THE MALAWI NATIONAL EXAMINATIONS BOARD

2008 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

MATHEMATICS

Subject Number: M131/II

Time Allowed: 2 h 30 mins

Monday, 20 October **8.30 - 11.00 am**

PAPER II

(100 marks)

Instructions:

1. **This paper contains 6 pages. Please check.**
2. Answer **all** the **six** questions in Section **A** and any **three** questions from Section **B**.
3. The maximum number of marks for each answer is indicated against each question.
4. Mathematical tables and answer books are provided.
5. Calculators may be used.
6. Used graph paper and/or supplementary sheets must be tied together inside the Answer Book with a string.
7. **All working must be clearly shown**; it should be done on the same sheet as the rest of the answers.
8. Read the instruction(s) on the Answer Book carefully.
9. Write your **Examination Number** on top of each page of your Answer Book.

Turn ov

Section A (55 marks)

Answer **all** the **six** questions in this section.

1. a. The image of the set {-1, 0} under the function $ax^2 + b$ is {7, 5}. Calculate the value of a. **(3 marks)**

b. Without using a calculator or four-figure tables simplify $\frac{15\sqrt{6}}{\sqrt{98}-\sqrt{2}}$ to its simplest form. **(4 marks)**

2. a. Simplify $\frac{1}{x}-\frac{1}{x+2y}-1$. **(4 marks)**

b. In **Figure 1**, **ET** and **EU** are tangents to a circle **PQRS** at **P** and **S** respectively. Angle **TEU** = 110°, angle **PSQ** = 46° and **PQ** is parallel to **SR**.

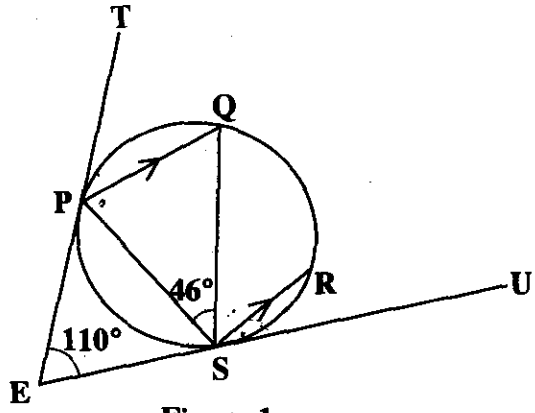

Figure 1

Calculate the value of angle **RSU**. **(6 marks)**

3. a. Given that matrix $V=\begin{pmatrix}3 & 5\\ -1 & 1\end{pmatrix}$ and $W=\begin{pmatrix}-1 & 1\\ 0 & 2\end{pmatrix}$. Find VW–V. **(4 marks)**

b. An arc of a circle subtends an angle of 54° at the centre. If the arc is 9 cm long, calculate the circumference of the circle. **(4 marks)**

4. a. Make R the subject of the formula $A=P\left(1+\frac{R}{100}\right)^T$. **(5 marks)**

b. Solve the equation $\log_7 343 = 2x - 5$. **(5 marks)**

5. a. Given that vector $A=\begin{pmatrix}2\\3\end{pmatrix}$ is translated by the vector $B=\begin{pmatrix}a\\b\end{pmatrix}$ to vector $A'=\begin{pmatrix}5\\7\end{pmatrix}$. Calculate the values of a and b. **(5 marks)**

b. At Mpini Secondary School, 72 students like watching football, 64 like watching basketball and 62 like watching netball; 18 like watching football and basketball, 24 like watching football and netball and 20 like watching basketball and netball, 8 students like watching all the three games and 56 don't like watching any game.

(i) Draw a venn diagram representing this information.
(ii) From the venn diagram, calculate the number of students at the school. **(6 marks**

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6. a. The probability of a bus arriving early at a depot is $\frac{1}{10}$ and arriving late is $\frac{3}{5}$. If 400 buses are expected at the depot during the day, calculate the number of buses that are likely to arrive at the depot in time. **(4 marks)**

b. **Figure 2** shows a circle **ABC** centre **O**. **AOB** and **ABC** are triangles in which **AB = BC**.

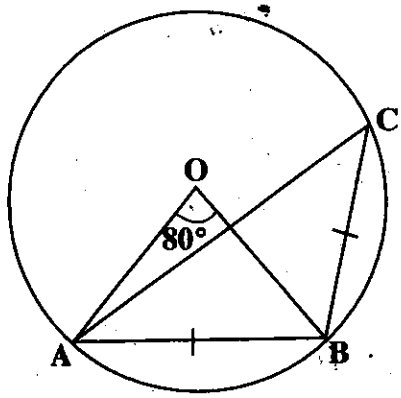

Figure 2

If angle **AOB** = 80°, calculate angle **OAC**. **(5 ma**

Section B (45 marks)

Answer any **three** questions from this section.

7. a. The second term of a geometric progression is –6 and the fourth term is –54. Calculate the common ratio, given that it is negative. **(5 ma**

b. (i) Copy and complete the table of values for the equation $y = x^2 - 3x + 10$.

x	–1	0	1	2	3	4	5
y	14	10	8		10		20

(ii) Using a scale of 2 cm to represent 1 unit on the horizontal axis and 2 cm to represent 2 units on the vertical axis, draw the graph of $y = x^2 - 3x + 10$.

(iii) Use your graph to solve the simultaneous equations:

$$y = x^2 - 3x + 10$$
$$y = x + 7$$

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8. a. **Figure 3** shows two similar triangles **ADE** and **ABC** in which **DE** is parallel to **BC**. The area of triangle **ADE** = 12 cm^2

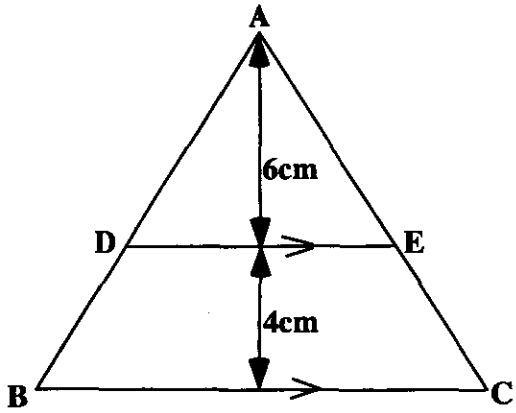

Figure 3

If the heights of triangle **ADE** and trapezium **DECB** are 6 cm and 4 cm respectively, calculate the length of **BC**. **(6 mark**

b. Mr Njinga cycled a distance of 42 km from his village. On his return journey he increased his speed by 2 km/h and took half an hour less. Calculate the average speed on the journey from his village. **(9 mark**

9. a. **Figure 4** shows a straight line graph $y = x + 8$ crossing the x and y axes at **A** and **B** respectively.

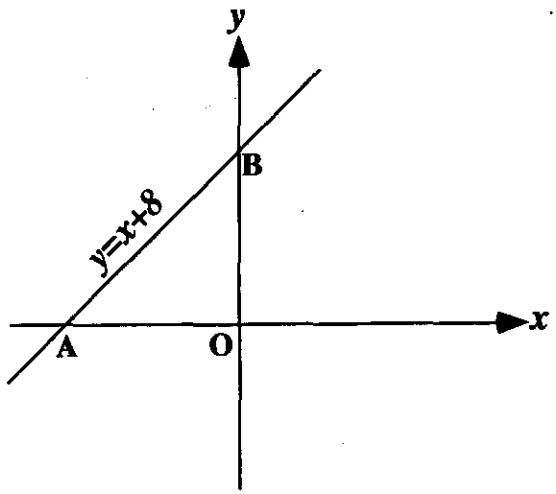

Figure 4

Calculate the distance between points **A** and **B**, leaving your answer correct to 2 decimal places. **(6 marl**

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9. (Continued)

b. The **table** below shows the deviations (d) from a mean of marks and the frequencies (f) of the marks pupils scored in a test.

Mark	f	d	d^2	fd^2
20	1	-11	121	121
23	1	-8	64	64
26	2	-5	25	50
27	1	-4	16	16
30	3	-1	1	3
34	2	3	9	18
35	3	4	16	48
40	2	9	81	162

Using information from the table, calculate:

(i) total number of pupils
(ii) mean
(iii) standard deviation to 3 significant figures. **(9 marks**

10. a. **Figure 5** shows a cone placed on top of a cylinder. The height of the cone is 10 m and that of a cylinder is 12 m. The diameter of both cone and cylinder is 8 m.

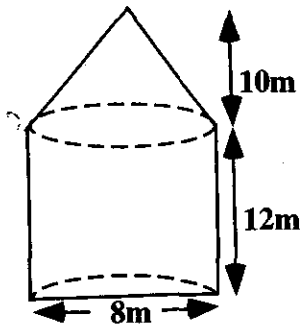

Figure 5

Calculate the total volume of the shape to 2 decimal places.
(Volume of cone $=\frac{1}{3}\pi r^2 h$, take $\pi = 3.14$). **(5 mark**

b. Mrs Mlimi has a piece of land on which she would like to plant maize and groundnuts. The cost of planting maize is K300 per hectare while groundnuts cost K900 per hectare. Maize requires 3 labourers per hectare while groundnuts requires 6 labourers per hectare. She hired at least 60 labourers and she has only K18 000 for planting costs.

(i) Write down two inequalities in addition to $x \geq 0$ and $y \geq 0$ by taking x to represent the number of hectares of groundnuts and y to represent number of hectares of maize.

(ii) Taking 2 cm to represent 5 units on the horizontal axis and 2 cm to represent 10 units on the vertical axis, draw graphs to show the region represented by the inequalities in x and y.

(iii) Using your graph, find the maximum number of maize hectares if she plants 10 hectares of groundnuts. **(10 mark**

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

(i) a circle centre O of radius 4 cm.

(ii) a diameter PT and a tangent to the circle at T.

(iii) a point R on the tangent such that TR = 9 cm.

(iv) Measure and state PR. **(6 marks)**

b. Solve the following simultaneous equations

$$x = \frac{8}{y}$$

$$y = x + 2$$ **(9 marks)**

12. a. x varies directly as y and inversely as the square of n. If $x = 15$, $y = 24$ and $n = 4$, calculate the value of n when $x = 8$ and $y = 20$. **(7 marks)**

b. Village B is on the bearing of 135° and a distance of 40 km from village A. Village C is on a bearing of 225° and a distance of 62 km from village A.

(i) Show that A, B and C form a right-angled triangle.

(ii) Calculate angle ACB to the nearest degree. **(8 marks)**

END OF QUESTION PAPER

NB: This paper contains 6 pages.