LILONGWE CITY MSCE MOCK EXAMINATION

2023 MALAWI SCHOOL CERTIFICATE OF EDUCATION

MATHEMATICS

Subject Number: M131/II

Thursday, 23 March

Time Allowed: 2hr 30 min
07:30 – 10:00 am

PAPER II
(100 marks)

Instructions

1. **This paper contains 15 printed pages. Please check**.

2. Answer all the **six** questions in section **A** and any **four** questions in section **B**

3. The maximum number of marks for each answer is indicated against each question.

4. Write your answers in the spaces provided on the question paper.

5. Scientific calculators may be used

6. All working must be clearly shown

7. Write your **Name and School** at the top of each page of your question paper.

8. In the table provided on the page, **tick** against the 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			

Section A (60 marks)

Answer all the six questions in this section.

1. (a) Simplify $\dfrac{9x^3 - 36x}{4x^2 - 1} \div \dfrac{x^2 - 2x}{6x + 3}$ **(4 marks)**

(b) Without using a calculator, simplify $\dfrac{\sqrt{t} - \sqrt{3}}{\sqrt{t} + \sqrt{3}}$, giving the answer with a rational

denominator. **(5 marks)**

2. (a) Solve the equation $2^{2n} - 5(2^n) + 4 = 0$ **(6 marks)**

(b) **Figure 1** shows vectors $\overrightarrow{OP} = \underline{q}$ and $\overrightarrow{OR} = \underline{r}$. Q is the midpoint of vector $\overrightarrow{PR}$ such that $\overrightarrow{PQ} = 3\overrightarrow{QR}$.
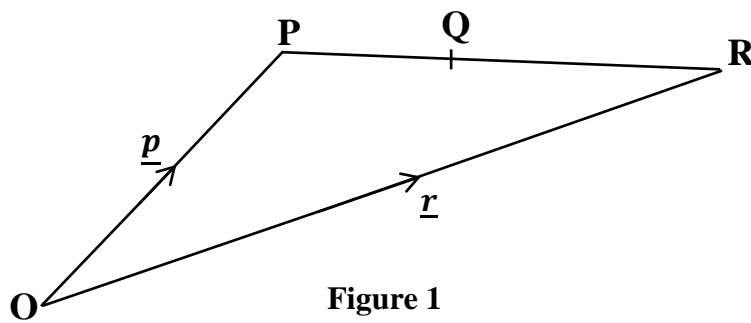
Figure 1

Calculate the value of $\overrightarrow{OQ}$ in terms of $\underline{p}$ and $\underline{r}$. **(6 marks)**
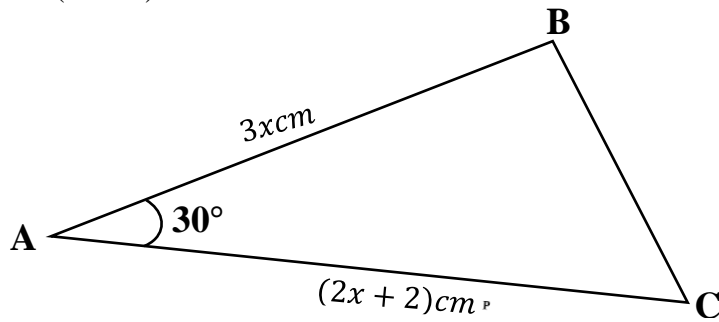
3. (a) Solve the simultaneous equations

$$2y = 5x + 1$$
$$3x^2 - xy = 0$$ **(5 marks)**

(b) Prove the theorem that states that an angle in a semicircle is a right angle. **(5 marks)**

4. (a) **Figure 2** shows triangle **ABC** in which **AB**= ($3x$)cm, angle **BAC** = 30° and
AC = ($2x$ + 2)cm.

Figure 2

If the area of the triangle is 30cm², calculate the length of side **AC**.   **(5 marks)**

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

    (i) A circle with centre **O** of radius 4cm

    (ii) A tangent from **X**, 9cm from the centre of the circle.

    (iii)Mark point **P**, on the tangent, 3.5cm from **X** measure and state angle **POX.**

(5 marks)

5. (a) The probability that it will be cold today is 0.2. If it is cold today, the probability that it will be cold tomorrow is 0.14 and if it is hot today, the probability that it will be cold tomorrow is 0.16. Find the probability both today and tomorrow will be hot (Hint: use a tree diagram) **(5 marks)**

(b) Given that the polynomial $2x^3 + Px^2 + 2x + 15$ is exactly divisible by $(x + 1)$, find the value of **P.** **(6 marks)**

6. (a) The rectangle is 5cm longer than its width. If the area of the rectangle is 66 cm^2, calculate the width of the rectangle.   **(5 marks)**

(b) **Table 1** shows masses in kg

   Table 1

Mass, kg	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Frequency	5	3	8	12	7	10	9

   Using a scale of 2cm to represent 2 units on the vertical axis, draw a histogram on the

   graph paper provided   **(5 marks)**

Section B (40 marks)

Answer any four questions

7. (a) **Table 2** shows some values of x and y for the equation $y = 3 - 4x - x^2$.

Table 2

x	-6	-5	-4	-3	-2	-1	0	1	2
y	-9	-2	3		7		3	-2	-9

(a) Complete the table **(1 mark)**

(b) Using a scale of 2cm to represent 1 unit on horizontal axis and 2 cm to represent 2 units on the vertical axis, draw th graph of $y = 3 - 4x - x^2$ **(5 marks)**

(c) Use your graph to solve the equation $5 - 3x - x^2 = 0$ **(4 marks)**

8. A class of 50 students wrote tests in Mathematics, Biology and physics. The results of the tests were as shown below:

      12 passed Mathematics and Physics

      19 passed Mathematics and Biology

      17 passed Biology and Physics

      2 Passed Physics only

      5 passed Mathematics only

      6 passed Biology only

If 5 students failed all the three subjects and x students passed all the three subjects,

(a) Draw a Venn diagram to represent the information **(7 marks)**

(b) Use the Venn diagram to calculate the value of x. **(3 marks)**

9. Madalitso is required to supply two types of shirts, A and B. The total number of shirts must not exceed 400. He has to supply more of type A than of type B. He must supply at most 300 of type A and at least 80 of type B.

(a) Taking x to represent the number of shirts of type A and y to represent the number of shirts of type B, formulate two inequalities in x and y in addition to $x \leq 300$ and $y \geq 80$ that satisfy the given information.   **(2 marks)**

(b) Using a scale of 2cm to represent 50 units on both axes, draw the graphs of the inequalities in **9(a)** on the graph paper provided. Shade the unwanted region to show the feasible region.   **(6 marks)**

(c) Given that the profit of type A is K600 per shirt and that of type B is K400 per shirt, use your graph to determine the number of shirts of each type that maximise the profit.   **(2 marks)**

10. The bus fare per passenger (F) is partly constant and partly inversely proportional to the number (n) of passengers. The fare per passenger for 40 passengers is K240 and for 50 passengers is K200. Calculate the fare per passenger when there are 100 passengers.

(10 marks)

11. The third term of an AP is half the 6th term. If the sum of the first 20 terms is 420, find the 15th term of the AP. **(10 marks)**

12. Figure 3 shows a rectangle based right pyramid. **VC** is slant height and **ABCD** is

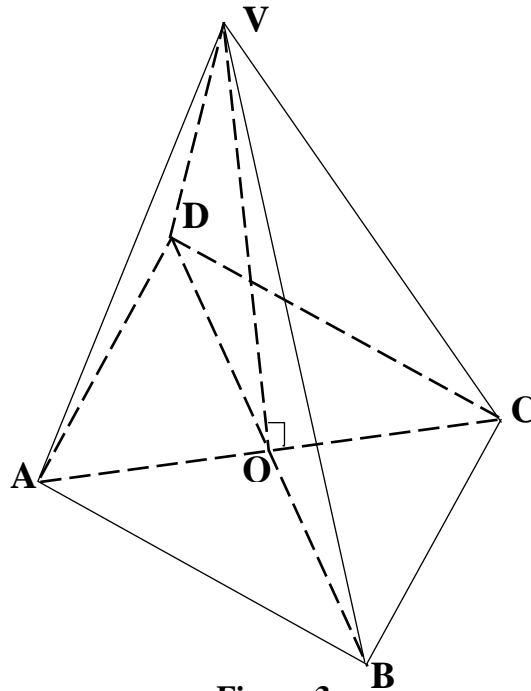rectangular base.   **(5 marks)**

Figure 3

Given that **VC = 26CM, AB** = 16cm, **BC** = 12 and **O** is the centre of the pyramid, calculate

(a) The height **VO** of the pyramid.   **(6 marks)**

(b) The angle between base **ABCD** and slant height **VC**, giving the answer correct to the

nearest degree. **(4 marks)**

END OF QUESTION PAPER

NB: This paper contains 15 printed pages.