

2023 SUPER MOCK 2 ELECTIVE MATHEMATICS 2
FURTHER MATHEMATICS/ MATHEMATICS (ELECTIVE) 2

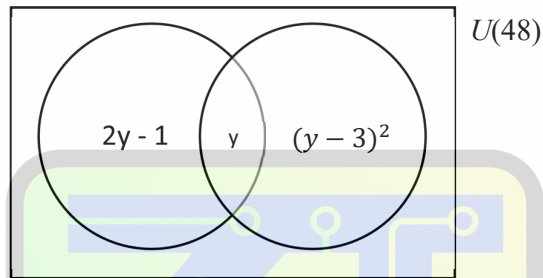
2 hours 30 minutes

[100 marks]

SECTION A
[48 Marks]

*Answer **all** the questions in this section. All questions carry **equal** marks.*

1. (a) The breakfast menu in a hotel is a choice of Rice(R) and Beans(B) or both. The Venn diagram shows the choice made by 48 guests of the hotel, find the value of y



- (b) simplify $\frac{\sec\theta}{\cos\theta} - \frac{\tan\theta}{\cot\theta}$

2. (a) If $\log_{81} y = n \log_3 y$ find the value of n

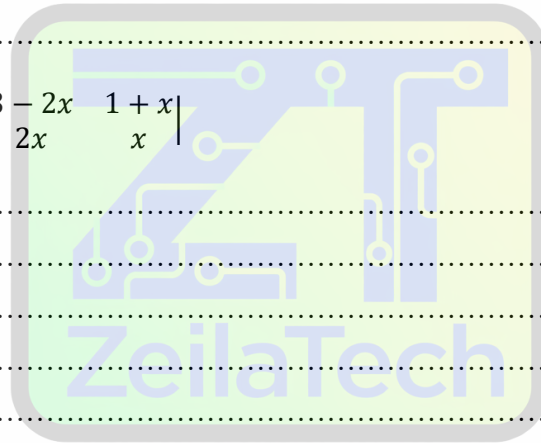
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(b) If α and β are the roots of $x^2 + kx + 11 = 0$ and $\alpha^2 + \beta^2 = 27$, find the value of k

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3. Solve $\begin{vmatrix} 5-2x & 4x \\ 2-x & 3x \end{vmatrix} = \begin{vmatrix} 3-2x & 1+x \\ 2x & x \end{vmatrix}$

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4. Draw and shade the regions which satisfy simultaneously the inequalities;

$$x + y \leq 10, y - x \geq 0, y \geq 2, x \geq 0, 2x + 4 \geq y$$

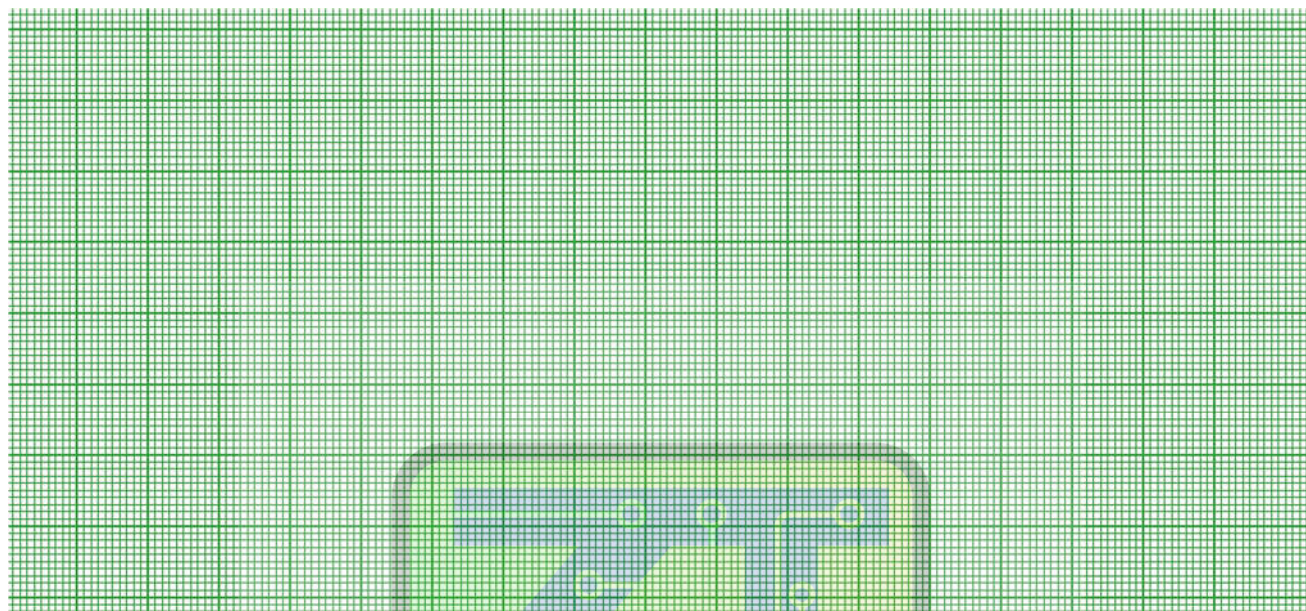
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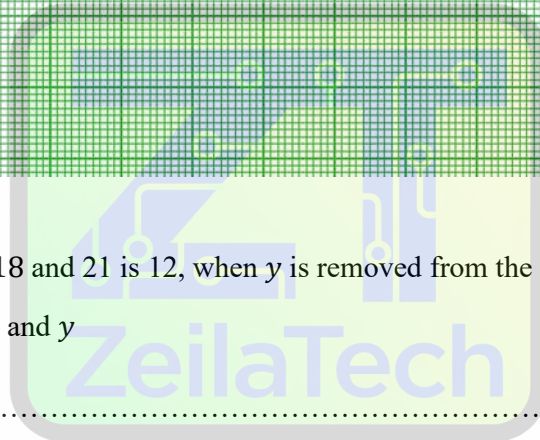
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5. (a) If mean of 4, 7, x , y , 18 and 21 is 12, when y is removed from the distribution, the mean becomes $12\frac{3}{5}$, find the values of x and y



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- (b) Evaluate $\int_{-1}^1 (2x + 1)dx$

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A	1.42	2.50	2.35	1.55	3.20	3.20	1.62
B	10	12	24	10	15	26	11
C	105	110	124	110	115	126	110

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time taken to reach that height. [Take $g = 10 \text{ ms}^{-2}$]

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(b) The forces $F_1 = (2i + 3j)N$, $F_2 = (-5i + j)N$, and $F_3 = (6i)N$ act on a particle. Find the magnitude of the resultant force F .

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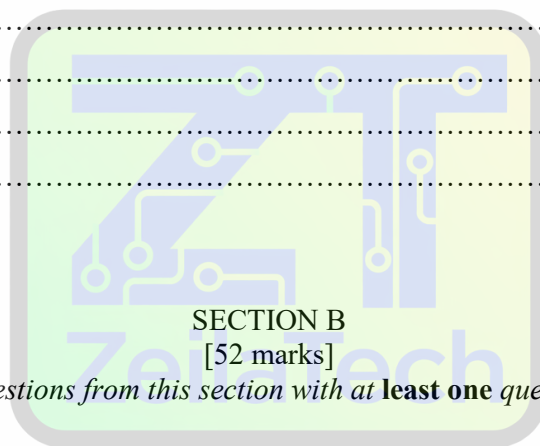
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SECTION B
[52 marks]

*Answer only **four** questions from this section with at **least one** question from each part.*

PART I

PURE MATHEMATICS

9. (a) Find the derivative of $\frac{1}{x^2}$ with respect to x from first principle.
 (b) A circle passes through the points P(-2,0), Q(1,0) and R(2,-1), find the
 (i) co-ordinate of the centre
 (ii) radius
 (iii) the equation of the circle.

10. The table below shows the set of experimental research for two variables x and y

x	2	4	8	12
y	50	70	99	121

Assuming x and y are related by an equation of the form $y = px^n$, draw a suitable line to represent the relation. Deduce the values of p and n . Find the value of y when $x = 10$

11. (a) A sequence is given by the relation $u_{n+1} + n^2 = nu_n + 2$, given that $u_1 = 2$ and $n \geq 1$, find u_2 , u_3 and u_4

- (b) The first three terms of a GP are; $2x - 1$, $x + 1$, and $x - 1$, find the possible values of x and hence calculate the sum to infinity of the G.p

PART II

STATISTICS AND PROBABILITY

12. The table below shows the marks of 50 students in an examination. Using an assumed mean of 68.
a. Copy and complete the table

Marks	f	x	$d = x - 68$	fd	Marks less than	Cumm. Freq.
51 – 55	3				55.5	
56 – 60	8				60.5	
61 – 65	12				65.5	
66 – 70	15				70.5	
71 – 75	10				75.5	
76 - 80	2				80.5	
Total	50					

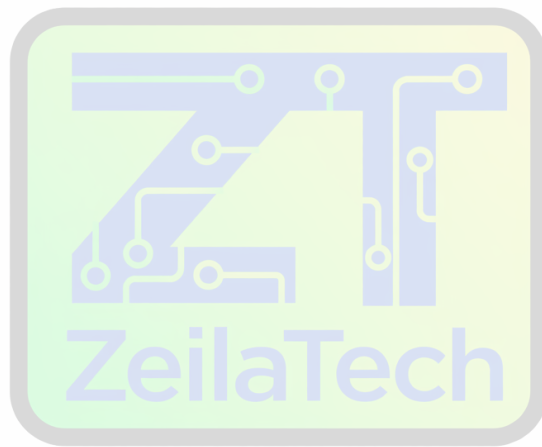
- b. Calculate the mean mark.
c. (i) Draw a cumulative frequency curve for the data
(ii) Using your graph, find the number of students who failed if the pass mark is 69.
(iii) Find the 80th percentile
13. Research found that 40% of Ghanaian do not think that having a university degree is important to succeed in their business world. If a random sample of five Ghanaian is selected. Find the probability that;
- Exactly 2 people will agree
 - Exactly 3 people will not agree
 - At least 2 people will agree

PART III

VECTORS AND MECHANICS

14. The coordinates of the vertices of a parallelogram QRST are, Q(1,6), R(2,2), S(5,4) and T(x, y).
a. Find $\overrightarrow{QR}$ and $\overrightarrow{TS}$ and hence determine the values of x and y
b. Calculate the magnitude of $\overrightarrow{TS}$ and $\overrightarrow{TQ}$
c. Find the angle QTS
15. A particle of mass 4kg moving with velocity $(\begin{smallmatrix} 5 \\ 3 \end{smallmatrix})ms^{-1}$ collides with another particle of mass 6kg moving with velocity $(\begin{smallmatrix} 5 \\ 12 \end{smallmatrix})ms^{-1}$. They move together after collision. If they were moving in the opposite direction before collision, find;
a. The magnitude of their common velocity
b. The direction correct, to the nearest degree of their common velocity

END OF PAPER



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