



**BAULKHAM HILLS
HIGH SCHOOL**

2022

**YEAR 11
ASSESSMENT TASK 1**

Mathematics Advanced

**General
Instructions**

- Reading time – 5 minutes
- Working time – 1 hour and 30 minutes
- Write using black pen
- NESA approved calculators may be used
- A reference sheet is provided
- In Questions 11 – 31, show relevant mathematical reasoning and/or calculations

**Total marks:
74**

Section I – 10 marks (pages 3–7)

- Attempt Questions 1 – 10
- Answer on answer sheet provided
- Allow about 15 minutes for this section

Section II – 64 marks (pages 8–18)

- Attempt Questions 11 – 31
- Allow about 1 hour and 15 minutes for this section

Section I

10 marks

Attempt Questions 1 – 10

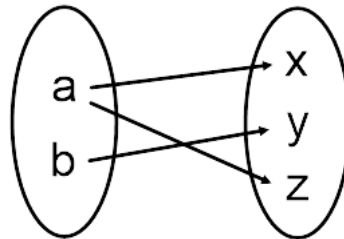
Allow about 15 minutes for this section

Use the multiple-choice answer sheet for Questions 1 – 10.

1 What is the value of $\sqrt[3]{\pi^2 - 5}$ correct to 2 significant figures?

- A. 1.6
- B. 1.69
- C. 1.7
- D. 1.70

2 What type of relation is shown?



- A. One to one
- B. One to many
- C. Many to one
- D. Many to many

3 Which polynomial below is a monic polynomial of degree 4 with a constant term of 3?

- A. $P(x) = -x^4 - x^3 + 3$
- B. $P(x) = x^3 - 3x^3 + 4$
- C. $P(x) = x^4 - 2x^3 + 3$
- D. $P(x) = 4x^4 - 3x^3 + 3$

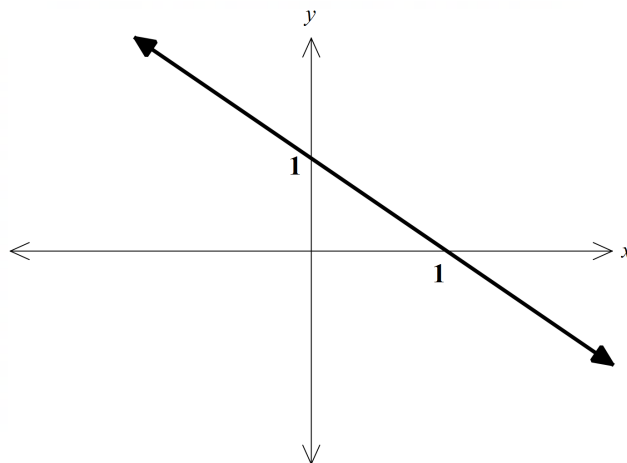
- 4 A group of 347 people were tested for flu and the results were recorded in the table below. The flu test results are not always accurate.

	Test results		Total
	Test indicated flu	Test did not indicate flu	
People with flu	72	3	75
People without flu	16	256	272
	88	259	347

A person is selected at random from the tested group.

What is the probability that their test result is accurate to the nearest per cent?

- A. 22%
- B. 82%
- C. 95%
- D. 96%
- 5 Which of the following equations best describes the graph shown?



- A. $x + y - 1 = 0$
- B. $x + y + 1 = 0$
- C. $x - y - 1 = 0$
- D. $x - y + 1 = 0$

- 6 What is the minimum value of the function $f(x) = x^2 - 2x - 2$?
- A. -3
- B. -2
- C. 0
- D. 2
- 7 Which of the following is equal to $\sqrt{2p^2} + \sqrt{8}$?
- A. $2p\sqrt{2}$
- B. $(p + 2)\sqrt{2}$
- C. $(p + 4)\sqrt{2}$
- D. $(p^2 + 4)\sqrt{2}$
- 8 A box contains 12 marbles that are identical in every way except colour. There are 8 marbles coloured red and the remainder of the marbles coloured blue. Two marbles are drawn randomly from the box.
- If the first marble is not replaced into the box before the second marble is drawn, what is the probability that the two marbles drawn are of different colours?
- A. $\frac{14}{33}$
- B. $\frac{15}{33}$
- C. $\frac{16}{33}$
- D. $\frac{17}{33}$

- 9 What is the natural domain of $f(x) = \frac{1}{\sqrt{x^2}}$?
- A. $x \in (-\infty, \infty)$
 - B. $x \in (0, \infty)$
 - C. $x \in [0, \infty)$
 - D. $x \in (-\infty, 0) \cup (0, \infty)$
- 10 In a certain experiment, the probability of events A and B are $P(A) = 0.7$ and $P(B) = 0.2$ respectively. Which of the following shows the events are independent?
- A. $P(A \cap B) = 0.35$
 - B. $P(A|B) = 0.7$
 - C. $P(B|A) = 0.7$
 - D. $P(A \cup B) = 0.76$

End of Multiple Choice Section

2022

Year 11 Assessment Task 1

Mathematics Advanced

Section II Answer Booklet

64 marks**Attempt Questions 11 – 31****Allow about 1 hour and 15 minutes for this section**

Instructions

- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
 - Your responses should include relevant mathematical reasoning and/or calculations.
 - Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.
-

Question 11 (2 marks)

Write the following without fractional or negative indices.

(a) $5m^{\frac{1}{2}}$ 1

.....

.....

(b) $\left(\frac{x}{y}\right)^{-3}$ 1

.....

.....

Question 12 (2 marks)

The probability of a bus arriving on time is $\frac{5}{9}$.

(a) What is the probability that the bus will not arrive on time? 1

.....

.....

(b) If there are 90 buses in operation each day, how many would be expected to arrive on time? 1

.....

.....

Question 13 (10 marks)

Simplify the following.

(a) $\frac{(-ab)^3 \times (ab)^4}{-a^5b^2}$ 2

.....

.....

.....

.....

Question 13 (continued)

(b) $\frac{x^2 - 3x + 2}{x^2 - 6x + 9} \div \frac{x^2 - 1}{x^2 - 2x - 3}$ 3

.....

.....

.....

.....

.....

.....

(c) $\frac{3}{x-2} + \frac{1}{x+3} - \frac{3x+4}{x^2+x-6}$ 3

.....

.....

.....

.....

.....

.....

.....

.....

.....

(d) $\frac{2x^2 + 3x + 1}{2x^3 + x^2 + 2x + 1}$ 2

.....

.....

.....

.....

.....

.....

Question 14 (2 marks)

Expand and simplify $2(m + 2)(m - 2) - (m + 3)^2$.

2

.....

.....

.....

Question 15 (2 marks)

Solve $\frac{3t}{5} = \frac{2t}{3} + 2$.

2

.....

.....

.....

.....

Question 16 (2 marks)

Solve for x . Leave your answer in exact form.

2

$$2x^2 - 3x - 1 = 0$$

.....

.....

.....

.....

Question 17 (2 marks)

Solve the simultaneous equations $3x - 3y + 21 = 0$ and $3x - 4y + 26 = 0$.

2

.....

.....

.....

.....

.....

.....

Question 18 (2 marks)

Solve $\frac{1}{4\sqrt{2}} = 32^x$.

2

.....

.....

.....

.....

.....

Question 19 (2 marks)

Rationalise the denominator of $\frac{2\sqrt{5}}{\sqrt{3}-\sqrt{5}}$.

2

.....

.....

.....

.....

.....

.....

Question 20 (2 marks)

For what values of k does the quadratic equation $x^2 - 8x + k = 0$ have real roots?

2

.....

.....

.....

.....

.....

.....

Question 21 (2 marks)

Simplify $\frac{9^m - 1}{3^m - 1}$.

2

.....

.....

.....

.....

.....

Question 22 (6 marks)

(a) Write $y = x^2 + 4x + 3$ in the form $y = (x - h)^2 + k$.

2

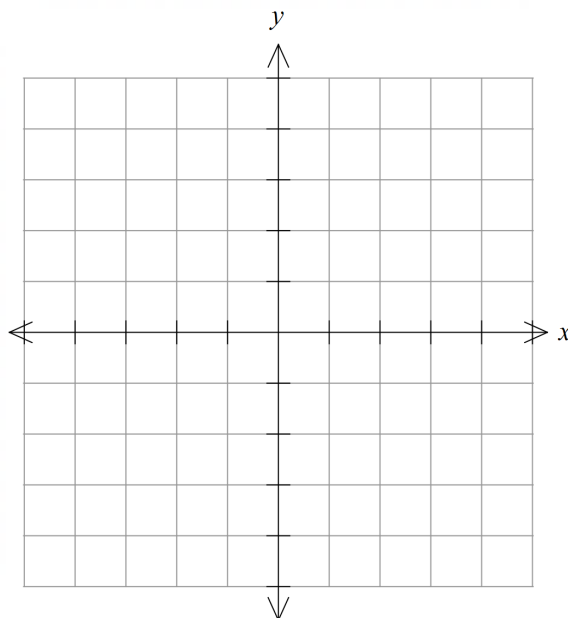
.....

.....

.....

(b) Hence, or otherwise, sketch the parabola $y = x^2 + 4x + 3$. Label all intercept(s) and the vertex.

2



(c) State the domain and range of $y = x^2 + 4x + 3$.

2

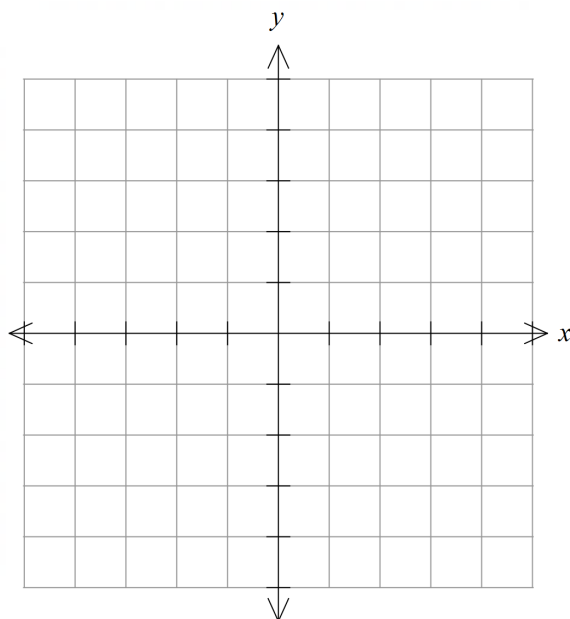
.....

.....

Question 23 (4 marks)

- (a) Sketch $y = \sqrt{9 - x^2}$.

2



- (b) State the domain and range of $y = \sqrt{9 - x^2}$.

2

.....

Question 24 (3 marks)

Find the equation of a parabola that passes through the points $(0, 1)$, $(-2, 3)$ and $(1, 6)$ in the form $y = ax^2 + bx + c$.

3

.....

Question 25 (3 marks)

Two identical biased coins are tossed together and the outcome is recorded. (For each toss, the probability of obtaining a head remains the same). After a large amount of trials, it is observed that the probability that both coins land showing heads is 0.36.

- (a) What is the probability of obtaining a head on a single toss of the coin? **1**

.....

.....

.....

- (b) What is the probability that when tossing two coins, one will land showing a head and one will land showing a tail in any order? **2**

.....

.....

.....

Question 26 (3 marks)

Tom and Jerry are playing a game. They take turns throwing two regular 6-sided dice. The game is won by the first player to throw a sum of 10 or more. Tom starts the game.

- (a) Find the probability that Tom wins the game on the first throw. **1**

.....

.....

.....

- (b) What is the probability that Tom wins the game on the first or the second throw? **2**

.....

.....

.....

.....

.....

.....

Question 27 (3 marks)

Solve simultaneously for x and y .

3

$$y = x^2 + 1$$

$$x - y + 3 = 0$$

.....

.....

.....

.....

.....

.....

.....

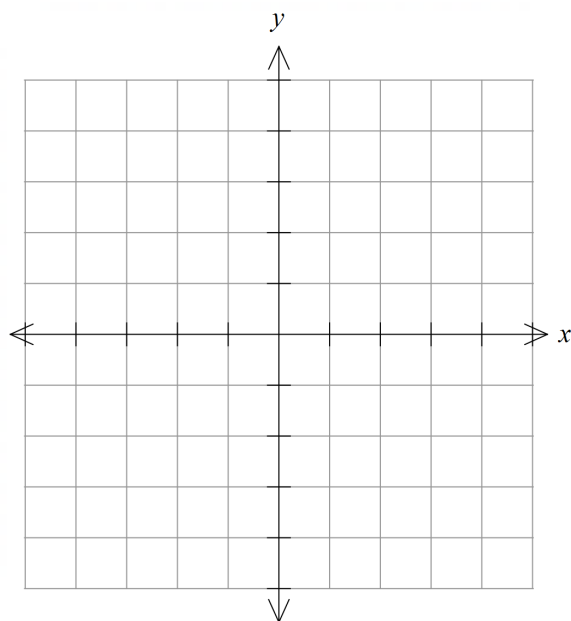
.....

Question 28 (3 marks)

Sketch the graph of $y = f(x)$, where

3

$$f(x) = \begin{cases} 4 - x^2, & x < 1 \\ x - 2, & x \geq 1 \end{cases}$$



Question 29 (2 marks)

For events A and B from a given sample space, $P(A) = \frac{1}{4}$, $P(B) = \frac{2}{3}$ and $P(A \cap B) = \frac{1}{6}$.

(a) Find $P(B')$.

1

.....

.....

.....

.....

(b) Find $P(A' \cap B)$.

1

.....

.....

.....

.....

.....

Question 30 (3 marks)

Solve $4^x - 3(2^x) + 2 = 0$.

3

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 31 (4 marks)

A piece of wire 28cm long is cut into two pieces. The first piece is bent to form a square. The second is bent to form a rectangle whose length is 3 times its breadth. Let the piece which is bent to form a square be $4p$ cm long.

- (a) If the sides of the rectangle are q and $3q$ cm respectively, show that

2

$$q = \frac{7 - p}{2}$$

.....

.....

.....

.....

- (b) If the sum of the areas of the square and the rectangle is 21cm^2 . Evaluate p .

2

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

End of paper

Section II extra writing space

If you use this space, clearly indicate which question you are answering.

This image shows a full page of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for handwriting practice or general writing. There are no margins, text, or other markings on the page.

This image shows a single page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



Solution

**BAULKHAM HILLS
HIGH SCHOOL**

2022

**YEAR 11
ASSESSMENT TASK 1
EXAMINATION**

Mathematics Advanced

**General
Instructions**

- Reading time – 5 minutes
- Working time – 1 hour and 30 minutes
- Write using black pen
- NESA approved calculators may be used
- A reference sheet is provided
- In Questions 11 – 31, show relevant mathematical reasoning and/or calculations

**Total marks:
74**

Section I – 10 marks (pages 3–7)

- Attempt Questions 1 – 10
- Answer on answer sheet provided
- Allow about 15 minutes for this section

Section II – 64 marks (pages 8–18)

- Attempt Questions 11 – 31
- Allow about 1 hour and 15 minutes for this section

Section I

10 marks

Attempt Questions 1 – 10

Allow about 15 minutes for this section

Use the multiple-choice answer sheet for Questions 1 – 10.

1 What is the value of $\sqrt[3]{\pi^2 - 5}$ correct to 2 significant figures?

A. 1.6

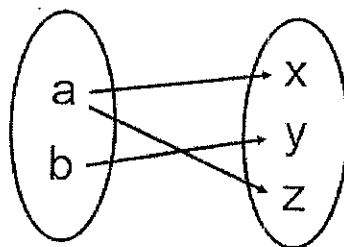
B. 1.69

☒ C. 1.7

D. 1.70

$$\begin{aligned} &= 1.69497... \\ &\approx 1.7 \end{aligned}$$

2 What type of relation is shown?



A. One to one

☒ B. One to many

C. Many to one

D. Many to many

3 Which polynomial below is a monic polynomial with constant term 3 and degree 4?

A. $P(x) = -x^4 - x^3 + 3$

B. $P(x) = x^3 - 3x^3 + 4$

☒ C. $P(x) = x^4 - 2x^3 + 3$

D. $P(x) = 4x^4 - 3x^3 + 3$

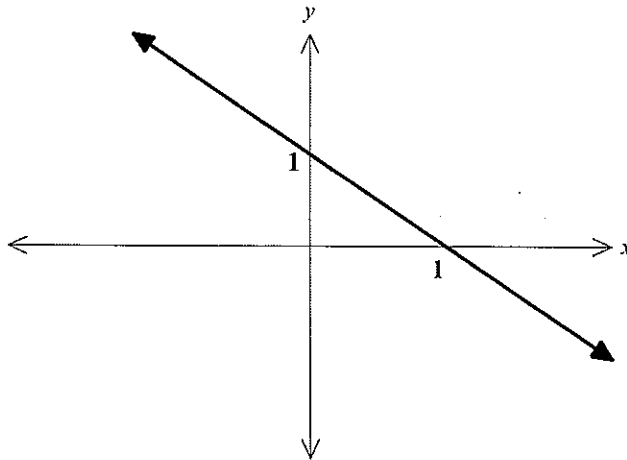
- 4 A group of 347 people were tested for flu and the results were recorded. The flu test results are not always accurate.

Test results			
	Test indicated flu	Test did not indicate flu	Total
People with flu	72	3	75
People without flu	16	256	272
	88	259	347

A person is selected at random from the tested group.

What is the probability that their test result is accurate to the nearest per cent?

- A. 22%
- B. 82%
- ☒ C. 95%
- D. 96%
- 5 Which of the following equations best describes the graph shown?



- ☒ A. $x + y - 1 = 0$
- B. $x + y + 1 = 0$
- C. $x - y - 1 = 0$
- D. $x - y + 1 = 0$

6 What is the minimum value of the function $f(x) = x^2 - 2x - 2$?

(A) -3

B. -2

C. 0

D. 2

$$x = \frac{-b}{2a}$$

$$= \frac{2}{2}$$

$$= 1$$

$$f(1) = 1^2 - 2 - 2 = -3$$

7 Which of the following is equal to $\sqrt{2p^2} + \sqrt{8}$?

A. $2p\sqrt{2}$

$$p\sqrt{2} + 2\sqrt{2}$$

(B) $(p+2)\sqrt{2}$

$$= (p+2)\sqrt{2}$$

C. $(p+4)\sqrt{2}$

D. $(p^2+4)\sqrt{2}$

8 A box contains 12 marbles that are identical in every way except colour. There are 8 marbles coloured red and the remainder of the marbles coloured blue. Two marbles are drawn randomly from the box.

If the first marble is not replaced into the box before the second marble is drawn. What is the probability that the two marbles drawn are of different colours?

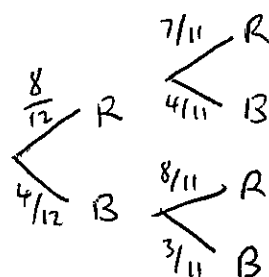
A. $\frac{14}{33}$

B. $\frac{15}{33}$

(C) $\frac{16}{33}$

D. $\frac{17}{33}$

8 Red, 4 Blue



$$\begin{aligned} \therefore P(RB \text{ or } BR) &= \frac{8}{12} \times \frac{4}{11} + \frac{4}{12} \times \frac{8}{11} \\ &= \frac{16}{33} \end{aligned}$$

9 What is the natural domain of $f(x) = \frac{1}{\sqrt{x^2}}$?

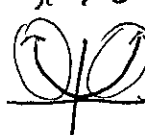
A. $x \in (-\infty, \infty)$

B. $x \in (0, \infty)$

C. $x \in [0, \infty)$

☒ D. $x \in (-\infty, 0) \cup (0, \infty)$

$x^2 > 0$



$\therefore x < 0, x > 0$

10 In a certain experiment, the probability of events A and B are $P(A) = 0.7$ and $P(B) = 0.2$ respectively. Which of the following shows the events are independent?

A. $P(A \cap B) = 0.35$

B. $P(A|B) = 0.7$

C. $P(B|A) = 0.7$

☒ D. $P(A \cup B) = 0.76$

$P(A \cap B) = P(A)P(B)$

$= 0.7 \times 0.2$

$= 0.14$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= 0.7 + 0.2 - 0.14$

$= 0.76$

End of Multiple Choice Section

Mathematics Advanced

Section II Answer Booklet

64 marks

Attempt Questions 11 – 31

Allow about 1 hour and 15 minutes for this section

Instructions

- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
 - Your responses should include relevant mathematical reasoning and/or calculations.
 - Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.
-

Question 11 (2 marks)

Write the following without fractional or negative indices.

(a) $5m^{\frac{1}{2}}$

1

$$= 5\sqrt{m}$$

1mk: Correct answer

(b) $\left(\frac{x}{y}\right)^{-3}$

1

$$\left(\frac{y}{x}\right)^3 \text{ or } \frac{y^3}{x^3}$$

1mk: Correct answer

Question 12 (2 marks)

The probability of a bus arriving on time is $\frac{5}{9}$.

(a) What is the probability that the bus will not arrive on time?

1

$$= \frac{4}{9}$$

1mk: Correct answer.

(b) If there are 90 buses in operation each day, how many would be expected to arrive on time?

1

$$= \frac{5}{9} \times 90$$

$$= 50$$

1mk: Correct answer.

Question 13 (10 marks)

Simplify the following.

(a) $\frac{(-ab)^3 \times (ab)^4}{-a^5b^2}$

2

$$= \frac{-a^3b^3 \times a^4b^4}{-a^5b^2}$$

$$= a^2b^5$$

2mk: Correct solution

1mk: Obtaining a^2 or b^5

(b) $\frac{x^2 - 3x + 2}{x^2 - 6x + 9} \div \frac{x^2 - 1}{x^2 - 2x - 3}$

3

$$= \frac{(x-2)(x-1)}{(x-3)^2} \times \frac{(x-3)(x+1)}{(x+1)(x-1)}$$

$$= \frac{x-2}{x-3}$$

3mk: Correct solution.

2mk: Factorises 3 expressions.

1mk: Factorises 1 expression.

(c) $\frac{3}{x-2} + \frac{1}{x+3} - \frac{3x+4}{x^2+x-6}$

3

$$= \frac{3(x+3)}{(x+3)(x-2)} + \frac{x-2}{(x+3)(x-2)} - \frac{3x+4}{(x+3)(x-2)}$$

$$= \frac{3(x+3) + (x-2) - 3x-4}{(x+3)(x-2)}$$

$$= \frac{3x+9+x-2-3x-4}{(x+3)(x-2)}$$

$$= \frac{x+3}{(x+3)(x-2)}$$

3mk: Correct solution.

2mk: Correctly obtains single fraction.

1mk: Attempts to express fraction with a common denominator.

$$= \frac{1}{(x-2)}$$

(d) $\frac{2x^2 + 3x + 1}{2x^3 + x^2 + 2x + 1}$

$$= \frac{2x^2 + 2x + x + 1}{2x(x^2+1) + 1(x+1)}$$

$$= \frac{(2x+1)(x+1)}{(2x+1)(x+1)}$$

$$= \frac{x(2x+1) + 1(2x+1)}{(x^2+1)(2x+1)}$$

2

$$= \frac{(2x+1)(x+1)}{(x^2+1)(2x+1)}$$

$$= \frac{x+1}{x^2+1}$$

2mk: Correct solution.

1mk: Factorises 1 expression.

Question 14 (2 marks)Expand and simplify $2(m+2)(m-2) - (m+3)^2$.

2

$$= 2(m^2 - 4) - (m^2 + 6m + 9)$$

$$= 2m^2 - 8 - m^2 - 6m - 9$$

2MK: Correct solution.

$$= m^2 - 6m - 17$$

1MK: Expands 1 product.

Question 15 (2 marks)Solve $\frac{3t}{5} = \frac{2t}{3} + 2$.

2

$$\frac{9t}{15} = \frac{10t}{15} + 2$$

$$9t = 10t + 30$$

$$-t = 30$$

2MK: Correct solution.

$$t = -30$$

1MK: Multiplies both sides by 15.

Question 16 (2 marks)Solve for x . Leave your answer in exact form.

2

$$2x^2 - 3x - 1 = 0$$

$$x = \frac{3 \pm \sqrt{(-3)^2 - 4 \times 2 \times (-1)}}{4}$$

$$= \frac{3 \pm \sqrt{17}}{4}$$

2MK: Correct solution.

1MK: Substitutes into quadratic formula.

Question 17 (2 marks)Solve the simultaneous equations $3x - 3y + 21 = 0$ and $3x - 4y + 26 = 0$.

2

$$\textcircled{1} - \textcircled{2}: \quad y - 5 = 0$$

$$y = 5$$

$$\text{Sub } y \text{ into } \textcircled{1}: \quad 3x - 3(5) + 21 = 0$$

$$3x = -6$$

2MK: Correct solution.

$$x = -2$$

1MK: Obtains correct x or y .

Question 18 (2 marks)

Solve $\frac{1}{4\sqrt{2}} = 32^x$.

2

$$\therefore \frac{1}{2^2 2^{1/2}} = 2^{5x}$$

$$2^{-\frac{5}{2}} = 2^{5x}$$

$$\therefore -\frac{5}{2} = 5x$$

$$x = -\frac{1}{2}$$

2MK: Correct solution.

1MK: Obtains same base.

Question 19 (2 marks)

Rationalise the denominator of $\frac{2\sqrt{5}}{\sqrt{3}-\sqrt{5}} \times \frac{\sqrt{3}+\sqrt{5}}{\sqrt{3}+\sqrt{5}}$

2

$$= \frac{2\sqrt{15} + 10}{3 - 5}$$

$$3 - 5$$

$$= \frac{2\sqrt{15} + 10}{-2}$$

$$-2$$

$$= -\sqrt{15} - 5$$

2MK: Correct solution.

1MK: Multiplies by conjugate

Question 20 (2 marks)For what values of k does the quadratic equation $x^2 - 8x + k = 0$ have real roots?

2

$$\Delta = (-8)^2 - 4 \times 1 \times k$$

$$= 64 - 4k$$

$$\text{Real roots: } \Delta \geq 0$$

$$\therefore 64 - 4k \geq 0$$

2MK: Correct solution.

$$64 \geq 4k$$

1MK: States $\Delta \geq 0$ or

$$k \leq 16.$$

calculates the discriminant.

Question 21 (2 marks)

Simplify $\frac{9^m - 1}{3^m - 1}$. 2

$$= \frac{3^{2m} - 1}{3^m - 1}$$

$$= \frac{(3^m)^2 - 1}{3^m - 1}$$

$$= \frac{(3^m + 1)(3^m - 1)}{3^m - 1}$$

$$= 3^m + 1$$

2MK: Correct solution

1MK: Obtains $(3^m)^2$ or equivalent merit

Question 22 (6 marks)

- (a) Write $y = x^2 + 4x + 3$ in the form $y = (x - h)^2 + k$. 2

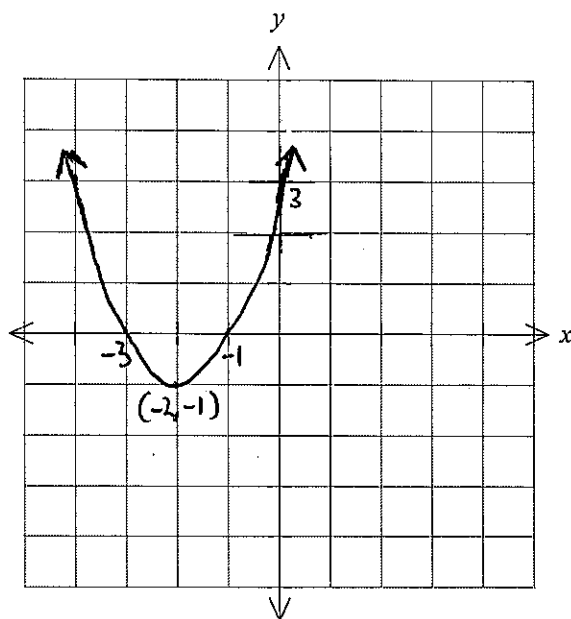
$$y = x^2 + 4x + 4 - 4 + 3$$

$$y = (x + 2)^2 - 1$$

2MK: Correct solution.

1MK: Obtains $(x + 2)^2$.

- (b) Hence, or otherwise, sketch the parabola $y = x^2 + 4x + 3$. Label all intercept(s) and the vertex. 2



2MK: Correct solution.

1MK: Correct shape or intercepts.

- (c) State the domain and range of $y = x^2 + 4x + 3$. 2

$$\text{Domain: } x \in (-\infty, \infty)$$

2MK: Correct solution.

$$\text{Range: } y \in [-1, \infty)$$

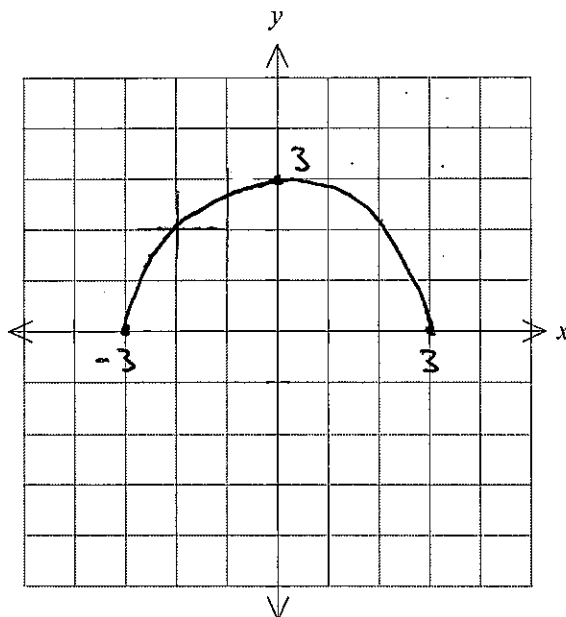
1MK: Correct domain or range.

* Must specify domain and range for full marks.

Question 23 (4 marks)

(a) Sketch $y = \sqrt{9 - x^2}$.

2



2MK: Correct solution.

1MK: Correct shape or intercepts.

(b) State the domain and range of $y = \sqrt{9 - x^2}$.

2

Domain: $x \in [-3, 3]$

2MK: Correct solution.

Range: $y \in [0, 3]$

1MK: Correct domain or range.

Question 24 (3 marks)

Find the equation of a parabola that passes through the points (0, 1), (-2, 3) and (1, 6) in the form $y = ax^2 + bx + c$.

3

y-int is 1. $\therefore c = 1$

$\therefore$ Substitute (-2, 3): $3 = 4a - 2b + 1$ (1)

Substitute (1, 6): $6 = a + b + 1$ (2)

(2) $\times 2$: $12 = 2a + 2b + 2$ (3)

(1) + (3): $15 = 6a + 3$

$a = 2$

3MK: Correct solution.

$\therefore$ Substitute a into (2): $6 = 2 + b + 1$

2MK: Obtains correct simultaneous equations and correct value for c .

$b = 3$

1MK: obtains 1 value or 3 correct simultaneous equations.

$\therefore a = 2, b = 3, c = 1$

$\therefore y = 2x^2 + 3x + 1$

Question 25 (3 marks)

Two identical biased coins are tossed together and the outcome is recorded. (For each toss, the probability of obtaining a head remains the same). After a large amount of trials, it is observed that the probability that both coins land showing heads is 0.36.

- (a) What is the probability of obtaining a head on a single toss of the coin?

1

$$P(H) \times P(H) = 0.36$$

$$\therefore P(H) = 0.6$$

1mk: Correct answer.

- (b) What is the probability that when tossing two coins, one will land showing a head and one will land showing a tail in any order?

2

$$P(T) = 0.4$$

$$\therefore P(HT \text{ or } TH) = 0.6 \times 0.4 + 0.4 \times 0.6$$

2mk: Correct solution.

$$= 0.48$$

1mk: Correct PCT.

Question 26 (3 marks)

Tom and Jerry are playing a game. They take turns throwing two regular 6-sided dice. The game is won by the first player to throw a sum of 10 or more. Tom starts the game.

- (a) Find the probability that Tom wins the game on the first throw.

1

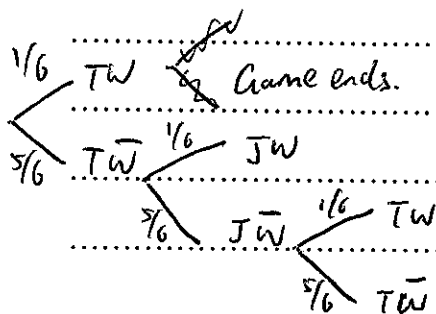
10 or more: (5,5), (6,4), (4,6), (6,5), (5,6), (6,6) $\therefore 6$ outcomes.

$$\therefore P(10 \text{ or more}) = \frac{6}{36} \text{ or } \frac{1}{6}$$

1mk: Correct answer.

- (b) What is the probability that Tom wins the game on the first or the second throw?

2



$$\therefore P(\text{Tom wins on 1st or 2nd})$$

$$= \frac{1}{6} + \left(\frac{5}{6}\right)^2 \left(\frac{1}{6}\right)$$

$$= \frac{61}{216}$$

2mk: Correct solution.

1mk: Significant progress

e.g. $\left(\frac{5}{6}\right) \left(\frac{1}{6}\right)$.

Question 27 (3 marks)

Solve simultaneously for x and y .

3

$$y = x^2 + 1 \quad (1)$$

$$x - y + 3 = 0 \quad (2)$$

$$y = x + 3 \quad (3)$$

Sub y into (3): $x^2 + 1 = x + 3$

$$x^2 - x - 2 = 0$$

$$(x - 2)(x + 1) = 0$$

$$\therefore x = 2 \text{ or } -1$$

$\therefore$ When $x = 2$, $y = 5$

When $x = -1$, $y = 2$

3MK: Correct solution.

2MK: Obtains both x 's or 1 pair of x and y .

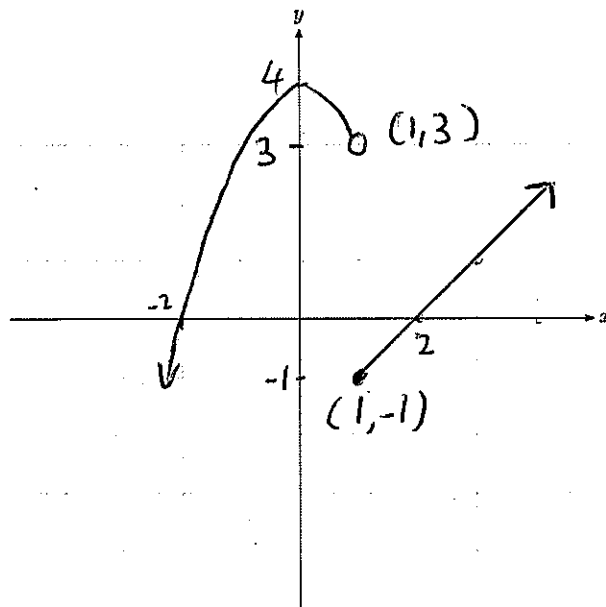
1MK: Correctly substitutes y or eliminate a variable.

Question 28 (3 marks)

Sketch the graph of $y = f(x)$, where

3

$$f(x) = \begin{cases} 4 - x^2, & x < 1 \\ x - 2, & x \geq 1 \end{cases}$$



3MK: Correct solution.

2MK: Correct shape for both branches

1MK: Correct shape for either branch.

Question 29 (2 marks)

For events A and B from a given sample space, $P(A) = \frac{1}{4}$, $P(B) = \frac{2}{3}$ and $P(A \cap B) = \frac{1}{6}$.

(a) Find $P(B')$.

1

$$= 1 - P(B)$$

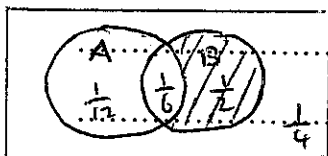
$$= 1 - \frac{2}{3}$$

$$= \frac{1}{3}$$

1mk: Correct answer.

(b) Find $P(A' \cap B)$.

1



$$\therefore P(A' \cap B) = \frac{1}{2}$$

1mk: Correct answer.

Question 30 (3 marks)

Solve $4^x - 3(2^x) + 2 = 0$.

3

$$(2^x)^2 - 3(2^x) + 2 = 0$$

$$\text{Let } u = 2^x: u^2 - 3u + 2 = 0$$

$$(u - 2)(u - 1) = 0$$

$$\therefore u = 2 \text{ or } 1$$

$$\therefore 2^x = 2 \text{ or } 2^x = 1$$

$$x = 1 \text{ or } x = 0$$

3mk: Correct solution.

1mk: Solves quadratic equation.

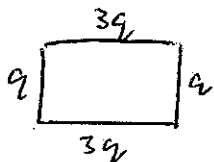
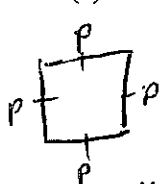
1mk: Correctly factorises for 2^x .

Question 31 (4 marks)

A piece of wire 28cm long is cut into two pieces. The first piece is bent to form a square. The second is bent to form a rectangle whose length is 3 times its breadth. Let the piece which is bent to form a square be $4p$ cm long.

- (a) If the sides of the rectangle are q and $3q$ cm respectively, show that

2



$$q = \frac{7-p}{2}$$

$$\therefore 4p + 8q = 28$$

$$p + 2q = 7$$

2MK: Correct proof.

$$q = \frac{7-p}{2} \text{ as required.}$$

1MK: Forms equation for length.

- (b) If the sum of the areas of the square and the rectangle is 21cm^2 . Evaluate p .

2

$$A = p^2 + 3q^2$$

$$21 = p^2 + 3\left(\frac{7-p}{2}\right)^2$$

$$84 = 4p^2 + 3(7-p)^2$$

$$84 = 4p^2 + 3(49 - 14p + p^2)$$

$$84 = 7p^2 - 42p + 147$$

$$7p^2 - 42p + 63 = 0$$

$$p^2 - 6p + 9 = 0$$

$$(p-3)^2 = 0$$

$$\therefore p = 3.$$

2MK: Correct solution.

1MK: Substitutes correctly into area equation.

End of paper