HILLCRESCENT PRIVATE SECONDARY SCHOOL 2024 MALAWI SCHOOL CERTIFICATE OF EDUCATION MOCK EXAMINATION



MATHEMATICS

PAPER II

(100 marks)

Time Allowed: 2hr 30min

8:00am – 10:30am

Instructions

- 1. This paper contains **18 printed pages**. Please check.
- 2. Write your **name** on every page.
- Answer all the six questions in section A and any four questions from section B.
- 4. Use of electronic calculators is allowed.
- 5. The maximum number of marks is indicated against each question.
- 6. In the table provided on this page, tick against the
- 7. question number you have answered.

Question number	Tick if answered	Do not write in these columns		
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
	Total			

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Section A. (60 marks)

Answer all the six questions in this section.

1a. Simplify the following $\frac{4a - 9b}{16a^2 - 9b^2} + \frac{1}{4a - 3b}$. (4 marks)

b. Solve the simultaneous equations: x + y = 3. $x^2 - y^2 = -3$. (5 marks) 2a. In a geometric progression the product of the 1st and 7th terms is equal to the 4th term. Given that the sum of the 1st and 4th terms is 9, find the third term of the progression.

b. The **table below** shows the distribution of marks obtained by students in a chemistry test.

Marks	Number of students.
1 - 5	4
6 - 10	7
11 - 15	11
16 - 20	3
21 - 25	6

Using the table above, construct a frequency polygon.	(5 marks)
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- **3a**. An object starts from rest and accelerates uniformly at 5m/s² in 4 seconds. It further accelerates uniformly to a velocity of 90m/s in the next 3 seconds. It maintains this velocity for 2 seconds and then it is brought to rest in another 5 seconds.
 - a. Draw a speed time graph for the motion of the object.
 - b. Use your graph, calculate the acceleration in the last 5 seconds.

(6 marks)

b. Figure 1 triangle **PQR** is such that PQ = (x + 13) cm, QR = x cm and angle $PQR = 30^{\circ}$.



Given that the area of the triangle is 35cm², calculate the length of **PR**. (5 marks)

4a. Given that
$$\mathbf{P} = \begin{pmatrix} 3 & 2 \\ 4 & 1 \end{pmatrix}$$
 and $\mathbf{PR} = \begin{pmatrix} 8 & 13 \\ 9 & 9 \end{pmatrix}$, find matrix **R**. (5 marks)

b. Given that the polynomial $3x^3 - 8x^2 + 4x - 5$ is identically equal to x(Ax + B)(x - 2) - 5. Find the value of A and B. (5 marks)

5a. Figure 2 shows a circle ABCD and AOC is the diameter of the circle. AT and DT are tangents at A and D respectively.





(5 marks)

b. Using a ruler and pair of compasses only, construct in the same diagram:

- i. a circle centre **O** with radius 4cm.
- ii. a tangent **MN** to the circle at any point **N** such that angle $NOM = 60^{\circ}$.
- iii. measure and state the length of **NM**.

6a. Solve the equation $\log_2(x^2 - x + 2) = 1 + 2\log_2 x$. (5 marks)

b. Prove the theorem which states that the angles between a tangent to a circle and a chord through the point of contact are equal respectively to the angles in the alternate segment. (6 marks)

Section B. (40 marks) Answer any four questions from this section.

7. Figure 3 shows a rectangular prism in which AY = 12 cm, AB = 8 cm and BC =

6cm.



Calculate,

a. the length of **YC**.

(4 marks)

b. the angle between **AY** and the face **ADZW**. (6 marks)

8a. In a group of 50 Form 3 students, each student was asked if they take at least one of the following subjects **Mathematics**, **Biology** and **Chemistry**. It was found that:

 $n(M \cap B \cap C) = (x + 1).$ $n(B \cap C \cap M') = 9.$ $n(M \cap B \cap C') = 8.$ $n(M \cap C \cap B') = 5.$ $n(M \cap C' \cap B') = x.$ $n(B \cap C' \cap M') = (x - 1).$ $n(C \cap M' \cap C') = (x + 4).$

i. Illustrate the information using a Venn diagram.

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ii. Use the Venn diagram find the total number of students who take Biology. (5 marks) **b. Figure 4** below shows a curve in form of $y = ax^2 + bx + c$ intersecting with a straight line at points **P** and **S**.



Given that the roots of the quadratic equation are **-4** and **2**, find the gradient of the straight line **PS**. (5 marks)

- **9a**. A box contains three cards numbered **1**, **2** and **5** respectively. Two cards are drawn at random from the box with replacement.
 - i. Draw a tree diagram to show all the possible outcomes.
 - ii. Use the tree diagram to calculate the probability that any two digit number formed with different digits is a multiple of **3**. (**5 marks**)

b. x varies partly as y and partly as y^2 . When y = 4, x = 52.8 and when y = 5, x = 81. Find x when y = 6. (5 marks)

10. The **table below** shows some values for the equation $y = 1 + 5x - x^2$.

$y = 1 + 5x - x^2.$										
x	-2	-1	0	2	3	4	5	6		
У	-13		1		7	5	1	-5		

i. Complete the table of values.

ii. Using a scale of **2cm** to represent **1 unit** on the horizontal axis and **2cm** to represent **2 units** on the vertical axis, draw the graph of $y = 1 + 5x - x^2$.

iii. Use your graph to solve the equation $1 + 5x - x^2 = 1$. (10 marks)

11a. Figure 5 below shows triangle **OXY** in which $\overrightarrow{\mathbf{OX}} = \underline{x}$ and $\overrightarrow{\mathbf{OY}} = \underline{y}$.



Given that **XA**: AY = 2: 5, express **XA** in terms of \underline{x} and \underline{y} . (5 marks)

b. From a port A, one ship is 10km away on a bearing of S60°E and another is 6km away on a bearing S70°W. How far apart are the two ships? (5 marks)

- **12**. A boarding master had K500 000 to buy bags of beans and bags of maize for a school. A bag of beans costs K50 000 and a bag of maize costs K20 000. He decided to spend the money as follows:
 - Buy at least 30 bags of beans and 50 bags of maize.
 - Spend more on bags of beans than maize by no more than K100 000.

- i. Taking x to represent the number of bags of beans and y to represent the number of bags of maize, write down four inequalities in x and y that satisfy the above information. (4 marks)
- ii. Using a scale of 2cm to represent 10 units on the x axis and 2cm to represent 20 units on the y axis, draw a graph to show the region bounded by the four inequalities by shading the unwanted region.

(5 marks)

iii. Use your graph to find the maximum number of the bags of maize that he can buy if 20 bags of beans have already been bought. (1 mark)

END OF QUESTION PAPER

The Best Never Rest.