EXAMINATION NO.:_____

# THE MALAWI NATIONAL EXAMINATIONS BOARD

## 2024 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

# MATHEMATICS

**Subject Number: M131/II**

**Friday, 12 July**

**Time Allowed: 2 h 30 min**
**8:00 – 10:30 am**

**PAPER II**
(100 marks)

**Instructions**

1. **This paper contains 19 printed pages. Please check.**
2. Answer **all** the **six** questions in Section **A** and any **four** questions from Section **B**.
3. The maximum number of marks for each answer is indicated against each question.
4. Scientific calculators may be used.
5. The blank answer sheet at the end of the question paper can be used if required.
6. **All working must be clearly shown.**
7. Write your **Examination Number** at the top of each page of your question paper in the spaces provided.
8. In the table provided on this page, **tick** against the question number you have answered.
9. At the end of the examination, hand in your paper to the invigilator.

| 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 in the spaces provided.

**1.** a. Simplify $\dfrac{\sqrt{5}-3\sqrt{3}}{2\sqrt{3}+\sqrt{5}}$, leaving the answer with a rational denominator.

**(5 marks)**

b. Simplify $\dfrac{a^2+2ab+b^2}{a^2-b^2}$.

**(4 marks)**

Continued/...

**2.** a. Factorise completely $6m^3 - 19m^2 + m + 6$. **(6 marks)**

b. A bag contains 3 blue pens and 5 red pens. If two pens are taken out of the bag randomly with replacement, one at a time, find the probability that both pens are of different colours. **(5 marks)**

Continued/…

3. a. Prove that tangents from an external point drawn to the same circle are equal in length.
**(5 marks)**

Continued/...

**3. (Continued)**

b. Solve the equation $2\log y = \log(3y + 4)$. **(6 marks)**

Continued/…

**4.** a. **Figure 2** shows a triangle **PQR** in which $\overrightarrow{PQ} = \underline{p}$, $\overrightarrow{QR} = \underline{r}$ and $\overrightarrow{RT} = \frac{2}{3}\overrightarrow{RP}$.

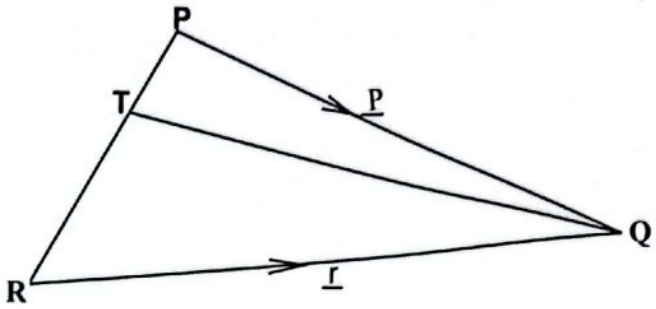


**Figure 2**

Express **RT** in terms of $\underline{p}$ and $\underline{r}$. **(5 marks)**

**4. (Continued)**

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

- a circle centre **O** of radius 4 cm
- a tangent **AB** at **A** such that **AB** = 8 cm
- a perpendicular bisector of line **OB** intersecting **AB** at **C**
- measure and state the length of **OC**

**(6 marks)**

**5.** a. In **figure 1**, **CDE** is a tangent at **D**, **AOB** is a diameter and angle **CDB** = $x^0$.

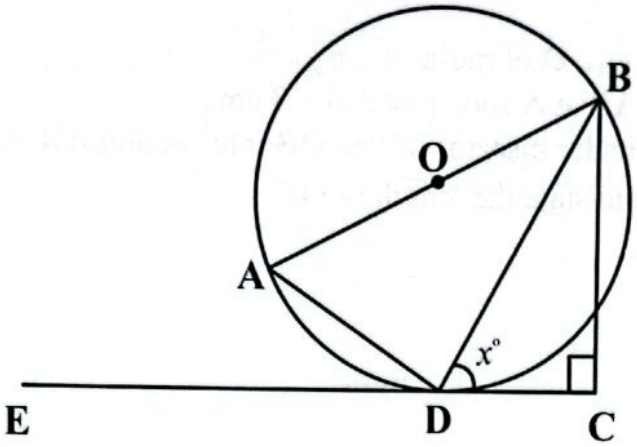


**Figure 1**

Show that angle **DBC** = angle **ABD**. **(5 marks)**

**5. (Continued)**

b. **Figure 3** is a Venn diagram showing sets **X**, **Y** and **Z**.

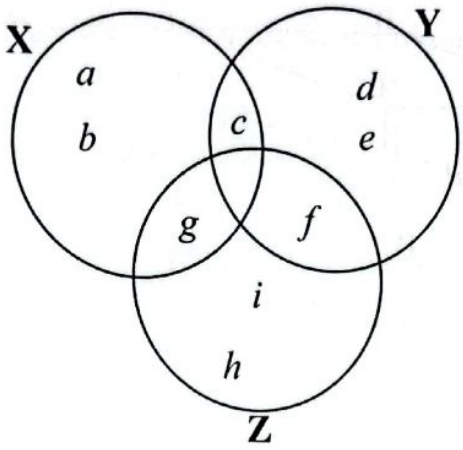


**Figure 3**

Find $n(X' \cap Y \cap Z)$. **(3 marks)**

**6.** a. Chisomo wishes to buy $x$ kg of maize and $y$ kg of beans. The cost of maize is K250 per kg while that of beans is K1 500 per kg. She wishes to buy more beans than maize and she has only K8 000 to spend. She was also advised to buy at least 4 kg of beans. Write down **four** inequalities to describe the given information. **(5 marks)**

6. **(Continued)**

b. **Figure 4** is a cube **ABCDEFGH** with dimensions of 7 cm.

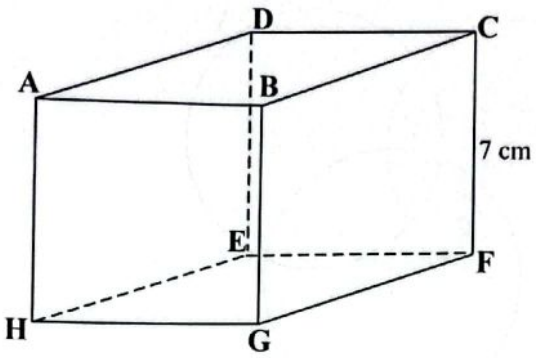


**Figure 4**

Calculate the angle between lines **AF** and **DF**. **(5 marks)**

**Section B** (40 marks)

Answer any **four** questions from this section in the spaces provided.

**7.** **Table 1** shows class intervals for diameters of containers.

**Table 1**

| Diameter (cm) | Mid interval ($x$) | Frequency ($f$) | $fx$ |
|---|---|---|---|
| 5 – 7.9 | 6.45 | 3 | 19.35 |
| 8 – 10.9 | 9.45 | 7 | 66.15 |
| 11 – 13.9 | 12.45 | 11 | 136.95 |
| 14 – 16.9 | 15.45 | 5 | 77.25 |

a. Draw a table of deviations for the data in **table 1**. **(4 marks)**

**7. (Continued)**

b. Use the table to calculate variance, giving the answer correct to 2 decimal places. **(6 marks)**

8. A cyclist at **P** moves 12 km due west to **Q**. He then travels 8 km to **R** on a bearing of 040°. Calculate the:

a. distance between **P** and **R** to one decimal place. **(6 marks)**

8. (Continued)

b. bearing of R from P to the nearest degree. (4 marks)

Continued/…

9. The ratio of the fourth term to the twelfth term of an arithmetic progression (AP) is 3:10 and the difference between the twelfth and the fourth term is 56. Calculate the sum of the first 10 terms. **(10 marks)**

Continued/…

10. The Cost (c) of producing songs is partly constant and partly varies as the number of songs (s). The total cost of producing 5 songs is K100 000 and that of producing 20 songs is K250 000. Find the cost of producing 30 songs. **(10 marks)**

Continued/...

11. Solve the following equations simultaneously $x+\frac{x}{y}=8$

$x-y=3.$ **(10 marks)**

Continued/…

**12.** **Table 2** shows values of $x$ and $y$ for the equation $y = x^2 + x - 6$.

**Table 2**

| $x$ | $-3$ | $-2$ | $-1$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y$ | 0 | $-4$ | | 6 | $-4$ | 0 | 6 |

a. Complete the value of $y$ in the table. **(1 mark)**

b. 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 $y = x^2 + x - 6$ on the graph paper provided on **page 19**.

**(5 marks)**

c. Use the graph to solve the equations $y = x^2 + x - 6$ and $y = 2x + 2$ simultaneously. **(4 marks)**

Continued/...

**END OF QUESTION PAPER**

**NB: This paper contains 19 printed pages.**