CANDIDATE NAME…….....

# CHINSAPO CLUSTER EXAMINATION

## 2022 MALAWI SCHOOL CERTIFICATE OF EDUCATION

## MATHEMATICS

**Date__/__/2022**

**Subject Number M131/I**
**Time allowed 2Hrs**
**8:00am - 10.30 am**

## PAPER II

(100 marks)

1. This paper contains **16 pages.** Please check.
2. Answer **all** the **six** questions in Section **A** and any four in Section **B**
3. Write **your name** on top of **each page** used as answer sheet
4. The maximum number of marks for each question is indicated against each question
5. Calculators may be used
6. Candidate will be penalized for cheating
7. In the box provided on this page, tick against the question number you have answered.

| **Question number** | **Tick if answered** | **Do not write in these column** | |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
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| Total | | | |

CANDIDATE NAME…….....**.....**

**Section A (60 marks)**

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

1. (a) Evaluate $42241_5 - 34343_5$, leaving your answer in base 5. (3 marks)

(b) Formulate a quadratic equation in $x$ with integral coefficients whose roots are $\frac{1}{2}$ and -3.

(5 marks)

CANDIDATE NAME……

2. (a) Solve for *x* and *y* in the following matrix equation. $\begin{pmatrix} x & 3 \\ -2 & y \end{pmatrix}\begin{pmatrix} 2 \\ 1 \end{pmatrix} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$ (5 marks)

(b) **Figure 1** below shows a circle ABC with centre O in which AB = BC and angle ABO = 50˚.

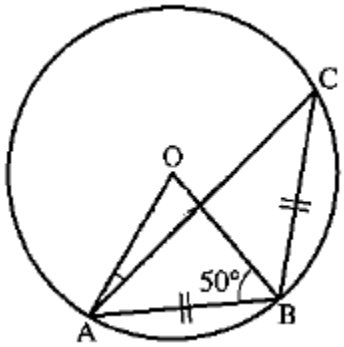



**Figure 1**

Calculate the value of angle OAC. (4 marks)

CANDIDATE NAME…….....

3. (a) Given that M = $\{a, b, c, d, e, f, g, h, i\}$, P = $\{a, e, i, h\}$ and F = $\{b, c, d, e, i\}$

(i) Show the three sets on a Venn diagram. (4 marks)

(ii) Find $n$(M∩P∩F). (2 marks)

(b) In **figure 2** below, $\overrightarrow{OD}$ = $\underline{d}$, $\overrightarrow{OC}$ = $\underline{c}$ and X is the mid-point of OD.

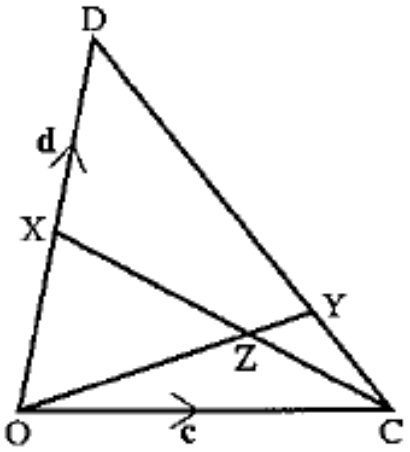



**Figure 2**

Express $\overrightarrow{CX}$ in terms of $\underline{c}$ and $\underline{d}$. (4 marks)

CANDIDATE NAME……

4. (a) In **Figure 3** below, triangle A′B′C′ is the image of triangle ABC after enlargement.

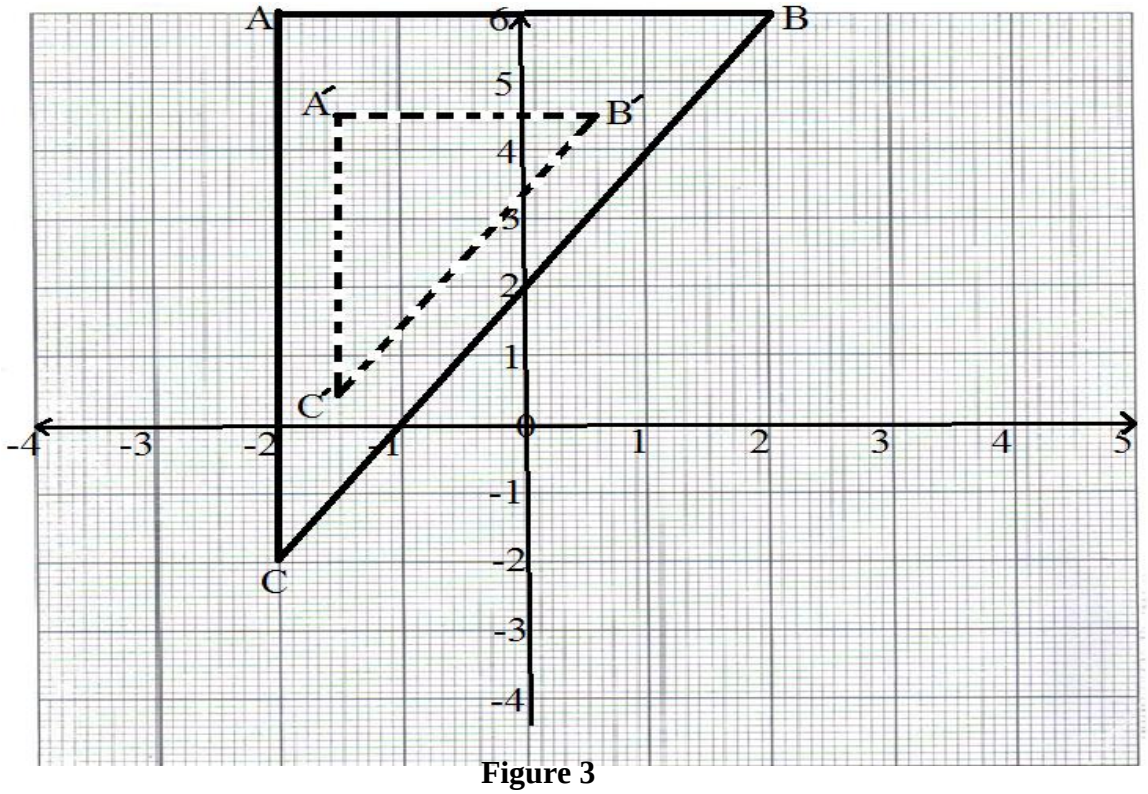



**Figure 3**

(i) In the same diagram, show the coordinates of the centre of enlargement. (4 marks)

(ii) Calculate the scale factor of enlargement. (2 marks)

(b) Find the value of $a$ if the line joining the points $(3a, 4)$ and $(a, -3)$ has a gradient of 1.

(4 marks)

CANDIDATE NAME…….....

5. (a) Given that the numbers $(x + 3)$, $(5x + 3)$ and $(11x + 3)$ are the first three consecutive terms of a GP, calculate the value of $x$ (5 marks)

(b) Solve for $x$ in the equation $(3^x)^2 - 12(3^x) + 27 = 0$. (5 marks)

CANDIDATE NAME…….....

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

(i) a circle centre O of radius 5 cm.

(ii) a point P on which is 8.5 cm from O

(iii) a tangent PT to the circle at T

(iv) a point X on the tangent such that TOX = 30˚ (7 marks)

(b) Prove that the angle which an arc of a circle subtends at the centre is twice that which it subtends at the circumference. (6 marks)

CANDIDATE NAME……

**Section B** (40 marks)

Answer any **four** questions from this section

7. **Figure 4** below shows a graph of $x(x - 2)(x + 2)$ for x values between -3 and + 3.

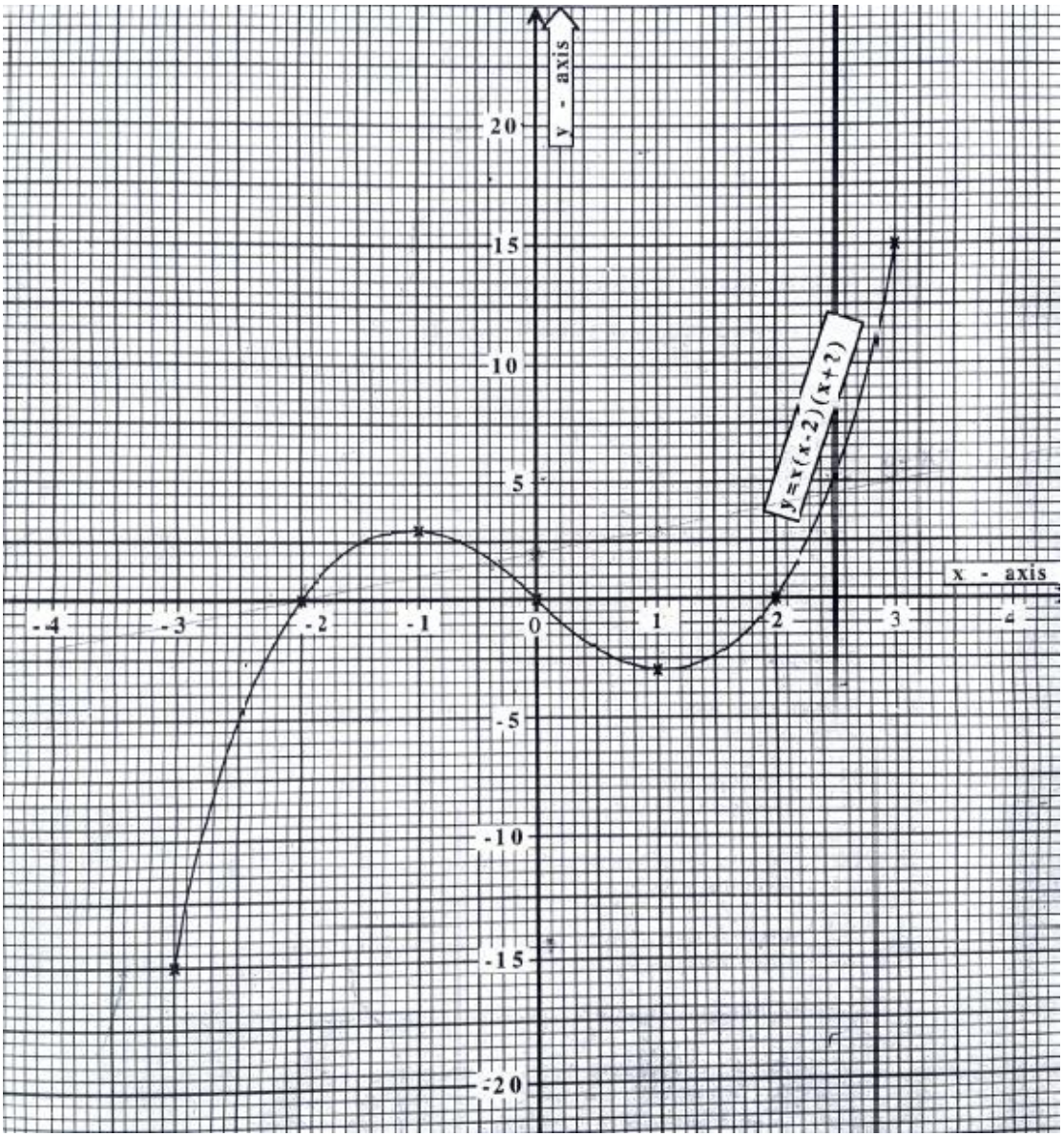



**Figure 4**

Use the graph to

(a) find the values of $x$ for which $y$ is positive. (2 marks)

(b) solve the following simultaneous equations

$y = 2x$

$y = x(x - 2)(x + 2)$ (4 marks)

(c) solve the equation $x^3 – 5x – 2 = 0$. (4 marks)

CANDIDATE NAME…….....

8. The cost of making a dress is partly constant and partly varies with the amount of time it takes to make. If it takes 3 hours to make, it costs K2700. If it takes 5 hours to make, it costs K3100. Find the cost if it takes $2\frac{1}{2}$ hours. (10 marks)

CANDIDATE NAME…….....

9. Solve the equation $2y^3 + 3y^2 - 8y + 3 = 0$. (10 marks)

CANDIDATE NAME…….....

10. **Figure 5** below shows a solid with a cylindrical middle of length 25 cm and hemispherical ends of radius 13 cm.

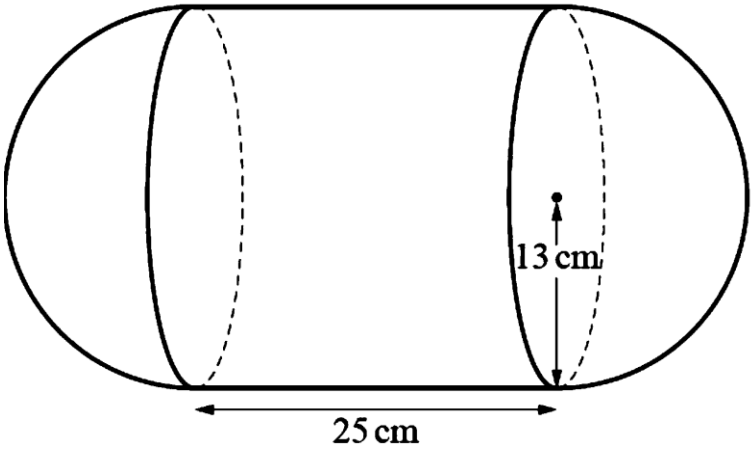



**Figure 5**

Calculate the;

(a) total length of the solid

(b) volume of the solid, to three significant figures. (Volume of a sphere = $\frac{4}{3}\pi r^3$) (10 marks)

CANDIDATE NAME…….....

11. A basket contains 6 mangoes and four oranges. Two fruits are removed one after the other from the basket without replacement. Using a tree diagram, find the probability that a mango and an orange removed. (10 marks)

12. A road construction company would like to hire machinery for its construction works. It intends to hire a total of 200 machineries. A lorry costs K80, 000 per week and a tractor costs K240, 000 per week. The company is prepared to spend K24, 960, 000.

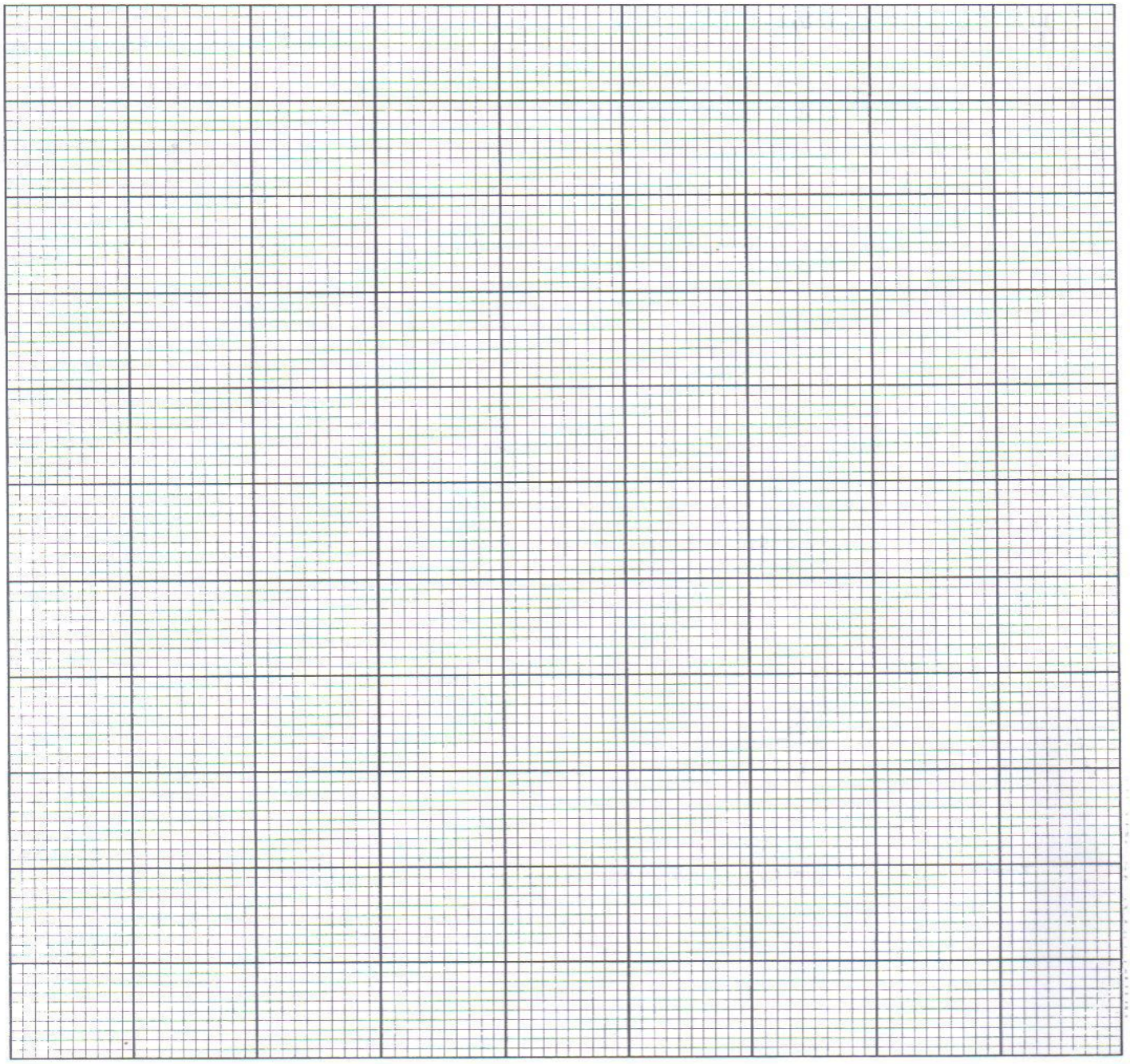
(a) Taking $x$ to represent the number of lorries and $y$ to represent the number of tractors, write down two inequalities in $x$ and y in addition to $x \geq 0$ and $y \geq 0$. (4 marks)

(b) Using a scale of 2 cm to represent 40 units on the x axis and 2 cm to represent 20 units on the $y$ axis, draw graphs to show the region represented by the four inequalities by shading the unwanted regions. (4 marks)

(c) Find the largest possible number of lorries and tractors that the company can hire in a week. (2 marks)

CANDIDATE NAME……

EXAMINATION NO.:_____



**END OF QUESTIONS**