar 3

Question 15 $10 000 **Total: 1.5 marks**

Blaire's parents invest $10 000.00 when Blaire is born to use towards college. The investment has an annual interest rate of 8.00%.

Using the rule of 72, determine approximately how much money Blaire will have when they are 18 years old.

$$t = \frac{72}{r} \rightarrow t = \frac{72}{8} \Rightarrow 9$$

N = 18

I = 8.00

PV = 10 000.00

PMT = 0

FV = ?

P/y = 1

C/y = 1

FV = −39 960.19

↓

Blaire will have approximately $39 960.19 at 18 years old.

Mark(s): 0.5/1.5

1. 0.5 mark for correct years to double the investment

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Exemplar 1

Question 16 **Total: 5.5 marks**

Cody will retire in 40 years. He starts to build a financial portfolio. The portfolio consists of the following investments:

Investment 1: He invests $12 000.00 in a bond earning simple interest at an annual interest rate of 6.00%.

Investment 2: He makes regular monthly deposits of $500.00 in a tax-free savings account (TFSA) with an annual interest rate of 3.45% compounded monthly.

a) Determine the value of Investment 1 when Cody retires.

(*1 mark*)

$12000 \times 0.6 = 7200$

$A = 12000 + 7200 =$ $19200 when he retires

b) Determine the value of Investment 2 when Cody retires.

(*2 marks*)

$P = \$0$

$R = 3.45$

$N = 12$

$T = 40$

$A = 516006.83$

he will have

Saves up $516006.83 after 40 years

c) Determine the total amount Cody invested into his portfolio when he retires.

(*1 mark*)

19200 + 516006 = # 535206

d) State the value of Cody's portfolio when he retires.

(*0.5 mark*)

516006.83 − 240 000 = #276006.83

e) Determine the average rate of return on Cody's portfolio when he retires.

(*1 mark*)

$$\frac{276006.83 - 535206}{535206} = -0.4843$$

E1

Mark(s): 2.5/5.5

- ❷ 0.5 mark for consistent value of investment in (a)
- ❸ 0.5 mark for appropriate work in (b) (deducted 1 mark for two incorrect inputs)
- ❹ 0.5 mark for consistent answer for the correct output in (b)
- ❽ 0.5 mark for appropriate work in (e)
- ❾ 0.5 mark for consistent rate of return in (e)
- Ⓔ1 incorrectly states the final answer in (e)

Exemplar 2

Question 16 **Total: 5.5 marks**

Cody will retire in 40 years. He starts to build a financial portfolio. The portfolio consists of the following investments:

Investment 1: He invests $12 000.00 in a bond earning simple interest at an annual interest rate of 6.00%.

Investment 2: He makes regular monthly deposits of $500.00 in a tax-free savings account (TFSA) with an annual interest rate of 3.45% compounded monthly.

a) Determine the value of Investment 1 when Cody retires.

(*1 mark*)

$I = Prt$

$I = 12000\ (.06)(40) = \boxed{\$28\,800}$

$28\,800 + 12\,000 = 40\,800$

b) Determine the value of Investment 2 when Cody retires.

(*2 marks*)

P.V. = 0

F.V. = ?

M.D. = 500

Ir = 3.45 %

T = 40

$\boxed{F.V. = \$516006.83}$

c) Determine the total amount Cody invested into his portfolio when he retires.

(*1 mark*)

Cody invested $252000 into his portfolio.

d) State the value of Cody's portfolio when he retires.

(*0.5 mark*)

$40800 + 516006.83 = \boxed{\$556806.83}$

e) Determine the average rate of return on Cody's portfolio when he retires.

(*1 mark*)

$$\frac{556806.83 - 252000}{252000} = 1.20055$$

$$= \boxed{1.20\%}$$

PE

Mark(s): 3.5/5.5

1. 0.5 mark for interest in (a)
3. 1 mark for appropriate work in (b) (deducted 0.5 mark for one incorrect input)
4. 0.5 mark for consistent answer for the correct output in (b)
6. 0.5 mark for consistent sum of principal paid in (c)
7. 0.5 mark for consistent value of portfolio in (d)
8. 0.5 mark for appropriate work in (e)
9. 0.5 mark for consistent rate of return in (e)

PE 0.5 mark deduction for procedural error in (e)

Exemplar 1

Question 17 **Total: 4 marks**

Kultaj is hoping to buy a house valued at $340 000.00. She has saved $50 000.00 to use on a down payment. The bank offers a 25-year mortgage at an annual interest rate of 5.25% compounded semi-annually.

a) Determine Kultaj's monthly mortgage payment.

(*2 marks*)

N: 12 · 25 = 300
I/Y: 5.25
PV: 340 000 − 50 000 = $290 000
PMT: ? → $-1 728.16
FV: Ø
P/Y: 12
C/Y: 2

r7 ÷ 365 = 246.57

b) Kultaj has a gross annual income of $90 000.00. The monthly property taxes for the house would be $390.00 and the monthly heating cost would be approximately $240.00. Determine the gross debt service ratio (GDSR).

(*1 mark*)

$$GDSR = \frac{\$1\,728.16 + \$390.00 + \$240.00}{\$246.57} = 9.56\% \leftarrow \text{PE}$$

c) Explain if the bank would lend her money based on the GDSR.

(*1 mark*)

Yes, the bank would lend her money based on her GDSR because her GDSR is less than 32%

Mark(s): 3/4

1. 1.5 marks for appropriate work in (a)
2. 0.5 mark for consistent answer for the correct output in (a)
4. 0.5 mark for consistent GDSR in (b)
PE. 0.5 mark deduction for procedural error in (b)
5. 1 mark for appropriate explanation with reference to 32% in (c)

Exemplar 2

Question 17 **Total: 4 marks**

Kultaj is hoping to buy a house valued at $340 000.00. She has saved $50 000.00 to use on a down payment. The bank offers a 25-year mortgage at an annual interest rate of 5.25% compounded semi-annually.

a) Determine Kultaj's monthly mortgage payment.

(*2 marks*)

340000
-50000
=290000 needs to pay

Kultaj would have to pay 1738.80$ monthly.

b) Kultaj has a gross annual income of $90 000.00. The monthly property taxes for the house would be $390.00 and the monthly heating cost would be approximately $240.00. Determine the gross debt service ratio (GDSR).

(*1 mark*)

$$GDSR = \frac{mmp + mpt + mhc}{\text{Gross income}} \times 100$$

$$GDSR = \frac{1738.80 + 390 + 240}{90000} \times 100$$

$$GDSR = 2.63\%$$

c) Explain if the bank would lend her money based on the GDSR.

(*1 mark*)

the bank would lend her money because the GDSR is lower than 32 %

Mark(s): 1.5/4

- 4 0.5 mark for consistent GDSR in (b)
- 5 1 mark for appropriate explanation with reference to 32% in (c)

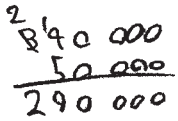
Exemplar 3

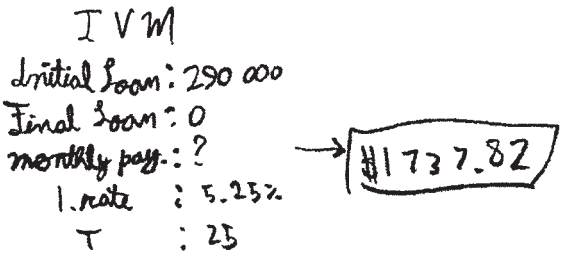
Question 17 — Total: 4 marks

Kultaj is hoping to buy a house valued at $340 000.00. She has saved $50 000.00 to use on a down payment. The bank offers a 25-year mortgage at an annual interest rate of 5.25% compounded semi-annually.

a) Determine Kultaj's monthly mortgage payment.

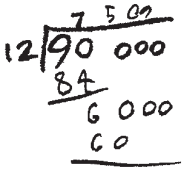
(*2 marks*)





b) Kultaj has a gross annual income of $90 000.00. The monthly property taxes for the house would be $390.00 and the monthly heating cost would be approximately $240.00. Determine the gross debt service ratio (GDSR).

(*1 mark*)



$$\frac{(1737.82 + 390 + 240)}{7500} = .3157 \times 100 = 31.57$$

E1

c) Explain if the bank would lend her money based on the GDSR.

(*1 mark*)

Because the GDSR is below 32%, the Bank would lend her money.

Mark(s): 3/4

- 1 mark for appropriate work in (a) (deducted 0.5 mark for one incorrect input)
- 0.5 mark for gross monthly income in (b)
- 0.5 mark for consistent GDSR in (b)
- 1 mark for appropriate explanation with reference to 32% in (c)
- E1 does not include a percent sign in (b)

Exemplar 1

Question 18 — Total: 4 marks

Janelle wants to buy a new laptop for $1275.00, taxes included.

- The store is offering a 0% interest rate promotion with no payments for 6 months.
- If the full amount is not paid within 6 months, interest will be charged from the date of purchase at an annual interest rate of 21.99% compounded monthly.

a) Janelle makes no payments during the first 6 months and is now charged interest. Determine the total amount Janelle will owe 6 months after the date of purchase.

(*2 marks*)

$P = \$1275$
$t = 6$ months
$r = 21.99\%$
$n = 12$

$A = P(1 + \frac{r}{n})^{nt}$
$= 1275(1 + \frac{0.2199}{12})^{(12)(6)}$
$= 1275(1 + \frac{0.2199}{12})^{72}$
$A = \$4,713.37$

Janelle will owe $4,713.37 after 6 months.

b) After 6 months, Janelle starts making monthly payments of $200.00 at an annual interest rate of 21.99% compounded monthly. Determine how many months Janelle will take to pay off the loan.

(*2 marks*)

Transaction : Investment
Payment : 12 (Monthly)
Compound : 12 (Monthly)
Present Value : 1,275
future Value : 4,713.37
Monthly Deposit: 200
Interest Rate : 21.99%
Years : 1.14

It will take 12 months and a half for Janelle to pay off the loan. ← AE

Mark(s): 1.5/4

1. 1 mark for appropriate work in (a) (deducted 0.5 mark for one incorrect input)
2. 0.5 mark for consistent answer for the correct output in (a)
4. 0.5 mark for consistent answer for the correct output in (b)

AE 0.5 mark deduction for arithmetic error in (b)

Exemplar 2

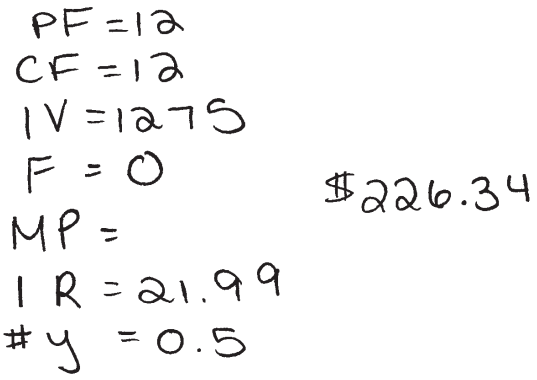
Question 18 **Total: 4 marks**

Janelle wants to buy a new laptop for $1275.00, taxes included.

- The store is offering a 0% interest rate promotion with no payments for 6 months.
- If the full amount is not paid within 6 months, interest will be charged from the date of purchase at an annual interest rate of 21.99% compounded monthly.

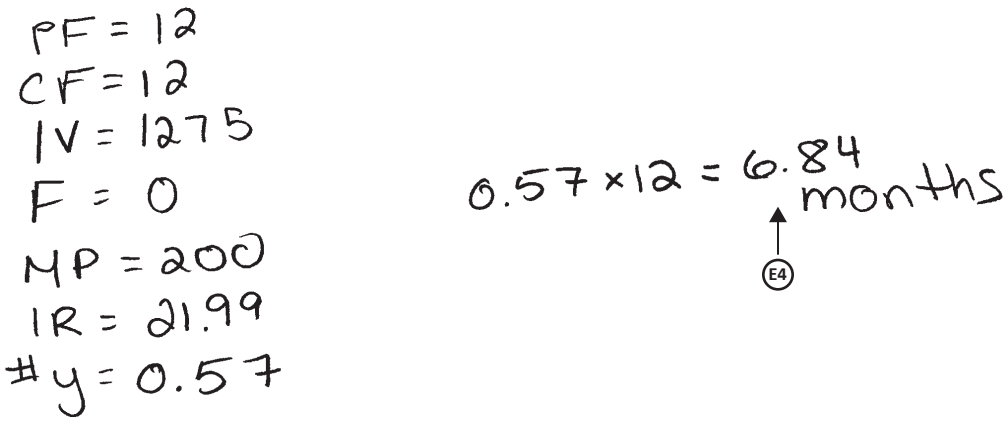
a) Janelle makes no payments during the first 6 months and is now charged interest. Determine the total amount Janelle will owe 6 months after the date of purchase.

(*2 marks*)



b) After 6 months, Janelle starts making monthly payments of $200.00 at an annual interest rate of 21.99% compounded monthly. Determine how many months Janelle will take to pay off the loan.

(*2 marks*)



Mark(s): 2.5/4

1 1 mark for appropriate work in (a) (deducted 0.5 mark for one incorrect input)

3 1 mark for appropriate work in (b) (deducted 0.5 mark for one incorrect input)

4 0.5 mark for consistent answer for the correct output in (b)

E4 does not use whole units in contextual questions involving discrete data in (b)

Exemplar 3

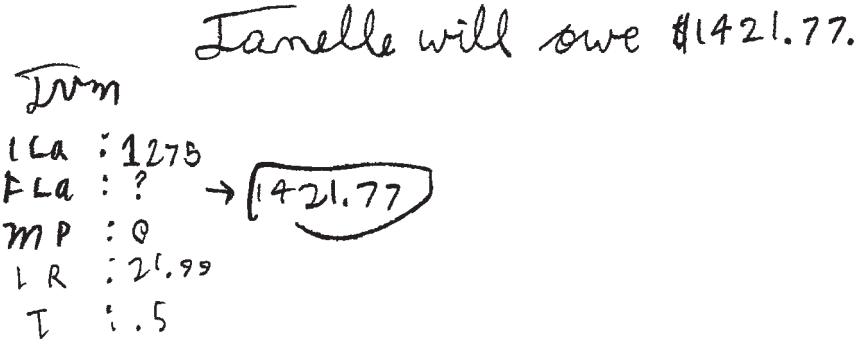
Question 18 — Total: 4 marks

Janelle wants to buy a new laptop for $1275.00, taxes included.

- The store is offering a 0% interest rate promotion with no payments for 6 months.
- If the full amount is not paid within 6 months, interest will be charged from the date of purchase at an annual interest rate of 21.99% compounded monthly.

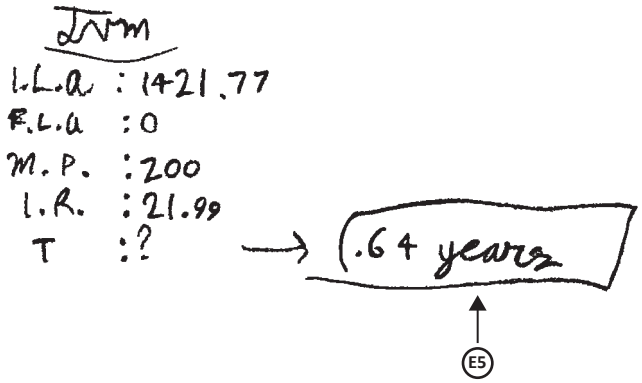
a) Janelle makes no payments during the first 6 months and is now charged interest. Determine the total amount Janelle will owe 6 months after the date of purchase.

(*2 marks*)



b) After 6 months, Janelle starts making monthly payments of $200.00 at an annual interest rate of 21.99% compounded monthly. Determine how many months Janelle will take to pay off the loan.

(*2 marks*)



Mark(s): 3.5/4

1. 1 mark for appropriate work in (a) (deducted 0.5 mark for one incorrect input)
2. 0.5 mark for consistent answer for the correct output in (a)
3. 1.5 marks for appropriate work in (b)
4. 0.5 mark for consistent answer for the correct output in (b)

E5 uses incorrect units of measure in (b)

Exemplar 4

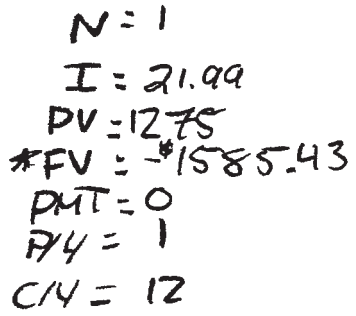
Question 18 **Total: 4 marks**

Janelle wants to buy a new laptop for $1275.00, taxes included.

- The store is offering a 0% interest rate promotion with no payments for 6 months.
- If the full amount is not paid within 6 months, interest will be charged from the date of purchase at an annual interest rate of 21.99% compounded monthly.

a) Janelle makes no payments during the first 6 months and is now charged interest. Determine the total amount Janelle will owe 6 months after the date of purchase.

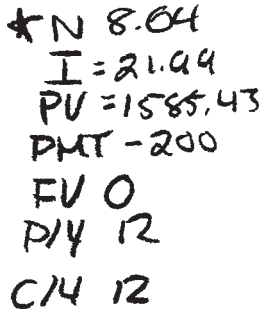
(*2 marks*)



Janelle will owe $1585.43 at the end of 6 month period

b) After 6 months, Janelle starts making monthly payments of $200.00 at an annual interest rate of 21.99% compounded monthly. Determine how many months Janelle will take to pay off the loan.

(*2 marks*)



$\frac{8.64}{12} = 0.72$ years or 8.64 months

9 months

Mark(s): 3.5/4

1. 1 mark for appropriate work in (a) (deducted 0.5 mark for one incorrect input)
2. 0.5 mark for consistent answer for the correct output in (a)
3. 1.5 marks for appropriate work in (b)
4. 0.5 mark for consistent answer for the correct output in (b)

Exemplar 1

Question 19 — Total: 2 marks

Explain one advantage and one disadvantage of leasing a new vehicle compared to purchasing the same vehicle.

Advantage:

Cheap

Disadvantage:

You don't own it

Mark(s): 1/2

2 1 mark for appropriate disadvantage

Exemplar 2

Question 19 — Total: 2 marks

Explain one advantage and one disadvantage of leasing a new vehicle compared to purchasing the same vehicle.

Advantage:

- Cheaper
- No need to pay for repairs

Disadvantage:

- Isn't yours
- Have to return it after x amount of time

Mark(s): 1/2

❷ 1 mark for appropriate disadvantage

Exemplar 3

Question 19 **Total: 2 marks**

Explain one advantage and one disadvantage of leasing a new vehicle compared to purchasing the same vehicle.

Advantage:

One advantage of leasing a vehicle is that if you don't like the vehicle, you can exchange it for one that isn't as old.

Disadvantage:

One disadvantage of leasing a vehicle is that you will probably pay more in interest.

Mark(s): 0.5/2

1 1 mark for appropriate advantage

LC 0.5 mark deduction for lack of clarity

Exemplar 4

Question 19 **Total: 2 marks**

Explain one advantage and one disadvantage of leasing a new vehicle compared to purchasing the same vehicle.

Advantage:

One advantage is that you get to get a new car after a certain amount of years

Disadvantage:

One disadvantage is that you can't damage the car because You don't actually own it

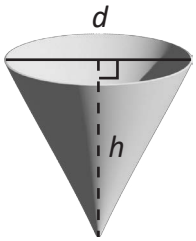
Mark(s): 1/2

1 1 mark for appropriate advantage

Exemplar 1

Question 21 — Total: 3 marks

Michelle has an ice cream cone.



- The diameter is 7 cm wide. $r = 3.5\text{cm}$
- The height is 12 cm high.

a) Calculate the surface area of the outside of the cone.

(*2 marks*)

$SA = \pi r^2 + \pi rs$ (0)

$= \pi rs$

$= \pi(3.5)(12)$

$= 131.9469$

$= 131.95\ \text{cm}^2$

b) State the cost of coating 30% of the outside of the cone with chocolate if the chocolate costs \$0.04 per cm^2.

(*1 mark*)

$= 1.5834$ (E5) (E6)

Mark(s): 2/3

2 0.5 mark for appropriate work calculating surface area in (a)

3 0.5 mark for consistent surface area in (a)

4 1 mark for consistent cost in (b)

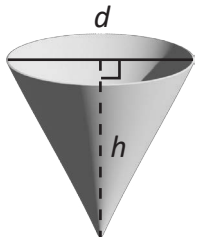
E5 does not include the dollar sign for monetary values in (b)

E6 does not express the answer to the appropriate number of decimal places, including monetary values to two decimal places in (b)

Exemplar 2

Question 21 — Total: 3 marks

Michelle has an ice cream cone.



- The diameter is 7 cm wide.
- The height is 12 cm high.

a) Calculate the surface area of the outside of the cone.

(*2 marks*)

$12^2 + 3.5^2 = \sqrt{156.25} = 12.5$

$\pi 3.5^2 + \pi \cdot 3.5 \cdot 12.5 = 175.93 \text{ cm}^2$

b) State the cost of coating 30% of the outside of the cone with chocolate if the chocolate costs \$0.04 per cm^2.

(*1 mark*)

$\frac{175.93}{30} \times 0.04 = 0.234\ldots$

\$0.23

Mark(s): 1.5/3

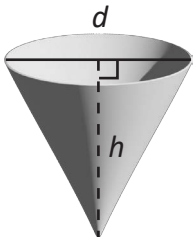
1 mark for slant height in (a)

0.5 mark for consistent surface area in (a)

Exemplar 3

Question 21 — Total: 3 marks

Michelle has an ice cream cone.



3.5r

- The diameter is 7 cm wide.
- The height is 12 cm high.

a) Calculate the surface area of the outside of the cone.

(*2 marks*)

$5^2 = 12^2 + 3.5^2$

πrs

$s = 12.5$

137.44 cm^2

b) State the cost of coating 30% of the outside of the cone with chocolate if the chocolate costs \$0.04 per cm^2.

(*1 mark*)

$137 \times \frac{30}{100} \times 0.04$

E6

\$1.64

Mark(s): 3/3

1. 1 mark for slant height in (a)
2. 0.5 mark for appropriate work calculating surface area in (a)
3. 0.5 mark for consistent surface area in (a)
4. 1 mark for consistent cost in (b)

E6 rounds too soon in (b)

Exemplar 1

Question 22 — Total: 1.5 marks

Corinne incorrectly calculated the surface area of a cylinder.

a) Indicate her mistake.

(*0.5 mark*)

$$\text{Surface area} = 2\pi\left(3.06\right) + 2\pi\left(3.06\right)\left(9\right)$$

$$= 19.2265\ldots + 173.0389\ldots$$

$$= 192.27\ cm^2$$

(1)

$2\pi(3.06)^2 + 2\pi(3.06)(9)$

$= 231.97 cm^2$

She forgot the square unit.

TE

b) State the correct surface area.

(*1 mark*)

$2\pi(3.06)^2 + 2\pi(3.06)(9)$

$= 231.97 cm^2$

AE

Surface Area of a cylinder is $2\pi r^2 + 2\pi rh$

Mark(s): 0.5/1.5

- 1 — 0.5 mark for identifying the mistake in the formula in (a)
- TE — 0.5 mark deduction for terminology error in (a)
- 2 — 1 mark for consistent answer in (b)
- AE — 0.5 mark deduction for arithmetic error in (b)

Exemplar 2

Question 22 — Total: 1.5 marks

Corinne incorrectly calculated the surface area of a cylinder.

a) Indicate her mistake.

(*0.5 mark*)

$$\text{Surface area} = 2\pi\left(3.06\right)^{2} + 2\pi\left(3.06\right)\left(9\right)$$

$$= 19.2265\ldots + 173.0389\ldots$$

$$= 192.27\ \text{cm}^2$$

Corinne forget to include the exponent 2.

b) State the correct surface area.

(*1 mark*)

$$SA = 2\pi(3.06)^2 + 2\pi(3.06)(9)$$

$$= 38.83 + 173.04$$

$$= 231.87\ \text{cm}^2$$

Mark(s): 1.5/1.5

1. 0.5 mark for identifying the mistake in the formula in (a)
2. 1 mark for consistent answer in (b)

Exemplar 3

Question 22 — Total: 1.5 marks

Corinne incorrectly calculated the surface area of a cylinder.

a) Indicate her mistake.

(*0.5 mark*)

$$\text{Surface area} = 2\pi(3.06) + 2\pi(3.06)(9)$$
$$= 19.2265\ldots + 173.0389\ldots$$
$$= 192.27\ \text{cm}^2$$

forgot to square r

b) State the correct surface area.

(*1 mark*)

$231.87\ \text{cm}^2$

Mark(s): 1/1.5

❷ 1 mark for consistent answer in (b)

Exemplar 4

Question 22 — Total: 1.5 marks

Corinne incorrectly calculated the surface area of a cylinder.

a) Indicate her mistake.

(*0.5 mark*)

$$\text{Surface area} = 2\pi\left(3.06\right)^{2} + 2\pi\left(3.06\right)\left(9\right)$$

$$= 19.2265\ldots + 173.0389\ldots$$

$$= 192.27\ \text{cm}^2$$

b) State the correct surface area.

(*1 mark*)

$= 2\pi r^2 + 2\pi r h$

$= 2\pi(3.06)^2 + 2\pi(3.06)(9)$

$= 173.038\ \text{cm}^2$

AE

Mark(s): 1/1.5

1. 0.5 mark for identifying the mistake in the formula in (a)
2. 1 mark for consistent answer in (b)
AE. 0.5 mark deduction for arithmetic error in (b)

Exemplar 1

Question 23 **Total: 5 marks**

Corbin wants to build a rectangular outdoor curling rink.

His backyard allows him to build a rink with a length from 48 ft. to 60 ft., and a width from 10 ft. to 20 ft.

a) State a possible set of dimensions for his rink.

(*0.5 mark*)

60 ft. by 20 ft.

b) His rink has a perimeter made of wood, one board high. A 12 ft. board costs $51.20, taxes included. Calculate the total cost of wood needed, using the dimensions you stated in (a).

(*1.5 marks*)

15 boards
2 boards = 7 board

7 x $1.20

$358.40

c) Corbin needs to fill the rectangular rink with water in order to make ice. He wants a depth of 8 in. Determine the volume of water he needs.

(*1 mark*)

$V = lwh$

$V = 60(20)(0.66)$

$V = 792 ft^3$ E6

$792 ft^3$ of wate

d) Water costs \$2.00 per 35 ft^3. Determine the cost of water used in (c).

(*1 mark*)

$\frac{790}{35} = 22.57$ ← E3

\$22.57

e) Corbin has a budget of \$800.00 for the rink. State how much money he has left over to purchase lights, after purchasing boards and water.

(*1 mark*)

$$\begin{array}{r} 358.40 \\ +\ 22.57 \\ \hline 380.97 \end{array} \qquad \begin{array}{r} 800 \\ -380.97 \\ \hline 419.03 \end{array}$$

\$419.03

Mark(s): 3.5/5

- 1 0.5 mark for dimensions in (a)
- 3 0.5 mark for consistent cost in (b)
- 4 0.5 mark for conversion in (c)
- 5 0.5 mark for consistent volume in (c)
- 6 0.5 mark for consistent amount of water in (d)
- 8 1 mark for consistent surplus in (e)
- E6 rounds too soon in (c)
- E3 makes a transcription error (inaccurate transferring of information) in (d)

Exemplar 2

Question 23 **Total: 5 marks**

Corbin wants to build a rectangular outdoor curling rink.

His backyard allows him to build a rink with a length from 48 ft. to 60 ft., and a width from 10 ft. to 20 ft.

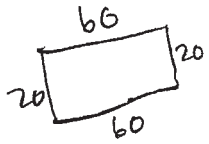
a) State a possible set of dimensions for his rink.

(*0.5 mark*)

60 ft. by 20 ft.

b) His rink has a perimeter made of wood, one board high. A 12 ft. board costs $51.20, taxes included. Calculate the total cost of wood needed, using the dimensions you stated in (a).

(*1.5 marks*)



$14 \times 51.20 = \$716.80$

$\frac{160}{12} = 13.\overline{3}$

c) Corbin needs to fill the rectangular rink with water in order to make ice. He wants a depth of 8 in. Determine the volume of water he needs.

(*1 mark*)

$(720)(240)(8) = 1382400\ in^3 = 9600\ ft^2$

d) Water costs $2.00 per 35 ft^3. Determine the cost of water used in (c).

(*1 mark*)

9600 ÷ 35 = 274.29

274.29 × 2 = $548.57

The water would cost $548.57

e) Corbin has a budget of $800.00 for the rink. State how much money he has left over to purchase lights, after purchasing boards and water.

(*1 mark*)

800.00
− 548.57
$ 251.43

Mark(s): 3.5/5

1. 0.5 mark for dimensions in (a)
2. 1 mark for number of boards in (b)
3. 0.5 mark for consistent cost in (b)
5. 0.5 mark for consistent volume in (c)
6. 0.5 mark for consistent amount of water in (d)
7. 0.5 mark for consistent cost in (d)

Exemplar 1

Question 25 **Total: 2 marks**

Consider the following true conditional statement:

"If I live in the capital city of Manitoba, then I live in Winnipeg."

a) Write the converse of the conditional statement above.

(*1 mark*)

if I live in Winnipeg then i live in Manitoba

E3

b) State the biconditional statement if possible. Otherwise, state a counterexample.

(*1 mark*)

if i dont live in manitoba then i dont live in winnipeg

Mark(s): 1/2

1 1 mark for converse in (a)

E3 makes a transcription error (inaccurate transferring of information) in (a)

Exemplar 2

Question 25 — Total: 2 marks

Consider the following true conditional statement:

"If I live in the capital city of Manitoba, then I live in Winnipeg."

a) Write the converse of the conditional statement above.

(*1 mark*)

If I live in Winnipeg, I live in the capital city of MB.

TE

b) State the biconditional statement if possible. Otherwise, state a counterexample.

(*1 mark*)

It is a biconditional statement, because Winnipeg is the only capital in manitoba.

Mark(s): 0.5/2

1 1 mark for converse in (a)

TE 0.5 mark deduction for terminology error in (a)

Exemplar 3

Question 25 **Total: 2 marks**

Consider the following true conditional statement:

"If I live in the capital city of Manitoba, then I live in Winnipeg."

a) Write the converse of the conditional statement above.

(*1 mark*)

I live in Winnipeg and I live in the capital city of Manitoba.

b) State the biconditional statement if possible. Otherwise, state a counterexample.

(*1 mark*)

I live in the capital city of Manitoba if and only if I live in Winnipeg.

I live in Winnipeg if and only if I live in the capital city of Manitoba.

Mark(s): 1/2

❷ 1 mark for biconditional statement in (b)

Exemplar 4

Question 25 **Total: 2 marks**

Consider the following true conditional statement:

"If I live in the capital city of Manitoba, then I live in Winnipeg."

a) Write the converse of the conditional statement above.

(*1 mark*)

Then I live in Winnipeg, but, if I live in the capacity of Manitoba

b) State the biconditional statement if possible. Otherwise, state a counterexample.

(*1 mark*)

If I live in capital of Winnipeg then I live in Manitoba

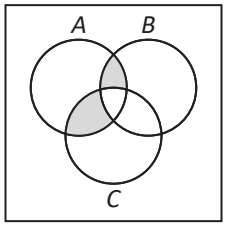
Mark(s): 0/2

→ no criteria met

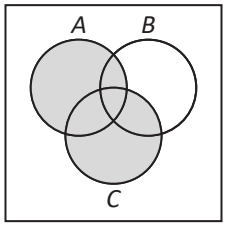
Exemplar 1

Question 26 — Total: 1.5 marks

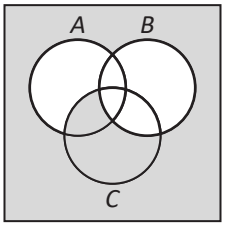
Match each set notation to its Venn diagram.



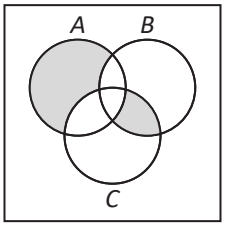
iii



i



iv



ii

i: $(A \cup C)$

ii: $\big((A \cap B) \setminus C\big) \cup \big((A \cap C) \setminus B\big)$

iii: $(A \setminus B \setminus C) \cup \big((B \cap C) \setminus A\big)$

iv: $(A \cup B \cup C)' \cup \big((A \cap C) \setminus B\big) \cup (C \setminus A \setminus B)$

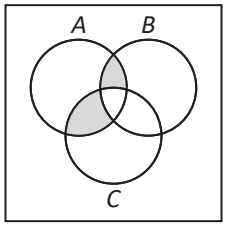
Mark(s): 1/1.5

1. 0.5 mark for correctly placing one set notation
2. 0.5 mark for correctly placing a second set notation

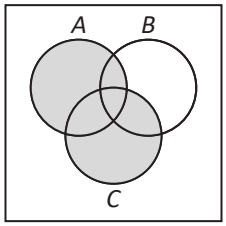
Exemplar 2

Question 26 — Total: 1.5 marks

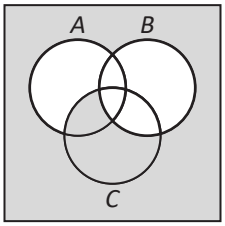
Match each set notation to its Venn diagram.



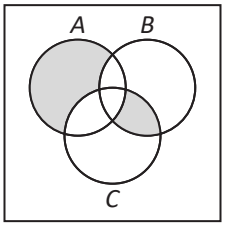
2



1



4



3

i: $(A \cup C)$

ii: $\big((A \cap B) \setminus C\big) \cup \big((A \cap C) \setminus B\big)$

iii: $(A \setminus B \setminus C) \cup \big((B \cap C) \setminus A\big)$

iv: $(A \cup B \cup C)' \cup \big((A \cap C) \setminus B\big) \cup (C \setminus A \setminus B)$

Mark(s): 1.5/1.5

1. 0.5 mark for correctly placing one set notation
2. 0.5 mark for correctly placing a second set notation
3. 0.5 mark for correctly placing the remaining set notations

Exemplar 1

Question 27 **Total: 3 marks**

Given the following statements:

- I have a fruit.
- I am learning biology.
- I am learning systems.
- I am learning math.
- I can make a snack.
- I have a strawberry.
- I am studying plants.
- I am studying inequalities.

a) Using two of the above statements, write a conditional statement.

(*1 mark*)

If I have a fruit, then I have a snack

E3

b) Write the inverse of your statement in (a).

(*1 mark*)

If I have a snack, then I have a fruit

c) State a counterexample for either statement in (a) or (b).

(*1 mark*)

If I don't have a fruit, then I don't have a snack.

Mark(s): 1/3

1 1 mark for a conditional statement in (a)

E3 makes a transcription error (inaccurate transferring of information) in (a)

Exemplar 2

Question 2 **Total: 3 marks**

Given the following statements:

- I have a fruit.
- I am learning biology.
- I am learning systems.
- I am learning math.
- I can make a snack.
- I have a strawberry.
- I am studying plants.
- I am studying inequalities.

a) Using two of the above statements, write a conditional statement.

(*1 mark*)

I have a strawberry If I have a fruit.

b) Write the inverse of your statement in (a).

(*1 mark*)

I do not have a strawberry If I don't have a fruit.

c) State a counterexample for either statement in (a) or (b).

(*1 mark*)

I could have an apple & not a strawberry & still be a fruit.

Mark(s): 2/3

2 1 mark for inverse in (b)

3 1 mark for counterexample in (c)

Exemplar 3

Question 27 — Total: 3 marks

Given the following statements:

- I have a fruit.
- I am learning biology.
- I am learning systems.
- I am learning math.
- I can make a snack.
- I have a strawberry.
- I am studying plants.
- I am studying inequalities.

a) Using two of the above statements, write a conditional statement.

(*1 mark*)

If I have a fruit then I can make a snack

b) Write the inverse of your statement in (a).

(*1 mark*)

If I don't have a fruit, then I can't make a snack.

c) State a counterexample for either statement in (a) or (b).

(*1 mark*)

b) I can make a snack even if I don't have a fruit.

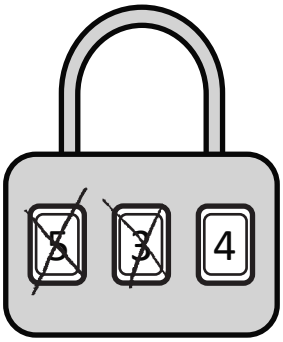
Mark(s): 2/3

1. 1 mark for a conditional statement in (a)
2. 1 mark for inverse in (b)

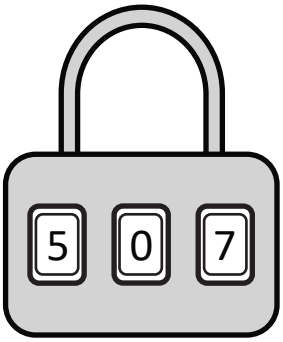
Exemplar 1

Question 28 **Total: 2 marks**

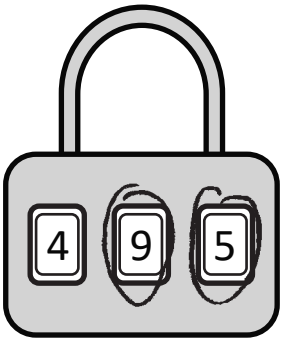
The following are clues to open a three-digit lock:



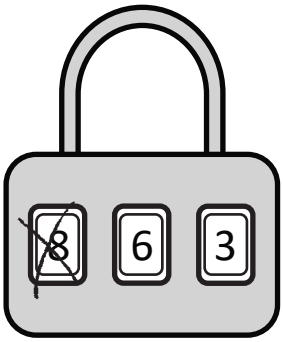
only one digit is correct and perfectly placed



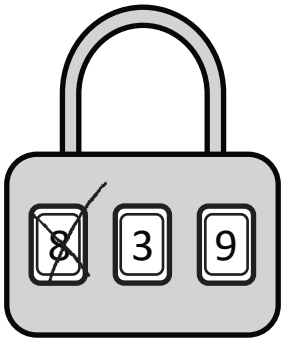
only one digit is correct but wrongly placed



two digits are correct but wrongly placed

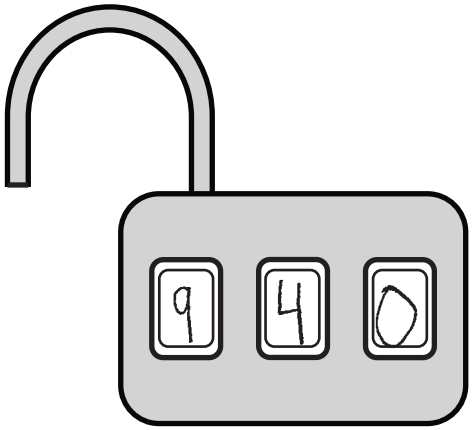


nothing is correct



only one digit is correct but wrongly placed

Determine the three-digit code.



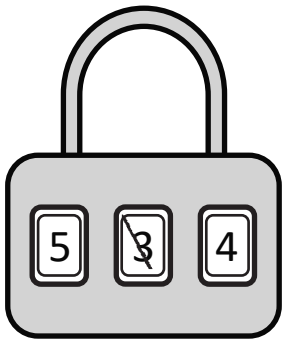
Mark(s): 1/2

1 1 mark for correctly placing one digit

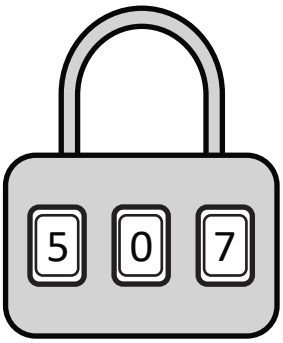
Exemplar 2

Question 28 **Total: 2 marks**

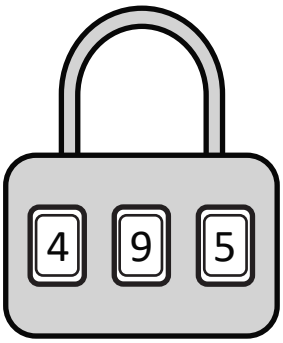
The following are clues to open a three-digit lock:



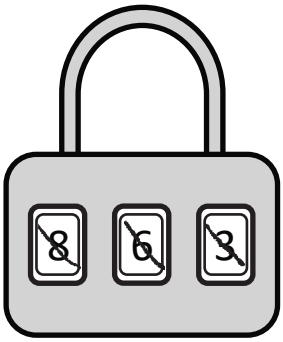
only one digit is correct and perfectly placed



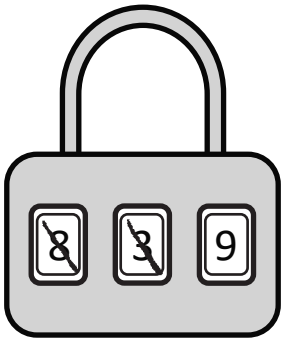
only one digit is correct but wrongly placed



two digits are correct but wrongly placed

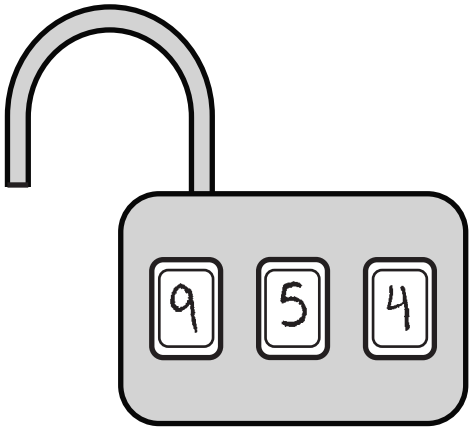


nothing is correct



only one digit is correct but wrongly placed

Determine the three-digit code.



Mark(s): 1.5/2

1. 1 mark for correctly placing one digit
2. 0.5 mark for correctly placing a second digit