TASMANIAN ASSESSMENT, STANDARDS & CERTIFICATION

External Assessment 2026

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MATHEMATICS METHODS – FOUNDATION

MTM315117

Section A

Pages: 24
Questions: 23
Information Sheets: 1

Preparation time for this exam: 15 minutes

Suggested working time: 80 minutes

Instructions:

Calculators are not allowed to be used in this section.

Section A will be collected after 80 minutes.

- There are **five (5) parts** to this section.
- Answer **all** questions and **all** items within each question.
- Write your answers in the spaces provided in this exam paper.
  - Spare diagrams have been provided at the end of each part.
    Indicate in the box provided if you have used the spare diagram.
- The exam is **three (3) hours** in length. The suggested working time for this section is **approximately 80 minutes**.
- During the first 80 minutes of the exam you may move onto Section B, but you **cannot** use your calculator until told by your supervisor(s).
- The Mathematics Methods – Foundation Information Sheet can be used throughout the exam.
- All answers must be written in **English**

Marker use	
C4	/ 16
C5	/ 16
C6	/ 16
C7	/ 16
C8	/ 16

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Additional Exam Instructions

- You **must** make sure your answers address the listed criteria.
- For questions worth **one (1)** mark, you **are not required** to show workings. Markers will look at the presentation of the answer(s) and at the argument(s) leading to the final answer(s).
- For questions worth **two (2)** or more marks you **are required** to show relevant workings.
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  - according to the degree to which workings convey a logical line of reasoning, and
  - for suitable justifications and explanations of methods and processes when requested.

Criteria

You **must** make sure your answers address:

- Criterion 4 manipulate algebraic expressions and solve equations
- Criterion 5 understand linear, quadratic and cubic functions
- Criterion 6 understand logarithmic, exponential and trigonometric functions
- Criterion 7 use differential calculus in the study of functions
- Criterion 8 understand experimental and theoretical probabilities and of statistics.

Guide to Exam Structure

	Parts	Questions available	Questions to answer	Suggested working time	Marks available
Section A	Part 1	5	5	16 minutes	16 marks
	Part 2	5	5	16 minutes	16 marks
	Part 3	4	4	16 minutes	16 marks
	Part 4	5	5	16 minutes	16 marks
	Part 5	4	4	16 minutes	16 marks
Totals		**23**	**23**	**80 minutes**	**80 marks**
Section B	Part 1	6	6	20 minutes	20 marks
	Part 2	4	4	20 minutes	20 marks
	Part 3	6	6	20 minutes	20 marks
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	Part 5	4	4	20 minutes	20 marks
Totals		**25**	**25**	**100 minutes**	**100 marks**
Totals		**48**	**48**	**180 minutes (3 hours)**	**180 marks**

Part 1

Marker use

- Answer **all** questions in this part.
- This part assesses **Criterion 4**.

Question 1

Expand and simplify the following:

a) $9(3x - 1) - 2x$ /1

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b) $(x + 3)(2x - 1)(4 - x)$ /2

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Question 2

Solve the following for x:

a) $5 - \frac{x+1}{2} = \frac{x-2}{4}$ /2

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b) $8x(x^2 - 9) = 0$ /2

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Question 2 continues

Question 2 continued

Marker use

c) $x^2 - 5x - 14 = 0$

/2

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Question 3

Combine $\frac{4}{x^2} - \frac{2}{x^2+1}$ into a single simplified fraction.

/2

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Question 4

Transform $4x^2 - 4x + 6$ into the form $a(x-h)^2 + k$ by completing the square.

/3

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Question 5

Determine the missing term in the expansion of $(3x-2)^5$ shown below.

/2

$$243x^5 - 810x^4 + 1080x^3 + \quad ? \quad + 240x - 32$$

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Total P1

/16

Part 2

Marker use

- Answer **all** questions in this part.
- This part assesses **Criterion 5**.

Question 6

A linear graph has a y intercept of 4 and a gradient of 2.

a) State the equation of the graph.

..... /1

b) Sketch the graph using Figure 1, labelling the axes intercepts.

..... /2

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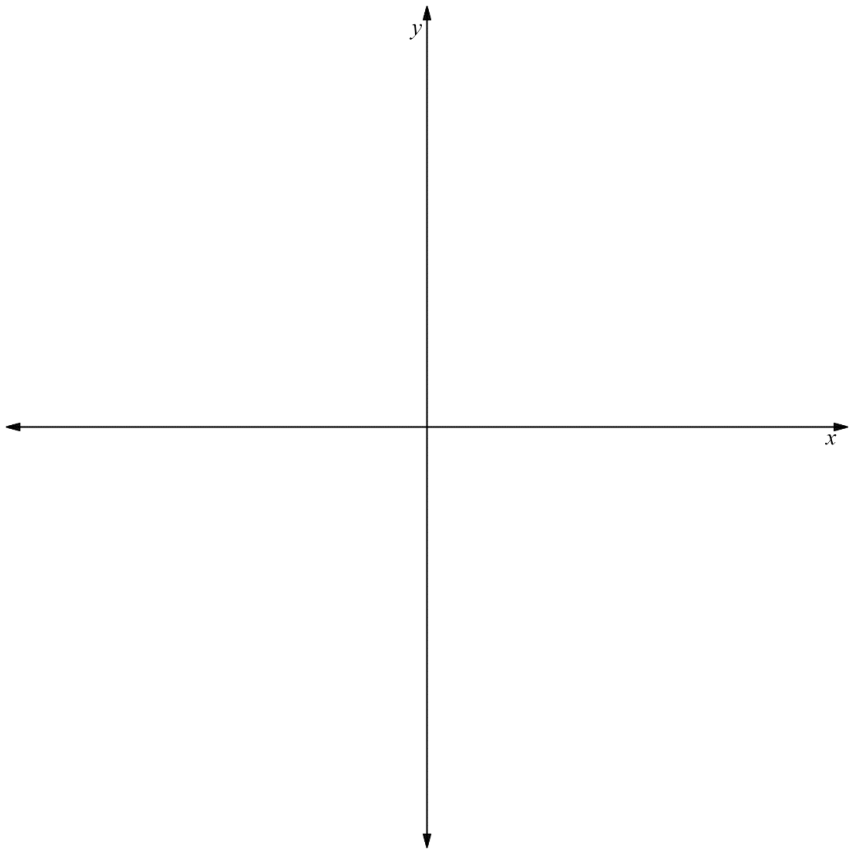


Figure 1

Spare diagram used (X) ☐

Question 7

Marker use

For the function $y = x^2 + 2x - 15$

a) Determine the x and y intercepts.

/2

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b) Sketch the graph using Figure 2, labelling the axes intercepts and the turning point.

/3

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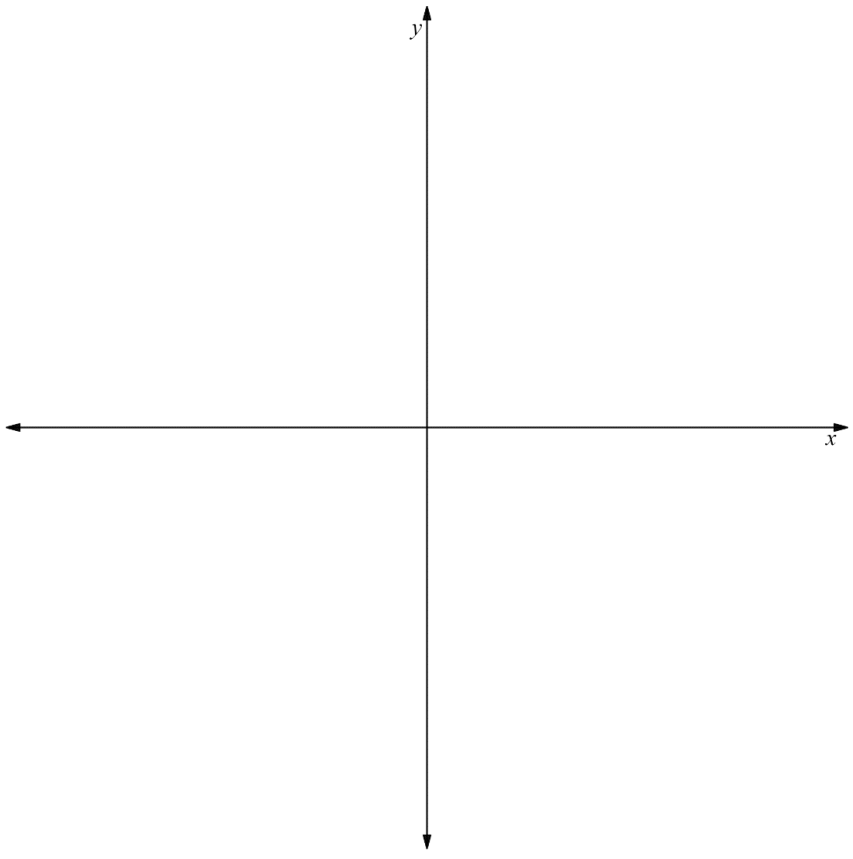


Figure 2

Spare diagram used (X) ☐

Question 8

Marker use

A cubic function is graphed using Figure 3 over the domain $x \in (-\infty, 6)$

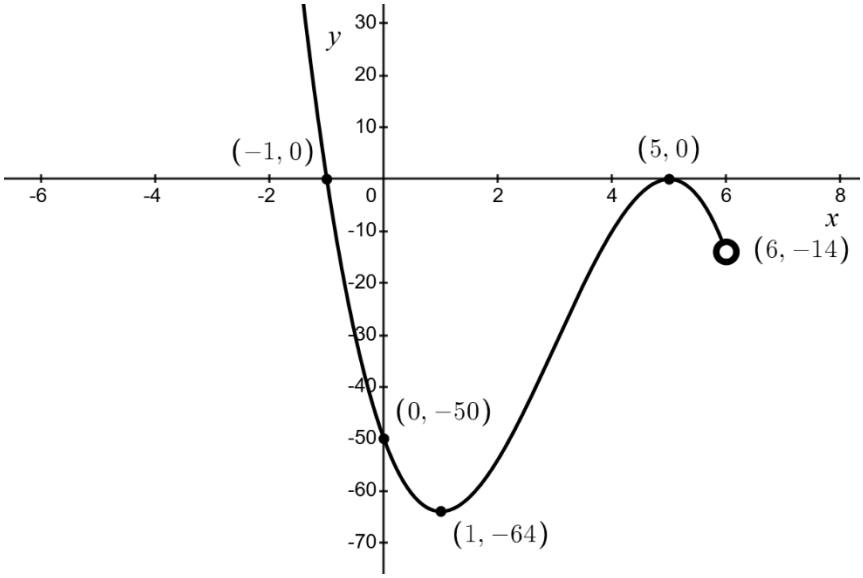


Figure 3

a) Determine the cubic function's equation.

/2

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b) State the range of the function.

/1

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Question 9

Marker use

Circle whether each of the following make a valid quadratic function $y = ax^2 + bx + c$.

/2

a) $a > 0,\ b > 0,\ c < 0$ and $\Delta < 0$ Valid Invalid

b) $a > 0,\ b = 0,\ c = 0$ and $\Delta > 0$ Valid Invalid

Question 10

The graph of $y = -x^2 + 4x$ shown in Figure 4 is translated by 2 units left, dilated by factor 0.5 in the direction of the y axis and then reflected in the x axis.

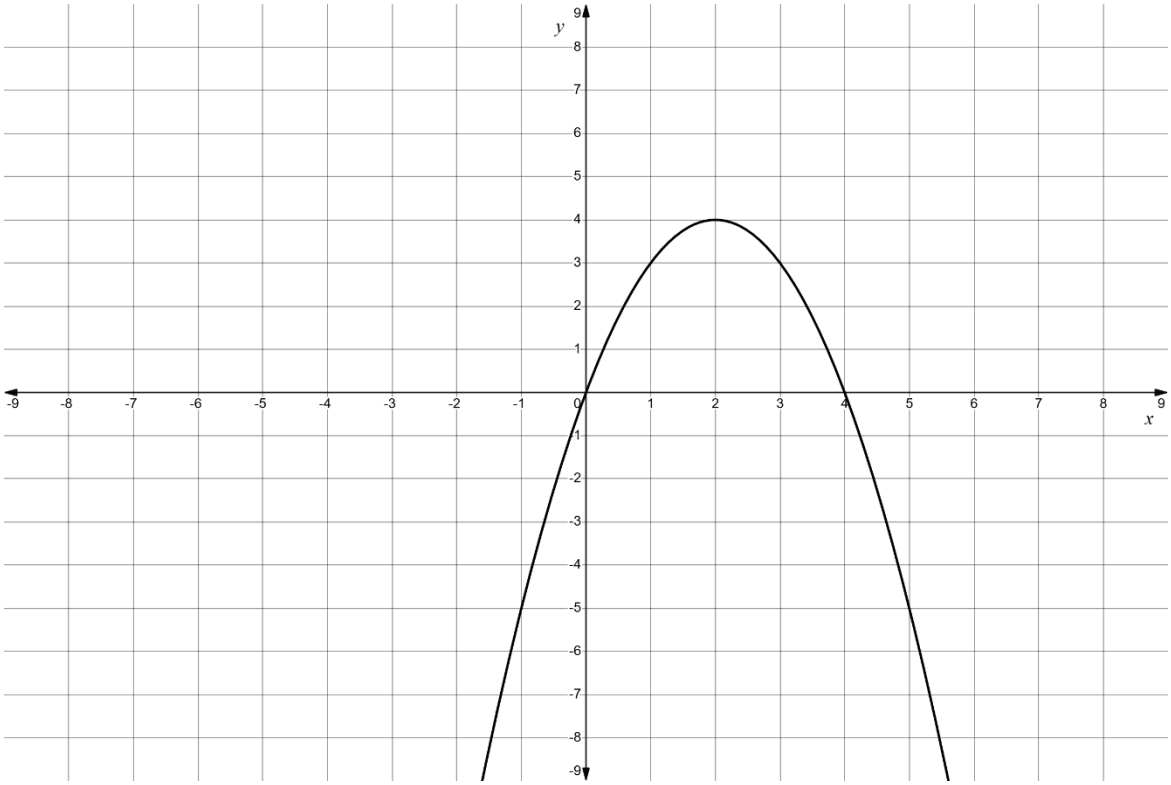


Figure 4

Spare diagram used (X) ☐

a) Sketch the location of the transformed function on Figure 4. /2

b) State the location of the turning point of the transformed function. /1

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Total P2

/16

Spare Diagrams

Question 6 b)

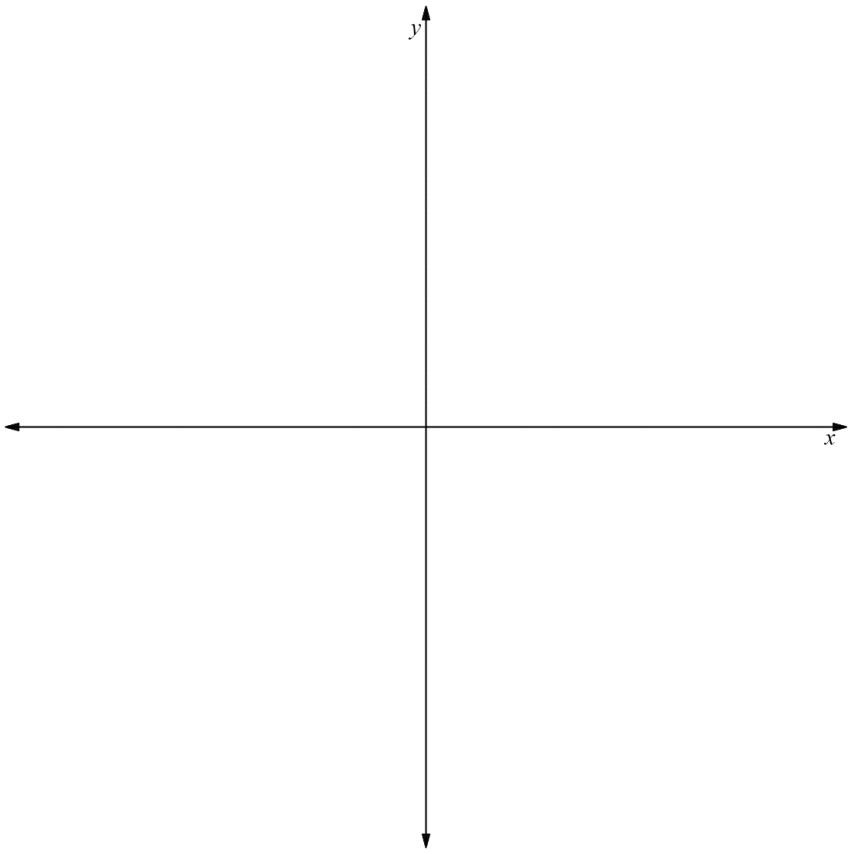


Figure 1

Question 7 b)

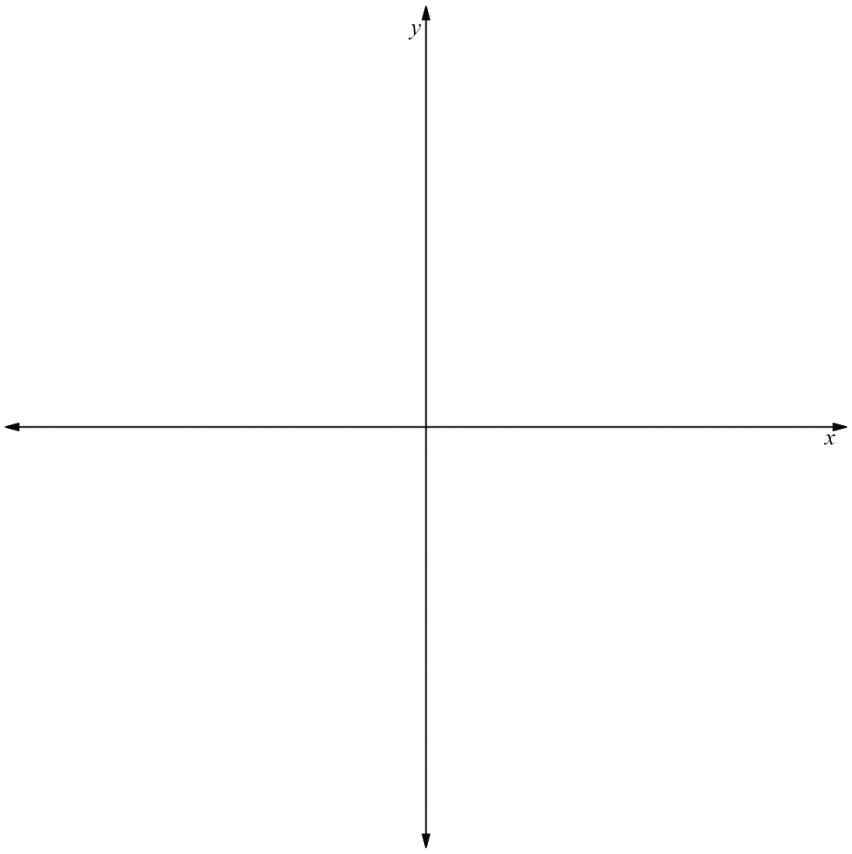


Figure 2

Spare Diagrams

Question 10 a)

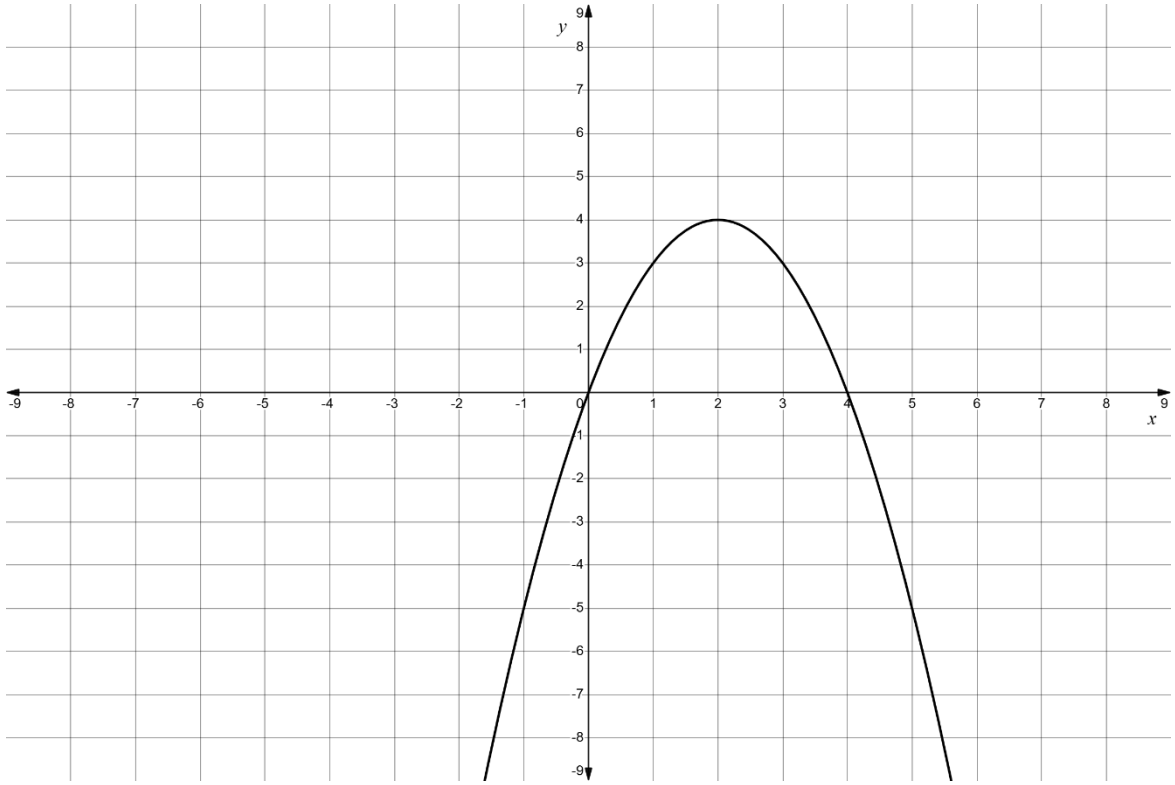


Figure 4

Part 3

Marker use

- Answer **all** questions in this part.
- This part assesses **Criterion 6**.

Question 11

For the angle $\theta = -\frac{5\pi}{4}$

a) Convert θ into degrees. /1

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b) Determine $\sin(\theta)$. /1

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Question 12

The number of zombies, z, which spawn (or appear) in a game can be modelled by the equation $z = a \times b^x + c$. There are initially 10 zombies, but in the advanced mode 2 more zombies immediately spawn at the start of the game. After every minute, x, the number of zombies that spawn **triples.**

a) State the values of a, b and c for the advanced mode, and state the equation. /2

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b) How many zombies are there 3 minutes into the game, if none have been eliminated? /1

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Question 13

Marker use

Solve the following for x

a) $5^{x-1} = 125$

/1

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b) $2^{x+2} = 16 \times 4^{x-5}$

/2

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c) $\log_4(27x - 18) - 2\log_4(3) = 2$

/3

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Question 14

Marker use

For the function $y = -3\log_2(x + 4)$

a) Describe the transformations in order to get from $y = \log_2 x$ to the function above. /2

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b) Sketch the function using Figure 5, labelling any intercepts or asymptotes. /2

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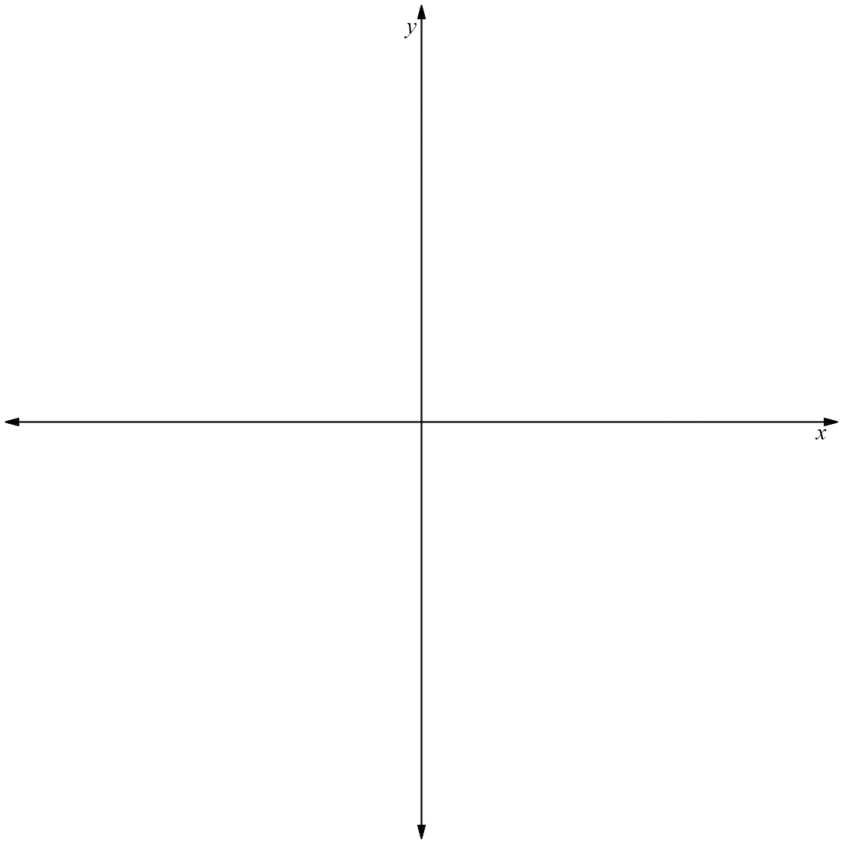


Figure 5

Spare diagram used (X) ☐

c) State the domain of the function.

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Total P3 /16

Spare Diagram

Marker use

Question 14 b)

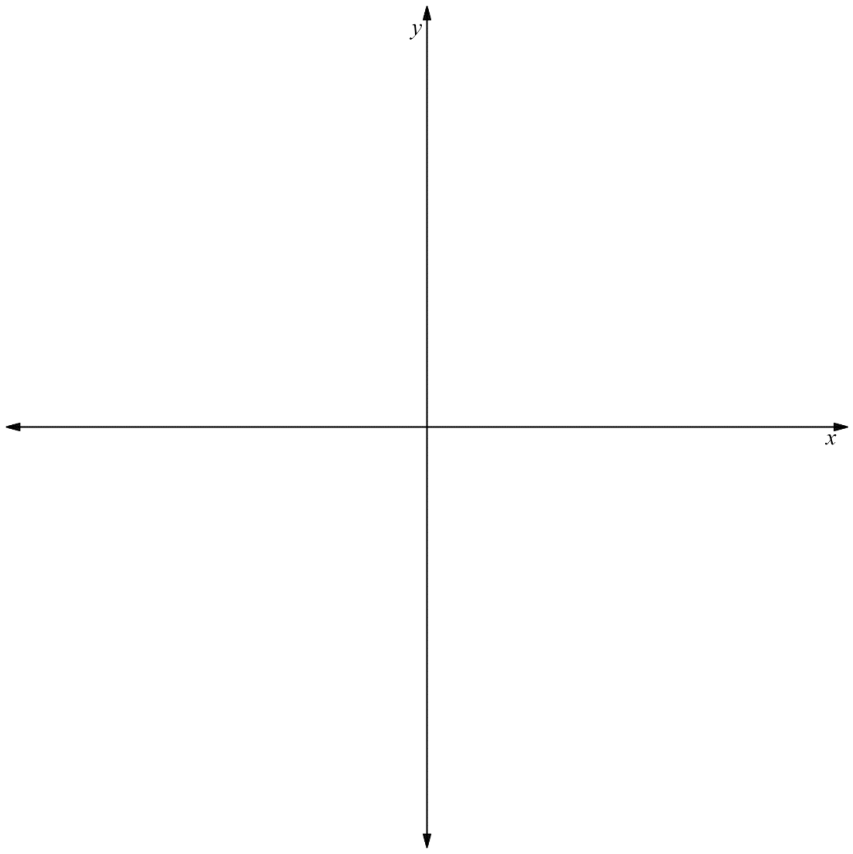


Figure 5

Part 4

Marker use

- Answer **all** questions in this part.
- This part assesses **Criterion 7**.

Question 15

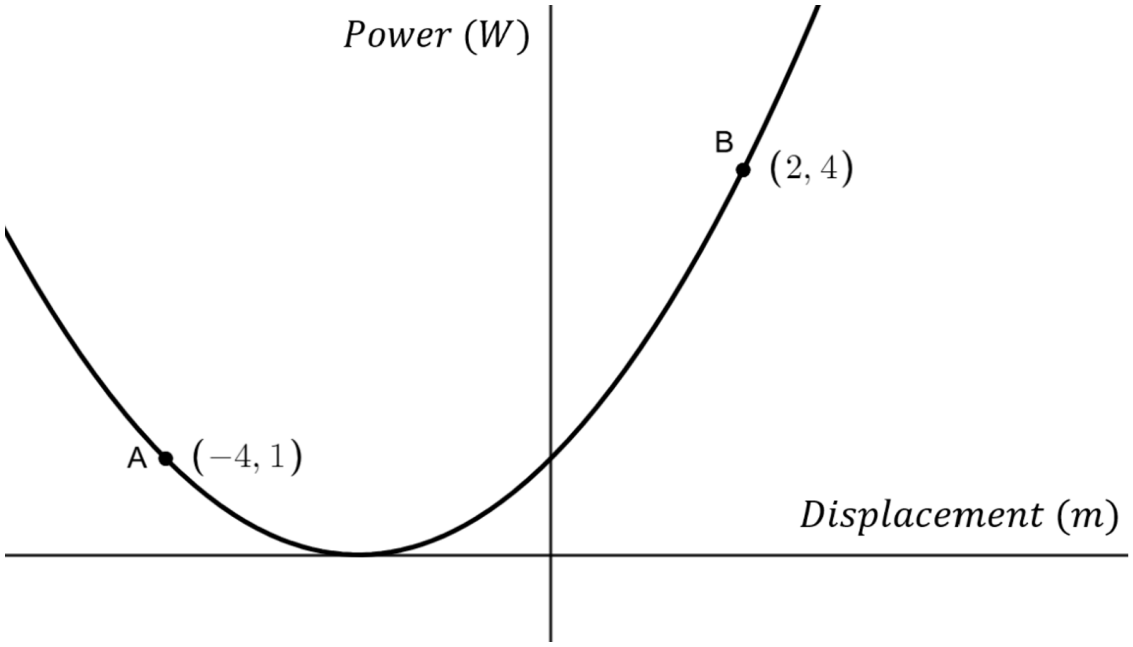


Figure 6

Spare diagram used (X) ☐

a) Calculate the average rate of change between points A and B, including appropriate units. /2

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b) Use Figure 6 to sketch an approximate normal to the graph at point A. /1

Question 16

Marker use

Use first principles to differentiate $f(x) = x^2 - 4$.

/3

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Question 17

Determine the derivative of each of the following:

a) $y = 2x^{25} - 6x^2 + 4$

/1

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b) $h(x) = \frac{10x^4 - 6x}{2x}$

/2

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c) $f(x) = 3x^{-3} + 6\sqrt{x} + \sqrt[4]{x^5}$

/3

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Question 18

Marker use

Sketch a possible graph of the function $f(x)$ which has the following properties:

$f(2) = 1$ $\quad$ $f'(2) = 0$ $\quad$ $f(x) \geq 1$ for $x \in R$

/2

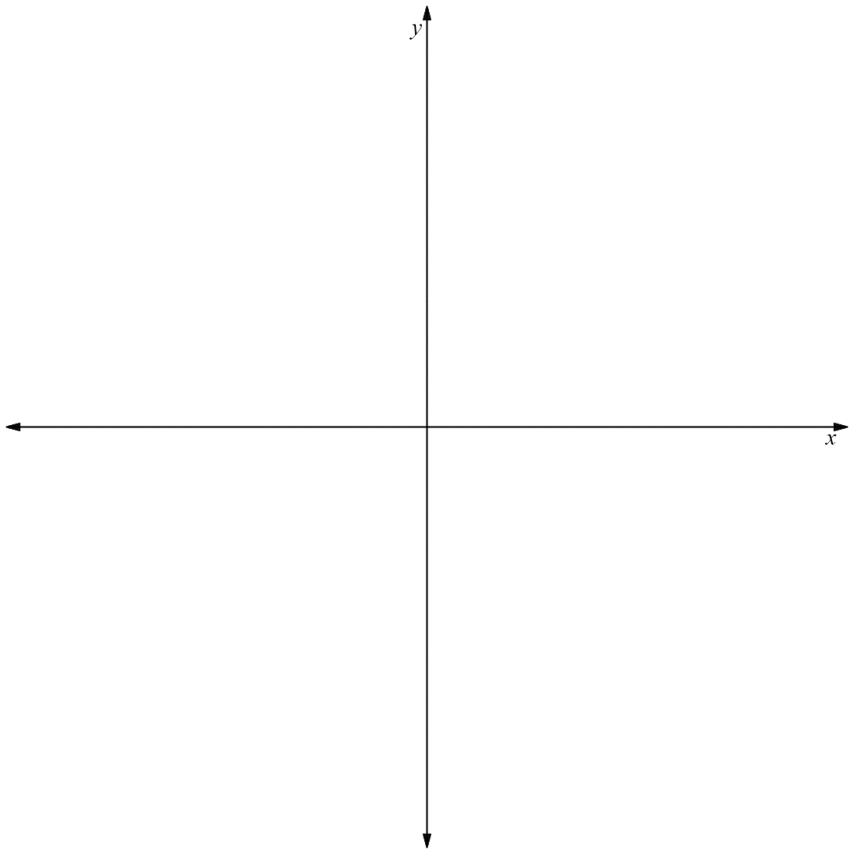


Figure 7

Spare diagram used (X) ☐

Question 19

Use calculus to determine the gradient of the function $y = 3x^2 - 4x + 1$ at the point $(1, 0)$.

/2

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Total P4

/16

Spare Diagrams

Question 15 b)

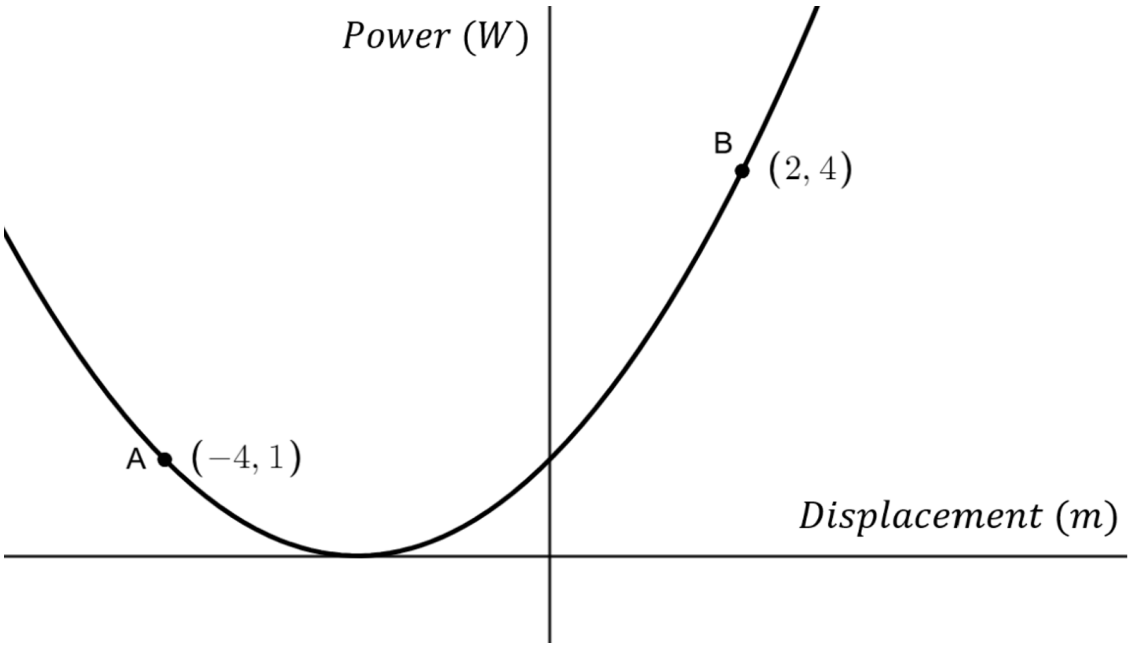


Figure 6

Question 18

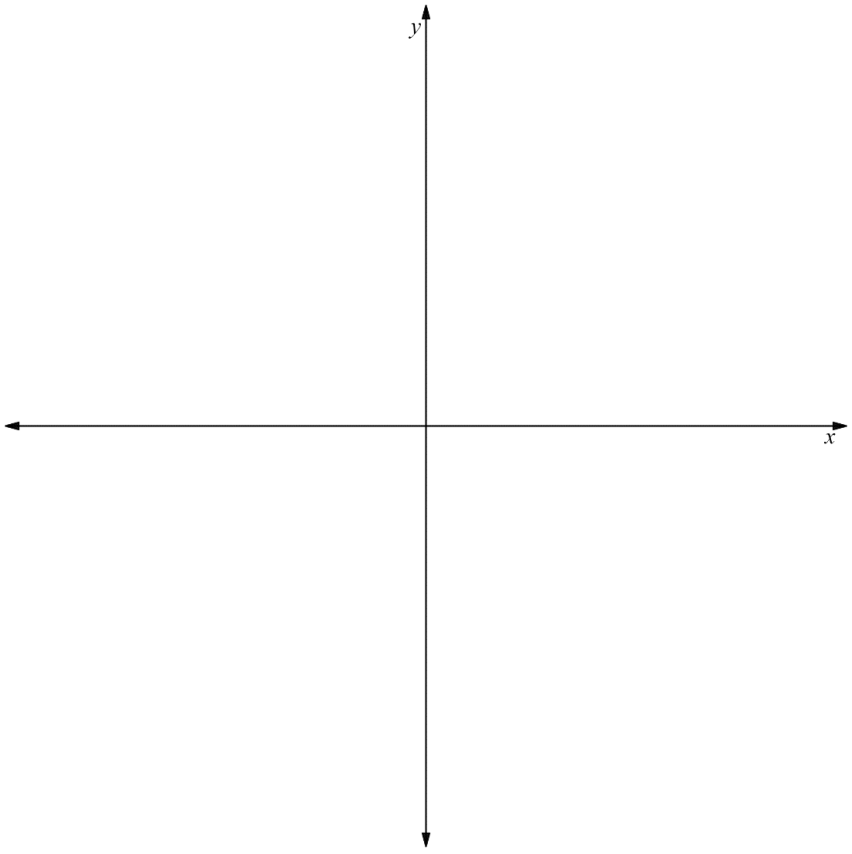


Figure 7

Part 5

Marker use

- Answer **all** questions in this part.
- This part assesses **Criterion 8**.

Question 20

Table 1 is a probability table.

	$\Pr(B)$	$\Pr(B')$	
$\Pr(A)$	0.3		
$\Pr(A')$			0.15
	0.4		

Table 1

Spare diagram used (X) ☐

a) Complete Table 1. /2

b) Determine $\Pr(A \cap B)'$.

..... /1

Question 21

At the movies, the probability I eat ice cream is 0.3. However, the probability I eat neither ice cream nor popcorn is 0.5.

Determine the probability that I eat popcorn if eating ice cream and popcorn is:

a) Mutually exclusive. /1

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b) Independent, and the probability I eat both is 0.12. /2

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Question 22

Marker use

For two (2) events C and D, $n(\xi) = 50$, $n(C) = 15$, $\Pr(C \cap D) = \frac{7}{50}$ and $\Pr(C|D) = \frac{1}{4}$.

a) Complete the Venn Diagram in Figure 8 to show this information. /2

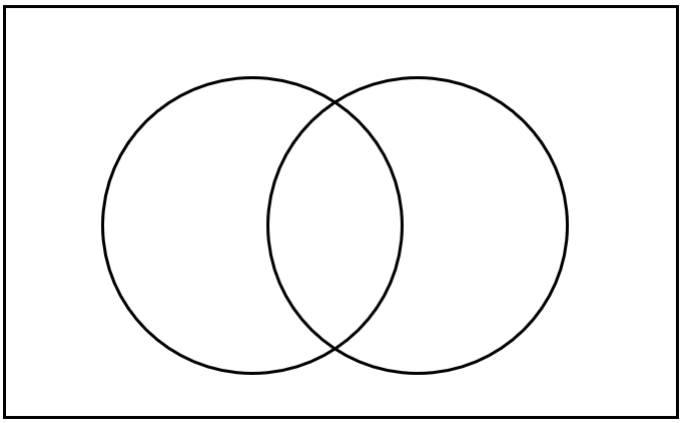


Figure 8

Spare diagram used (X) ☐

b) Determine $\Pr(C)$.

..... /1

c) Determine $\Pr(D|C')$.

..... /2

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Question 23

Marker use

Each letter of BICHENO BLOWHOLE is written on a tile. The tiles are randomly drawn out of the bag one at a time and **not replaced**.

Determine the probability that:

a) The first tile drawn is the letter B.

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/1

b) The first tile drawn is any letter and the second tile drawn is the letter W.

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/1

c) The word “COOL” is drawn, in that letter order.

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/3

Total P5

/16

Spare Diagrams

Question 20 a)

	$\Pr(B)$	$\Pr(B')$	
$\Pr(A)$	0.3		
$\Pr(A')$			0.15
	0.4		

Table 1

Question 22 a)

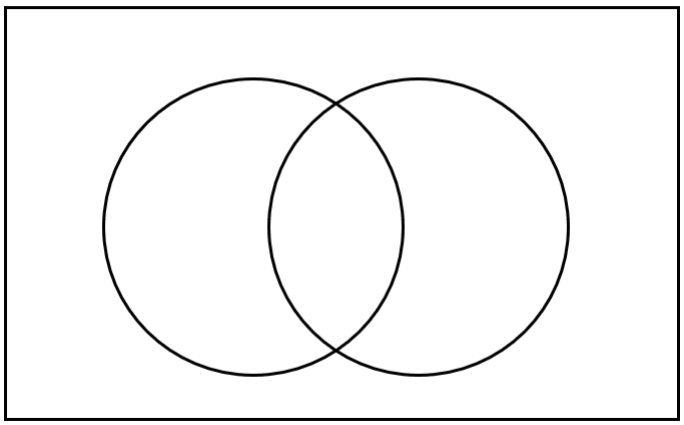


Figure 8

End of Section A



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MATHEMATICS METHODS – FOUNDATION

MTM315117

Section B

Pages: 28
Questions: 25
Information Sheets: 1

Suggested working time: 100 minutes

Instructions:

Calculators are allowed to be used in this section.

- There are **five (5) parts** to this section.
- Answer **all** questions and **all** items within each question.
- Write your answers in the spaces provided in this exam paper.
  - Spare diagrams have been provided at the end of Parts 2 – 5.
    Indicate in the box provided if you have used the spare diagram.
- The exam is **three (3) hours** in length. The suggested working time for this section is **approximately 100 minutes**.
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Marker use	
C4	/ 20
C5	/ 20
C6	/ 20
C7	/ 20
C8	/ 20

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	Part 4	5	5	16 minutes	16 marks
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Section B	Part 1	6	6	20 minutes	20 marks
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	Part 5	4	4	20 minutes	20 marks
Totals		**25**	**25**	**100 minutes**	**100 marks**
Totals		**48**	**48**	**180 minutes (3 hours)**	**180 marks**

Part 1

Marker use

- Answer **all** questions in this part.
- This part assesses **Criterion 4**.

Question 24

Expand $(2s - t)(4s^2 + 2st + t^2)$.

/1

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Question 25

The volume of a sphere is given by $V = \frac{4}{3}\pi r^3$.

a) Determine the value of V when r is 2 cm correct to 2 decimal places.

..... /1

b) Make r the subject of the formula.

..... /2

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Question 26

Marker use

A new stadium will have two (2) types of public transport vehicles running on game days:

- Rapid Buses, B, which each carry 48 passengers
- Mini Trams, T, which each carry 32 passengers.

a) For the stadium's opening match, a total of 25 vehicles were sent out. Together, they carried 976 passengers. By constructing and solving simultaneous equations, determine how many Rapid Buses and how many Mini Trams were used. /2

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The Mini Tram's power draw (in kW) at control setting x is $P(x) = 2x^2 - 14x + 30$. The system limit is 18 kW.

b) State the power drawn when the control setting is 2.25. /1

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c) **Using the quadratic formula**, solve $P(x) = 18$ to find the control setting(s) where the tram reaches the limit. /2

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Question 27

Marker use

When $f(x) = x^3 + kx^2 - 29x - 30$ is written in factorised form, $(x - 5)$ is a factor.

a) Determine the value of k.

/2

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b) Use algebraic techniques to fully factorise $f(x)$.

/2

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Question 28

Consider the equation $2s^2 + h \times s = -5$.

a) Explain why there are no real solutions when $h = -3$.

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b) Use the discriminant to determine what value(s) of h gives 2 real solutions.

/2

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Question 29

Marker use

/3

Use algebraic working to simultaneously solve the following pair of equations.

$$y = x^2 - 7x + 16$$

$$y - x = 4$$

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Total P1

/20

Part 2

Marker use

- Answer **all** questions in this part.
- This part assesses **Criterion 5**.

Question 30

The height of a swift parrot h metres above ground t seconds after being released is modelled by the equation $h(t) = -0.002t^3 + 0.05t^2 - 0.08t + 2$.

a) Determine the height of the swift parrot to the nearest metre:

i. When it is initially released.

..... /1

ii. After 8 seconds.

..... /1

iii. At the maximum height above ground.

..... /1

b) How long is the swift parrot above the ground?

..... /1

Question 31

Marker use

a) State the gradient and y intercept of the line $77x - 42y = 35$.

/2

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b) Find the equation of the perpendicular line which intersects $y = \sqrt{3}x + 1$ when $x = \sqrt{3}$.

/3

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Question 32

Marker use

a) State an ordered list of transformations required to turn $y = x^3$ into $y = 4 + (2 - x)^3$.

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b) Sketch the function $y = 4 + (2 - x)^3$ using Figure 9, labelling any intercepts and the point of inflection.

/2

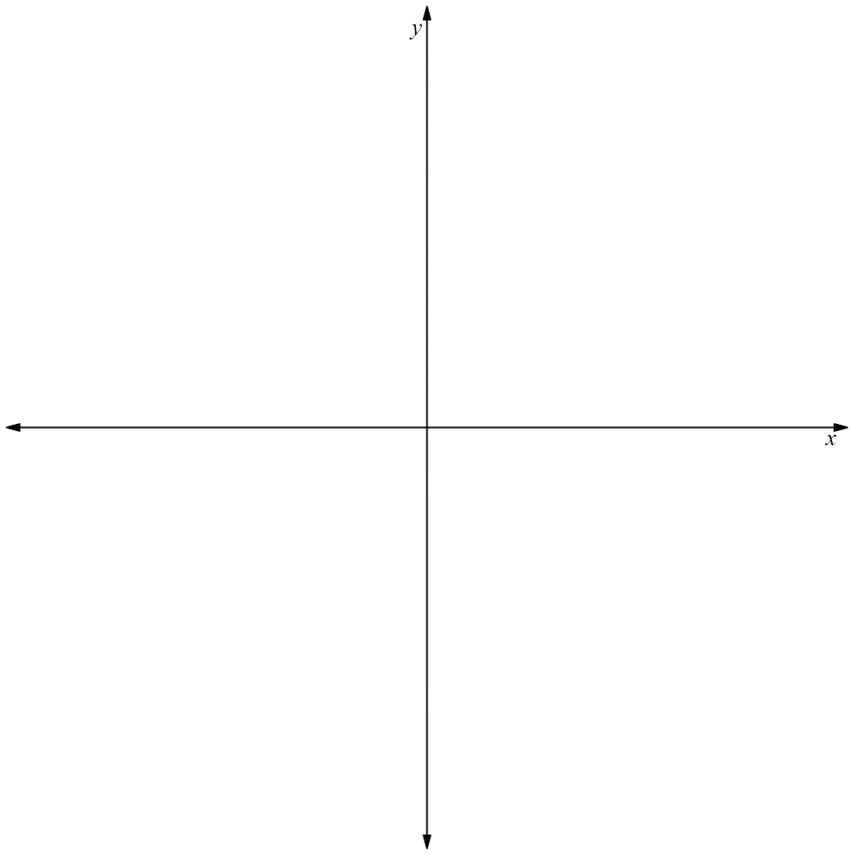


Figure 9

Spare diagram used (X) ☐

c) State why it is a function, not just a relation.

/1

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Question 33

Marker use

An architect is designing a linear bridge to connect the top of two (2) mountains, as shown in Figure 10.

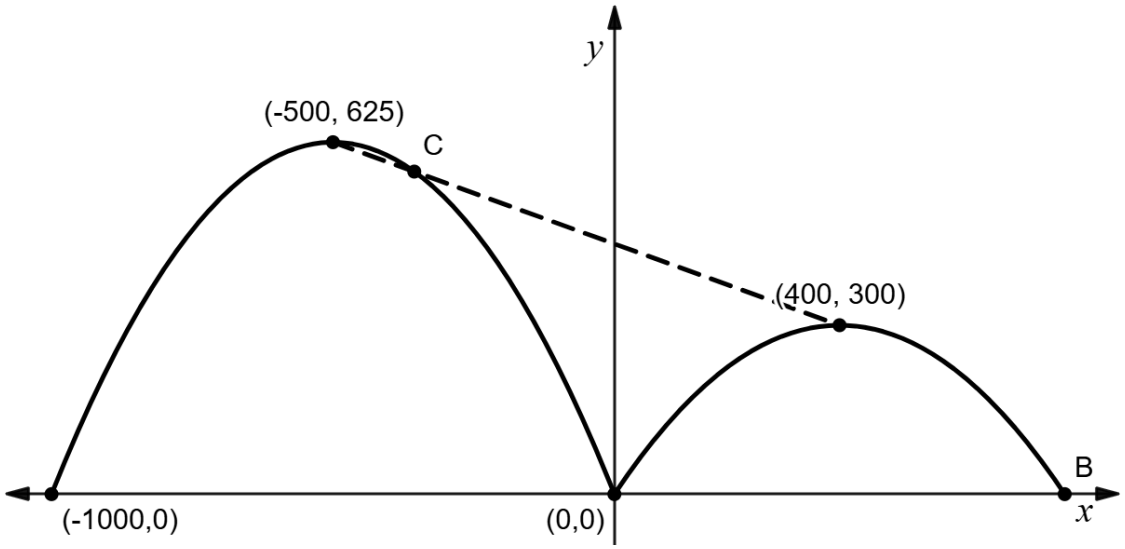


Figure 10

a) The base of the left mountain is 1000 m long. State the length of the base of the mountain on the right. /1

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b) Determine the equation of a linear bridge to connect the tops of the two (2) mountains. /2

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c) The bridge connects to the mountain on the left twice. By finding the equation of the left-hand mountain, determine the co-ordinates of the second connection at point C, where a restraint will be built. Answer to the nearest whole number. /3

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Total P2 /20

Spare Diagram

Question 32 b)

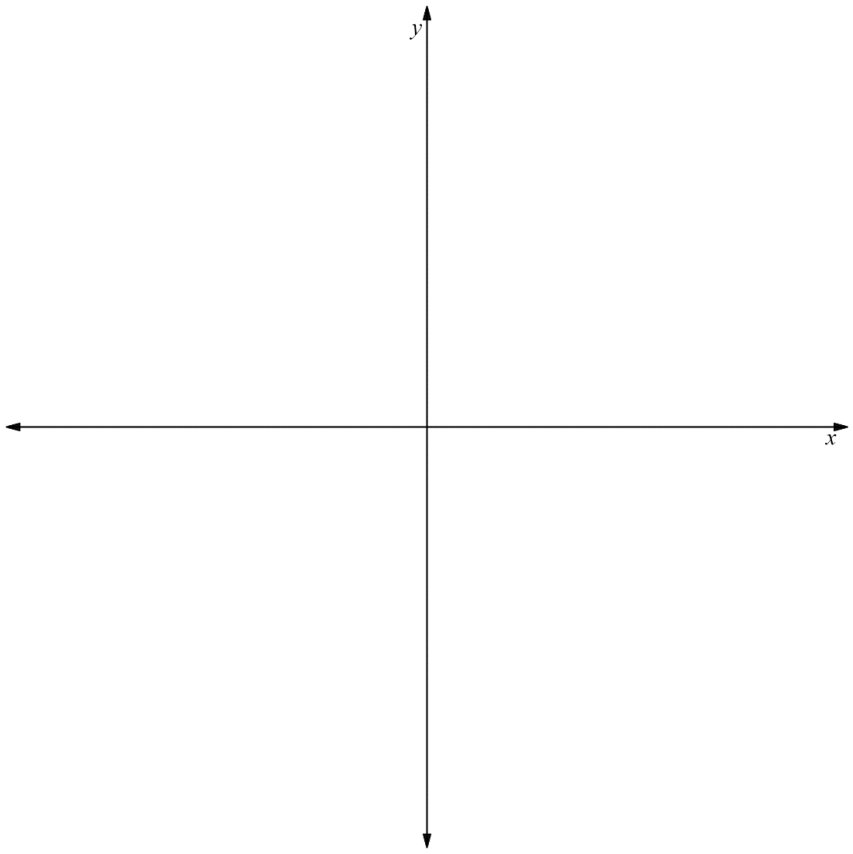


Figure 9

Part 3

Marker use

- Answer **all** questions in this part.
- This part assesses **Criterion 6**.

Question 34

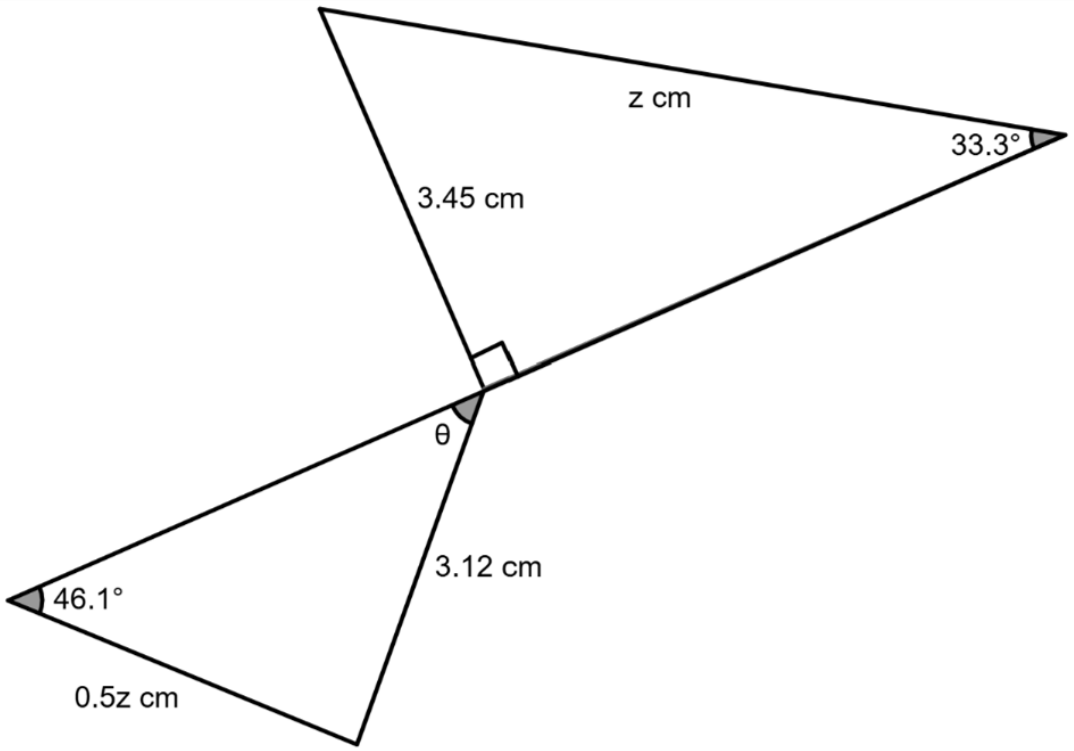


Figure 11

a) Determine the value of z using a right angle trigonometry rule.

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/1

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b) Determine the unknown angle θ.

/2

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Question 35

Marker use

a) State the period for each of the following trigonometric functions:

i. $y = 3\sin(4\pi x)$

..... /1

ii. The graph shown in Figure 12.

..... /1

iii. The graph shown in Figure 13.

..... /1

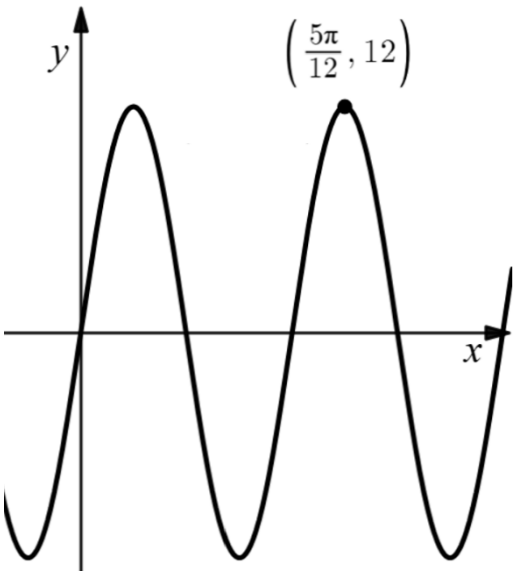


Figure 12

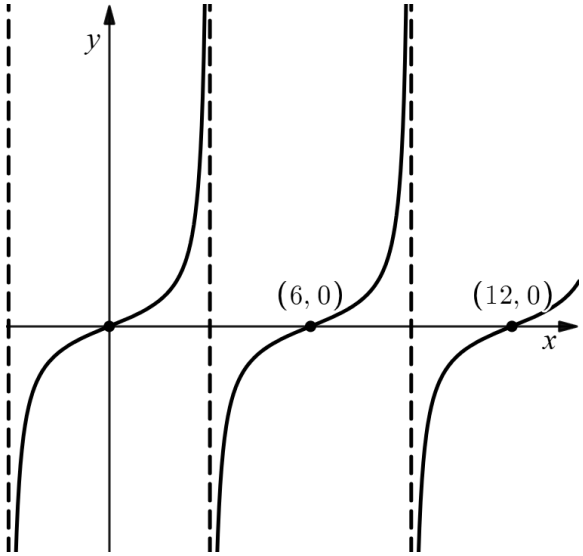


Figure 13

b) State the amplitude of the function in Figure 12.

..... /1

Question 36

Marker use

For the function $y = -4 \times 2^x + 8$ which has an asymptote at $y = 8$.

a) Sketch the graph of the function using Figure 14, labelling any intercepts.

/2

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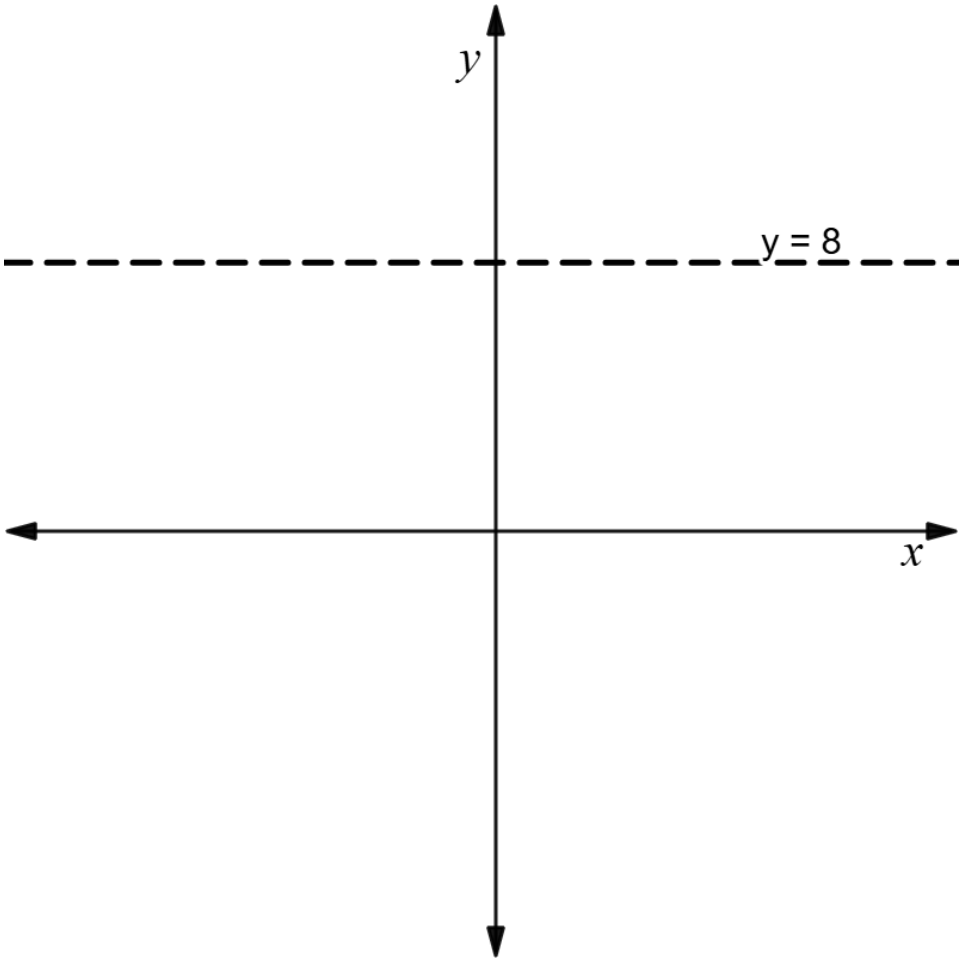


Figure 14

Spare diagram used (X) ☐

b) The point $(-2, p)$ lies on the function. Determine the value of p.

/1

.....

.....

c) State the range of the function.

/1

.....

Question 37

Marker use

/3

Sketch the graph of $f(x) = -10\cos(2x)$ for the domain $0 \leq x \leq \frac{3\pi}{2}$ using Figure 15.

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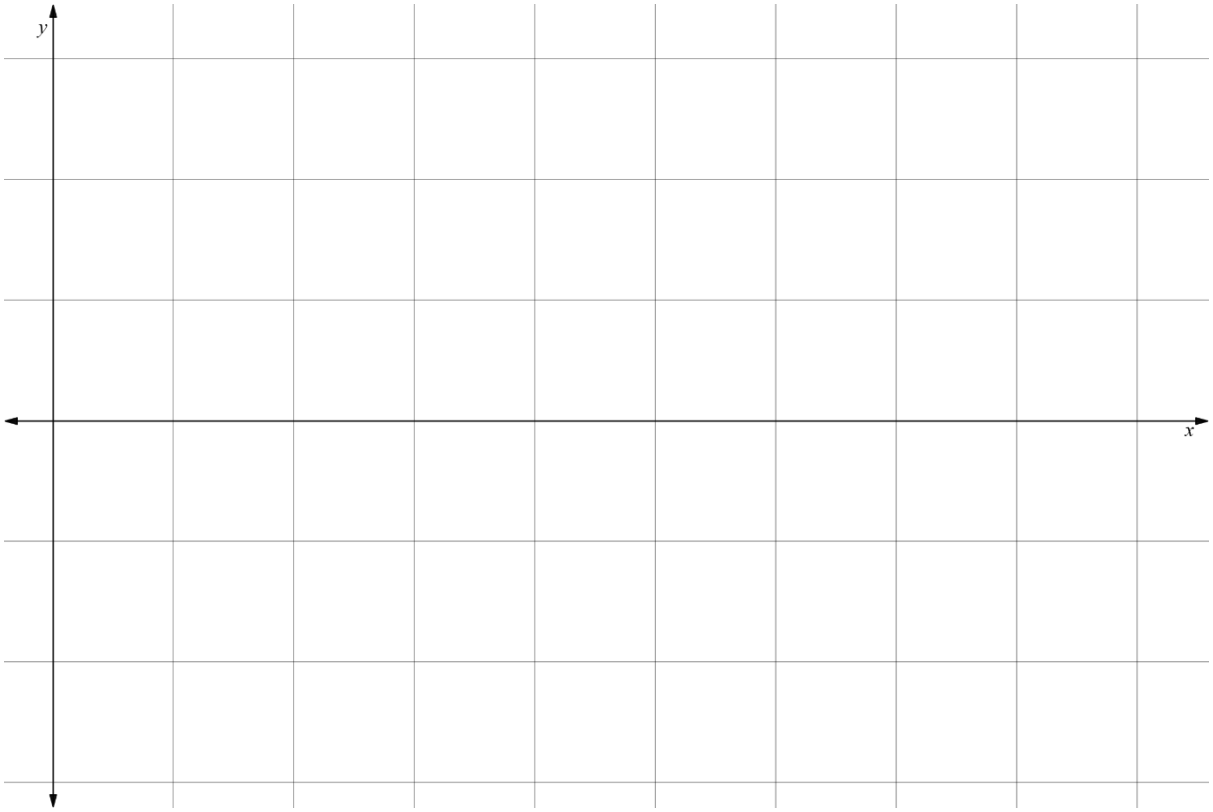


Figure 15

Spare diagram used (X) ☐

Question 38

Marker use

If $\cos\theta = -0.184$ and $90° < \theta < 180°$, use basic identities to determine the following correct to 3 decimal places:

a) $\sin(\theta)$.

/2

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.....

.....

.....

b) $\tan(\theta)$.

/1

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Question 39

The function $f(x) = 5\log_3(9 - x)$ has the domain $0 < x < 9$.

a) State the range.

/2

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.....

b) Determine x when $f(x) = 4$, correct to 3 decimal places.

/1

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Total P3

/20

Spare Diagrams

Question 36 a)

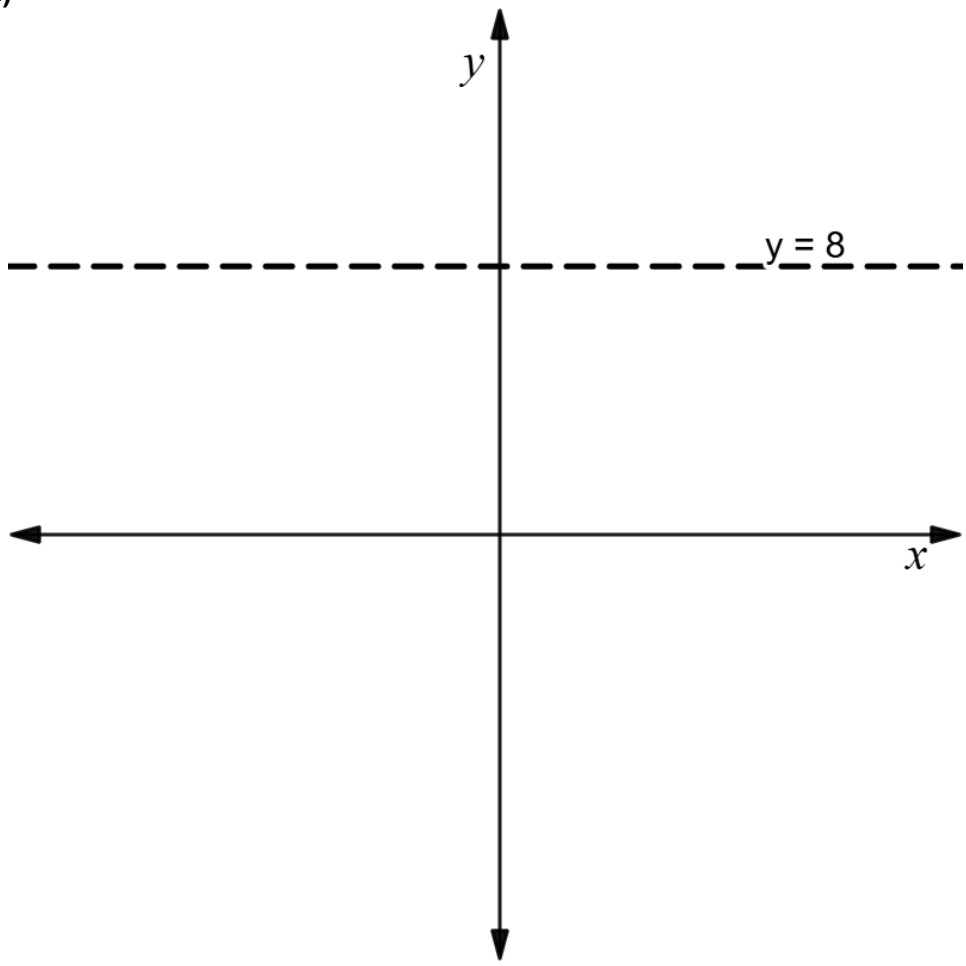


Figure 14

Question 37

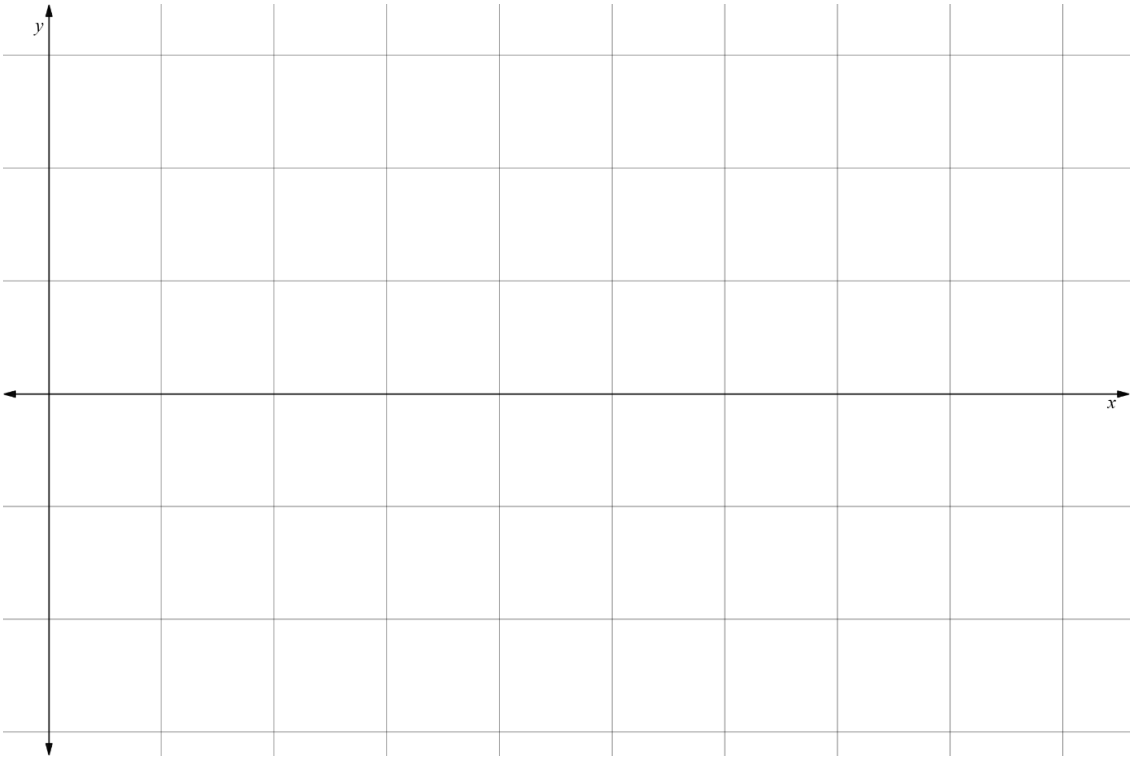


Figure 15

Part 4

Marker use

- Answer **all** questions in this part.
- This part assesses **Criterion 7**.

Question 40

The velocity (rate of change of displacement) of a drone is constant between A and B, zero between B and a chosen point C, and negatively decreasing between C and D.

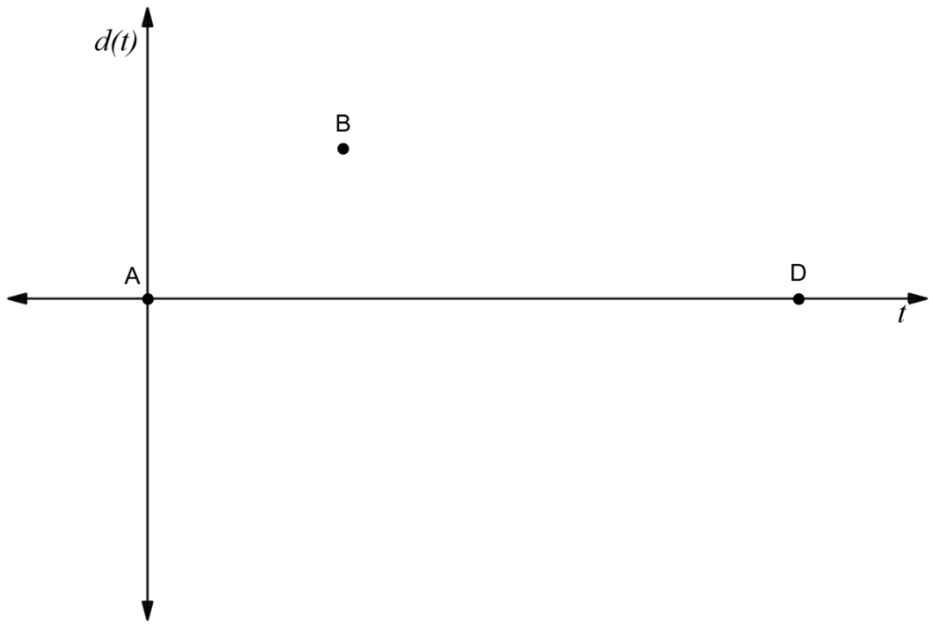


Figure 16

Spare diagram used (X) ☐

a) Complete the displacement-time graph in Figure 16 to show this information. /2

b) When is the drone's acceleration (rate of change of velocity) zero? /1

.....

Question 41

Marker use

Use calculus to find and classify any stationary points of $f(x) = x^3 - 2x^2 - 4x$, justifying their nature.

/5

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Question 42

The function $f(x) = -x(6 + x)$ has a gradient of 10 at a particular point.

a) Find the co-ordinates of the point.

/2

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b) Determine the equation of the tangent to the function when $x = -1$.

/2

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Question 43

Marker use

The temperature of a science experiment, $T(°C)$, after x minutes is given by the function $T(x) = -0.16x^4 + 100x + 24$.

a) State the initial temperature. /1

.....

b) Use calculus techniques to determine **when** the temperature is at a maximum. /2
No justification is required.

.....

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c) What is the maximum temperature to the nearest degree? /1

.....

Question 44

The function $f(x) = 3x^2 + 7x + b$ has tangent $y = x + 3$.

a) State the gradient of the tangent. /1

.....

b) Determine the value of b. /3

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Total P4 /20

Spare Diagram

Question 40 a)

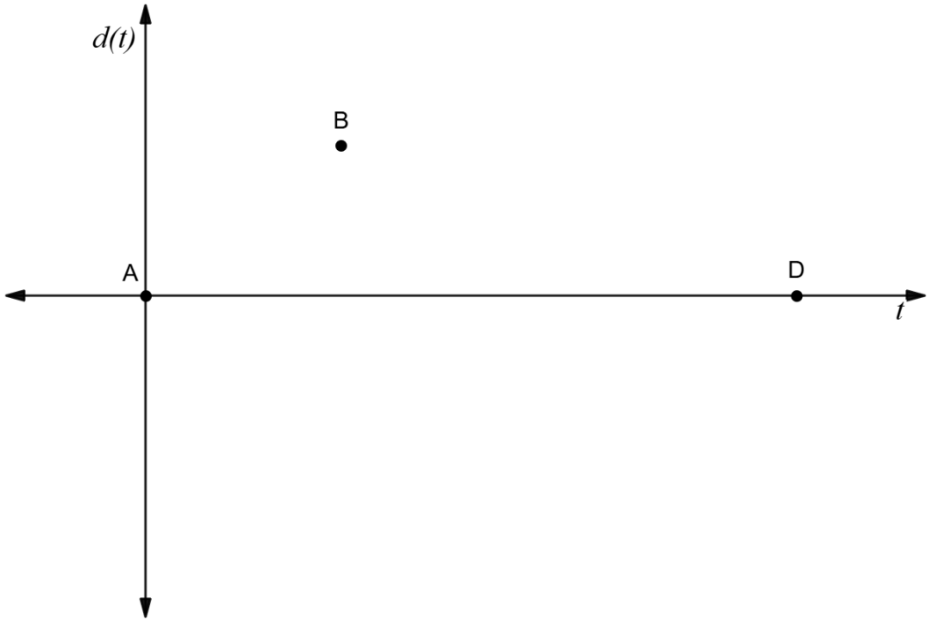


Figure 16

Part 5

Marker use

- Answer **all** questions in this part.
- This part assesses **Criterion 8**.

Question 45

The results of a zookeeper's survey of the colour and length of the 41 birds in their aviary are shown in Table 2.

	<15 cm	15 to 40 cm	>40 cm	**Totals**
Green	3	5	2	10
Brown	7	9	1	17
White	2	10	2	14
Totals	12	24	5	41

Table 2

a) What is the probability that a bird is white and >40 cm? /1

.....

b) What is the probability that a brown bird is not <15 cm? /2

.....

.....

c) What is the probability that a bird is green or 15 to 40 cm? /2

.....

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Question 46

Marker use

A gourmet cheese maker in North-West Tasmania makes 14 different cheeses:
7 types of hard cheese, 5 types of soft cheese, and the remainder are fresh cheese.
A customer chooses 4 cheeses to include in a tasting box.

a) How many different combinations of 4 cheeses could the customer choose? /1

.....

b) Determine the probability of the tasting box having:

i. Exactly 1 hard cheese. /2

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ii. 4 of the same type of cheese. /2

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Question 47

Tim has 5 waterfall photos and 3 beach photos that are not framed. How many combinations of waterfall or beach photos are possible if:

a) He chooses to get **at least** 1 of the photos framed? /1

.....

b) He decides to have an equal number of beach and waterfall photos framed? /3

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Question 48

Marker use

Molly is riding a downhill mountain bike course which has 3 jumps. The likelihood of landing (L) or stacking (S) each jump is independent and is shown by the partially completed tree diagram in Figure 17.

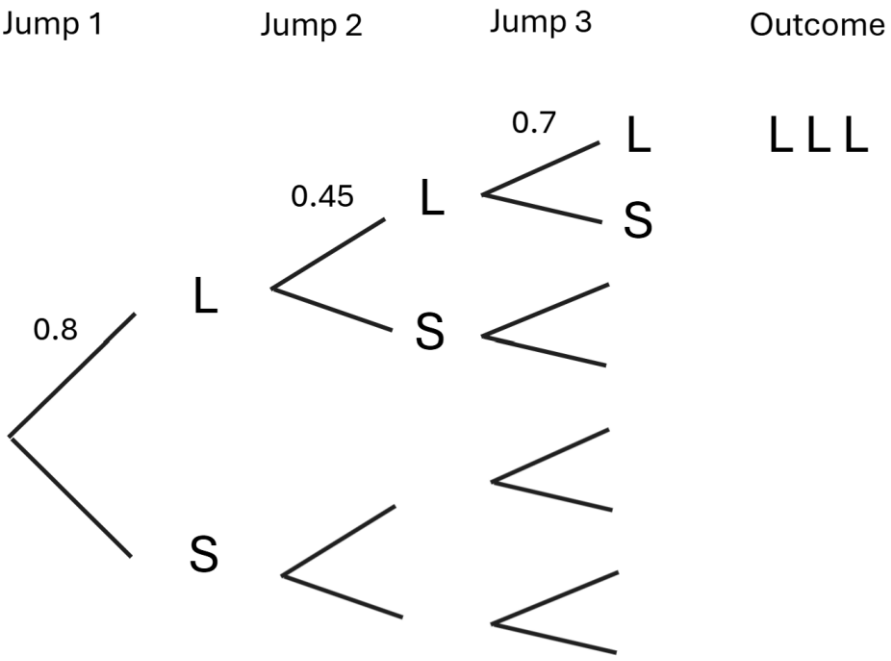


Figure 17

Spare diagram used (X) ☐

a) Complete the multi-stage tree diagram shown in Figure 17. /2

b) What is the probability that Molly will land:

i. All 3 jumps?

..... /1

ii. Exactly 2 jumps?

..... /2

.....

iii. The last jump?

..... /1

.....

Total P5 /20

Spare Diagram

Question 48 a)

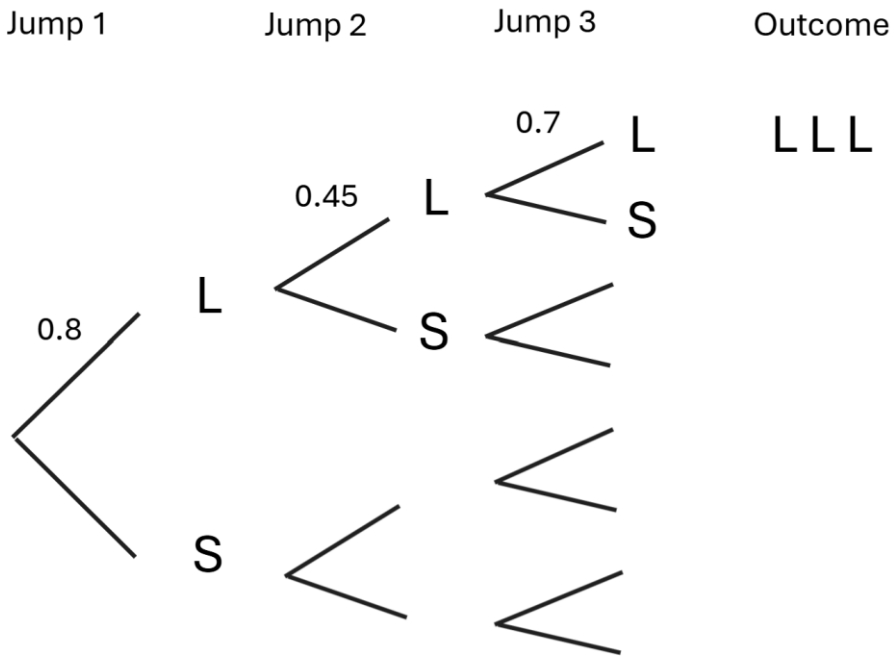


Figure 17

End of Section B

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