

NAME: _____

YEAR: _____

RATU NAVULA COLLEGE**YEAR 12 TRIAL EXAMINATION 2020****MATHEMATICS**

Time Allowed: 3 hours
(No reading time allowed)

INSTRUCTIONS

1. Write **Your Name, Year Level** on the front page of the **Paper**.
2. Answer all the questions with a blue or black ballpoint or ink pen. Do not use red ink pen. You may use a pencil only for drawing.
3. You may use a calculator, provided it is silent, battery-operated and non-programmable.
4. There are **nine strands** in the paper. All the strands are **compulsory**.
5. Round off answers to **2 decimal places** unless stated in the question.

SUMMARY OF QUESTIONS

STRAND	% Weighting	Suggested Time (Minutes)
BASIC MATHEMATICS	12	21
ALGEBRA	18	32
GRAPHS	12	21
COORDINATE GEOMETRY	7	13
TRIGNOMETRY	10	18
MATRICES AND GEOMETRY TRANSFORMATION	7	13
STATISTICS	6	12
PROBABILITY	10	18
CALCULUS	18	32
TOTAL	100	180

STRAND 1

BASIC MATHEMATICS

(12 MARKS)

- Choose the letter of the correct answer for Question 1 to 2
- Show all the working clearly for the following Question 3 to 7.

1.	If e is the identity element for an operation $\#$, then $(a \# e)$ is equal to A. a B. e C. 0 D. 1	(1 mark)
2.	If $a @ b = a^2 - b$, then $3 @ 4$ is equal to A. 5 B. 4 C. 3 D. 2	(1 mark)
3.	If $x = \log 2$ and $y = \log 4$, write an expression for $\log 64$ in terms of x and y .	(2 marks)
4.	Solve for x in the equation $2^{5x} = 2^{3x-8}$	(2 marks)

5.	Solve the value of x in $\log_2 16 = x$	(2 marks)
6.	Solve the equation $\frac{x+1}{4} = \frac{x-3}{5}$	(2 marks)

7.	Simplify: $\frac{4^{n+1} \times 2^2}{2^{2n+5}}$	(2 marks)
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STRAND 2

ALGEBRA

(18 MARKS)

- Choose the letter of the correct answer for Question 1 to 3
- Show all the working clearly for the following Question 4 to 10

1	Evaluate $\sum_0^1 n + 1$ is A. 2 B. 3 C. 4 D. 9	(1 mark)
2.	The solution set for $-2x \geq 2$ is given by A. $x < -1$ B. $x \leq -1$ C. $x \geq -1$ D. $x > -1$	(1 mark)

3.	<p>When simplified $\frac{x^2-9}{x+3}$ equals</p> <p>A. $x-3$ B. $x+3$ C. $\frac{1}{x+3}$ D. $\frac{1}{x-3}$</p>	(1 mark)
4.	<p>Using the quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ to solve the equation</p> $3x^2 + 11x = 6$	(2marks)

5.	Simplified $\frac{x^2+2xy}{2x^3y} \cdot \frac{xy+2y^2}{6x^2y^3}$	(3 marks)
6.	Find the value of x for which $\frac{2x-1}{3} = 5$	(2 marks)

7.	Make k the subject of the formula $r = \frac{2k+w}{3}$	(2 marks)
8.	A quadratic equation is given as $x^2 - px + 4 = 0$. Find the values of p such that $x^2 - px + 4 = 0$ has two distinct real roots. (Hint: $b^2 - 4ac > 0$).	(2 marks)

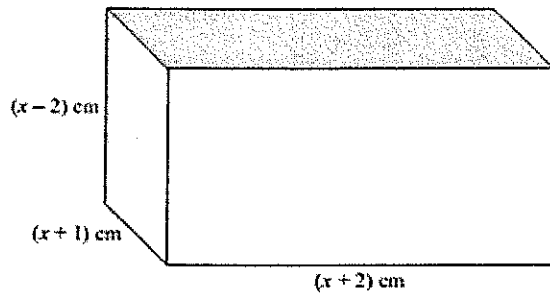
9.

A polynomial function is given by $f(x) = x^3 - 5x^2 - 2x + 24$. Given that $(x+2)$ is one of the factors of $f(x)$, find the other two factors.

(3 marks)

10.

A box is given below.



Write the expression for the volume (cm^3) of the box above in terms of x . (Do not expand)

(1 mark)

STRAND 3

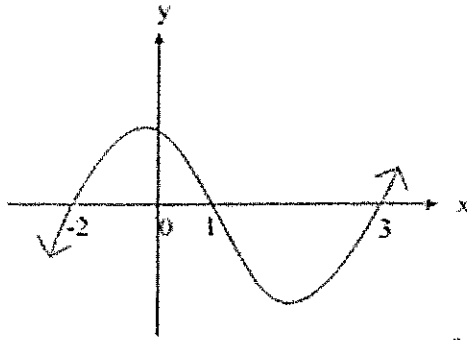
GRAPHS

(12 MARKS)

- Choose the letter of the correct answer for Question 1 to 3
- Show all the working clearly for the following Question 4 to 5

1.

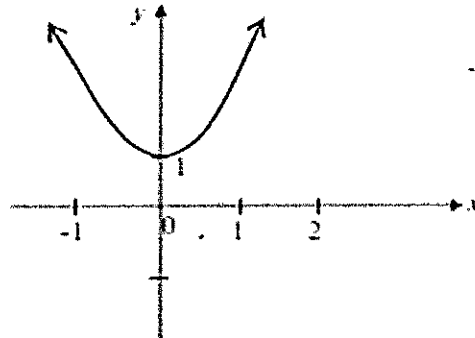
The equation of the graph shown is



- A. $y = (x-2)(x+1)(x+3)$
 B. $y = -(x-2)(x+1)(x+3)$
 C. $y = (x+2)(x-1)(x-3)$
 D. $y = -(x+2)(x-1)(x-3)$

(1 mark)

2.

The graph of the function $y = x^2 + 1$ is given below

The range of the function is

- A. $y > 1$
 B. $y < 1$
 C. $y \leq 1$
 D. $y \geq 1$

(1 mark)

3.	<p>The coordinate of the turning point given the equation $y = (x + 2)^2 - 1$ is</p> <p>A. (2,1) B. (-2,-1) C. (-1,2) D. (1,2)</p>	(1 mark)
4.	<p>A hyperbolic function is given by $y = \frac{x+2}{x-3}$</p> <p>(a) Write down the x - intercept of the function.</p>	(1 mark)
	<p>(b) Write down the y - intercept of the function.</p>	(1 mark)
	<p>(c) State the equation of the vertical asymptote.</p>	(1 mark)
	<p>(d) State the equation of the horizontal asymptote.</p>	(1 mark)

	<p>(e) Sketch the graph of this function.</p>	<p>(2 marks)</p>
5.	<p>Find the points of intersection of the line $x + y = 6$ and the hyperbola $xy - 5 = 0$.</p>	<p>(3 marks)</p>

STRAND 4

COORDINATE GEOMETRY

(7 MARKS)

- Choose the letter of the correct answer for Question 1 to 2
- Show all the working clearly for the following Question 3 to 4

1.	<p>The gradient of line $y = -3x + 5$ is</p> <p>A. 5 B. 3 C. $\frac{1}{3}$ D. -3</p>	(1 mark)
2.	<p>The gradient of the line that has a y- intercept of 5 and cross through x- axis at an angle of 45° is</p> <p>USE: $m = \tan\theta$</p> <p>A. 5 B. 45 C. 0 D. 1</p>	(1 mark)
3.	<p>Given points A (-2, -5) and B(4, 9) on the graph. Find the:</p> <p>(a) Gradient of point AB</p> <p>USE: $m = \frac{y_2 - y_1}{x_2 - x_1}$</p>	(1 mark)

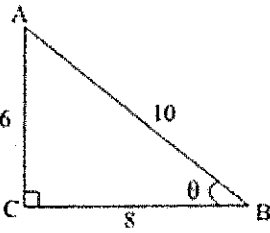
	<p>(b) Midpoint of AB $MP = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right)$</p>	<p>(1 mark)</p>
4	<p>Write the equation of the line parallel to $y + 3x - 2 = 0$ and passing through the midpoint of $A(-6,3)$ and $B(2,-1)$</p> <p>USE: $y - y_1 = m(x - x_1)$; $MP = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right)$; $m = \frac{y_2-y_1}{x_2-x_1}$</p>	<p>(3 marks)</p>

STRAND 5

TRIGONOMETRY

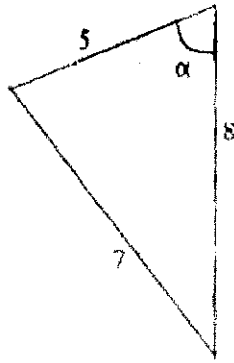
(10 MARKS)

- Choose the letter of the correct answer for Question 1 to 2
- Show all the working clearly for the following Question 3 to 5

1.	<p>In the right – angled triangle shown below, $\sin \theta$ is represented by</p>  <p>A. $\frac{8}{6}$ B. $\frac{8}{10}$ C. $\frac{6}{8}$ D. $\frac{6}{10}$</p>	(1 mark)
2.	<p>How many radians make up a full turn?</p> <p>A. 2 B. π C. 2π D. 360°</p>	(1 mark)

3

In the triangle given below find the size of the angle α
(Hint: $a^2 = b^2 + c^2 - 2bc \cos A$)



(2 marks)

4.

Solve for θ given in the function

$$y = 2\sin\left(\theta - \frac{\pi}{2}\right) = 1 \text{ for } 0 \leq \theta \leq 2\pi$$

(3 marks)

5

Sketch the graph of $y = \sin 2x$ **(3 marks)**

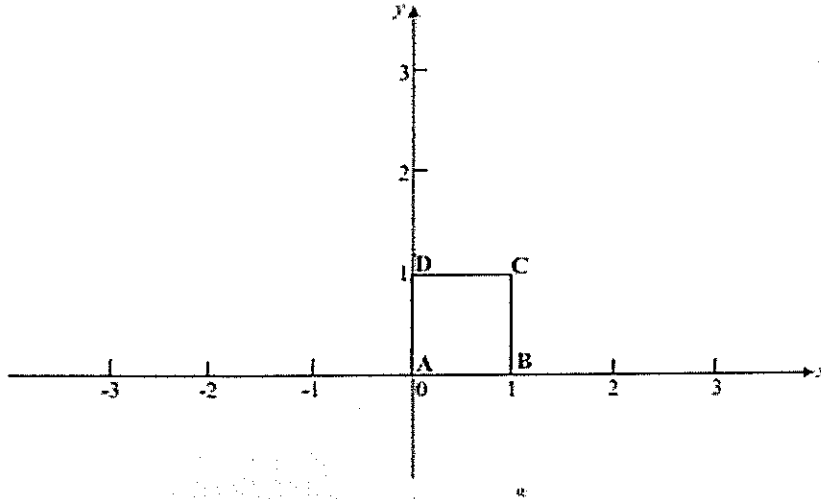
STRAND 6 MATRICES AND GEOMETRY TRANSFORMATION (7 MARKS)

- Choose the letter of the correct answer for Question 1
- Show all the working clearly for the following Question 2 to 3

1.	The determinant of Matrix $A = \begin{pmatrix} -3 & -1 \\ 4 & 2 \end{pmatrix}$ <p>A. -10 B. -5 C. -2 D. 2</p>	(1 mark)
2.	$A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 0 \\ -3 & 6 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -2 \\ 5 & 10 \end{bmatrix}$, find $(A + B) - C$.	(2 marks)

3.

The figure ABCD below is transformed by the matrix $N = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$



The coordinates of the images of A, B and D under the transformation by matrix $N \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ are $A' (0, 0)$, $B' (-1, 0)$ and $D' (0, 1)$.

(a) Find the coordinates C'.

(1 mark)

(b) On the same pair of axes given above draw the image of figure ABCD.

(2 marks)

(c) Describe fully the transformation given by matrix N.

(1 mark)

STRAND 7

STATISTICS

(6 MARKS)

- Choose the letter of the correct answer for Question 1 to 2
- Show all the working clearly for the following Question 3

1.	<p>A group of 4 boys have a total weight of 200kg. Another boy whose weight is 60kg is to be included in the group. The mean weight of the 5 students will be</p> <p>A. 50kg B. 51kg C. 52kg D. 53kg</p>	(1 mark)
2.	<p>Given ungrouped data 5, 6, 10, 4, 7, 2, 8, 8, 5, the standard deviation is</p> <p>A. 2.08 B. 2.18 C. 2.28 D. 2.38</p>	(1 mark)
3.	<p>The marks scored by a group of students are given below:</p> <p style="text-align: center;">20, 30, 35, 49, 50, 53, 67.</p> <p>Find the following:</p> <p>(a) Mean score</p>	(1 mark)
	<p>(b) Median</p>	(1 mark)

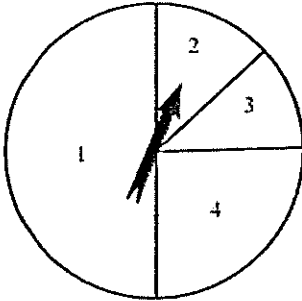
	(c) Upper quartile	(1 mark)
	(d) Range	(1 mark)

STRAND 8

PROBABILITY

(10 MARKS)

- Choose the letter of the correct answer for Question 1 to 2
- Show all the working clearly for the following Question 3 to 5

1.	<p>A spinner is made by dividing a circular board into four sectors as shown below.</p>  <p>The probability when the spinner will be at 2 is:</p> <p>A. $\frac{1}{4}$ B. $\frac{1}{2}$ C. $\frac{1}{8}$ D. 1</p>	(1 mark)
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2.	<p>Two identical dice are rolled simultaneously. Event A = the sum of the numbers is an even number. How many outcomes satisfy Event A.</p> <p>A. 20 B. 18 C. 36 D. 12</p>	(1 mark)
3.	<p>A bag contains 3 yellow marbles, 5 red marbles and 4 green marbles of the same size.</p> <p>(a) How many marbles are in the bag?</p> <p style="text-align: center;">"</p>	(1 mark)
	<p>(b) If a marble is drawn at random from the bag, what is the probability that it will be green?</p>	(1 mark)
4.	<p>A fair coin is tossed two times and the outcomes are noted.</p> <p>(a) List the sample space (set of all possible outcomes). Use H for head and T for tail.</p>	(2 marks)

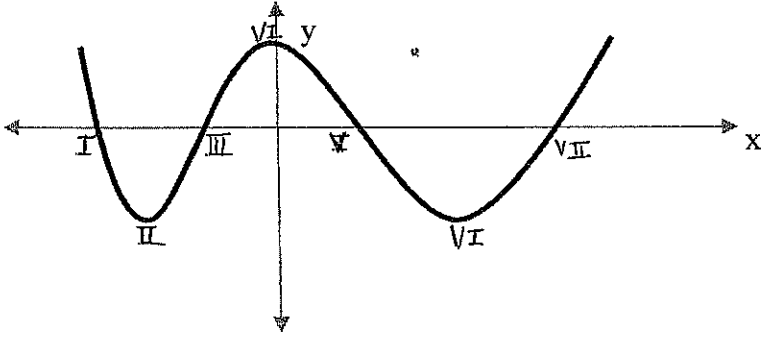
	(b) Find the probability that 2 heads turn up.	(1 mark)
5.	<p>A study is made on how long certain batteries last. The results follow a normal distribution with a mean of 500 hours and standard deviation of 40 hours.</p> <p>(a) A battery which lasts less than 376 hours is called a failure. What is the probability of getting a failure? Give your answer to 3 decimal places. "</p> <p>Use : $z = \frac{x - \bar{x}}{\sigma}$</p>	(2 marks)
	(b) Each failure costs \$50 to be replaced. From 7000 batteries, what would be the expected cost of replacing the failures?	(1 mark)

STRAND 9

CALCULUS

(18 MARKS)

- Choose the letter of the correct answer for Question 1 to 3
- Show all the working clearly for the following Question 4 to 6.

1.	<p>The derivative of $f(x) = 2x + 5$ is</p> <p>A. 2 B. 5 C. x^2 D. $x^2 + 5$</p>	(1 mark)
2.	<p>The graph of the function $f(x)$ is shown with points labeled on it</p>  <p>Which of the points correctly show $f'(x) = 0$?</p> <p>A. I, IV, V B. II, V, I C. II, VI, IV D. III, V, VII</p>	(1 mark)
3.	<p>Which of the following statement is NOT true?</p> <p>A. At turning point $f'(x) = 0$ B. $f'(x) > 0$ is maximum point C. to get the gradient differentiate $f'(x)$. D. a function is increasing when the function has a positive gradient.</p>	(1 mark)

4.	<p>A curve has a gradient (derived) function given by: $\frac{dy}{dx} = 3x^2 + 2x + 4$. It passes through the point (1, 8). Find the equation of the curve by integrating the function and calculating the constant of integration.</p>	(3 marks)
5.	<p>A cubic function is given by the equation $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 12x + 6$</p> <p>(a) Find $\frac{dy}{dx}$</p>	(2 marks)

(b) Determine the coordinates of the turning points of

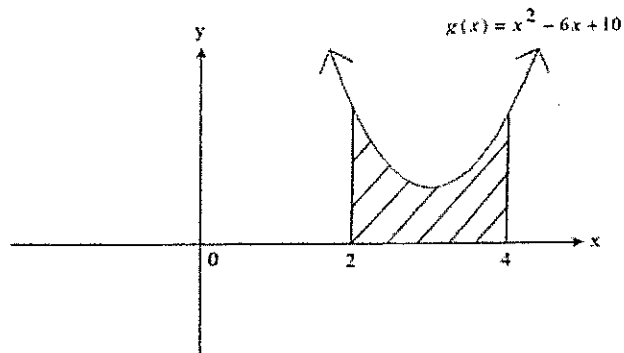
$$y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 12x + 6$$

(3 marks)

(c) Hence state the nature of the turning point.

(2 marks)

6. The area bounded by the parabola $g(x) = x^2 - 6x + 10$, the x-axis, and the lines $x = 2$ and $x = 4$ is shown below



- (a) Write an expression to find the area of the shaded region.

(2 marks)

- (b) Hence calculate the area of the shaded region

(3 marks)

THE END

