MARANDA HIGH SCHOOL

POST MOCK EXAMINATIONS – JANUARY 2021

121/2 **MATHEMATICS** **Paper 2**
Alt. A
January 2021 – 2½ hours

Name: ..... **Adm No:** ..... **Stream:** .....

Date: .....**Signature:** .....

Instructions to candidates

(a) Write your name, admission number and stream in the spaces provided above.
(b) Sign and write the date of examination in the spaces provided above.
*(c) This paper consists of **two** sections: **Section I** and **Section II.***
*(d) Answer **all** the questions in **Section I** and **only five** questions from **Section II.***
*(e) **Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.***
(f) Marks may be given for correct working even if the answer is wrong.
*(g) **Non-programmable** silent electronic calculators **and** KNEC Mathematical tables may be used, except where stated otherwise.*
*(h) **This paper consists of 17 printed pages.***
*(i) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.***
*(j) Candidates should answer the questions in **English***

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Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

SECTIONI (50 marks)

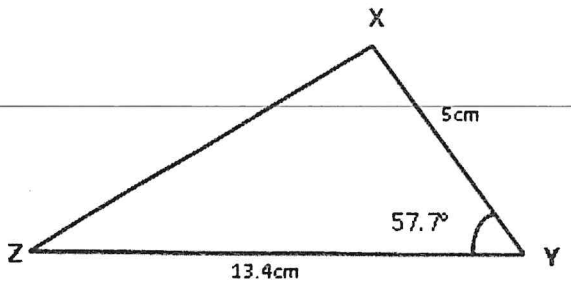
*Answer **all** the questions in this section in the spaces provided:*

1. Calculate the percentage error in estimating $5.7\dot{2}$ as 5.72. [3 marks]

2. If $\frac{2\sqrt{6}}{\sqrt{3}-\sqrt{2}} = x^2\sqrt{3} - k\sqrt{2}$, where k and x are rational numbers, find the values of k and x.

[3 marks]

3. In triangle XYZ below $YZ = 13.4\ cm$, $XY = 5cm$ and $\angle XYZ = 57.7^0$. Calculate the radius, to two decimal places, of the circumscribing circle to the triangle. [3 marks]

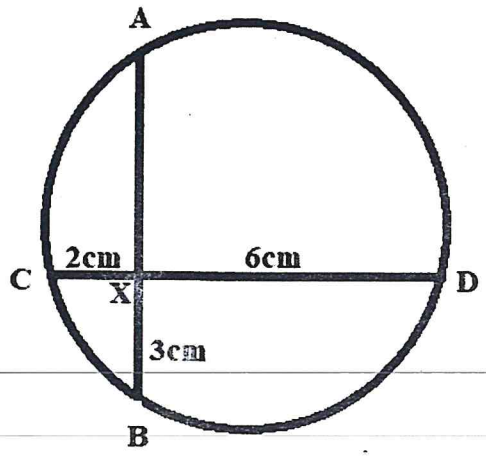


4. The cash price of a bed is KShs. 6500. Wambui bought it on hire purchase by making a down payment of Kshs. 2300 followed by 12 monthly instalments of Ksh.490. Calculate the rate of the carrying charge to two decimal places if it is compounded. [4 marks]

5. Using the substitution $k=(m-3)$ solve for m in the equation $2(m-3)^2-5(m-3)-7=0$ by completing square method. [4 marks]

6. Simplify completely. $\frac{\log 49+2\log\sqrt{7}}{4\log 7-\log 7}$. [2 marks]

7. In the figure below chord AB is perpendicular to chord CD at X and CX=2cm, DX=6cm and BX=3cm.



Calculate the radius of the circle to two decimal places. [3 marks]

8. Expand and simplify $(1-2x)^6$ in ascending powers of x up to the term in x^3 then use the expansion to evaluate $(1.02)^6$ to 4 decimal places. [3 marks]

9. Determine matrix T given that AT=B when $A = \begin{pmatrix} -2 & 4 \\ 4 & -1 \end{pmatrix}$ and $B = \begin{pmatrix} -20 & 30 \\ 40 & -10 \end{pmatrix}$. [3 marks]

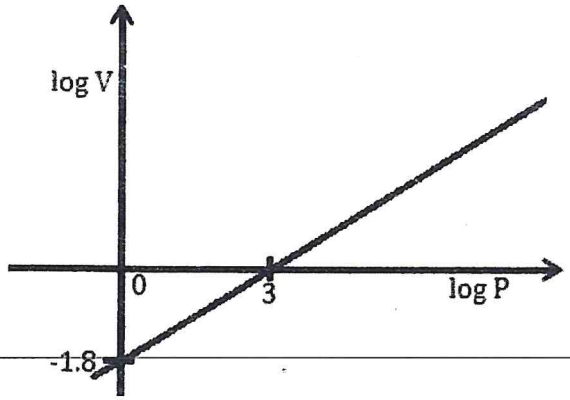
10. Find the co-ordinate of the centre and the radius of a circle whose equation is given as $3x^2 + 3y^2 - 12x + 18y + 8 = 0$. [3 marks]

11. A merchant blends 350kg of Kakuzi Tea costing Sh. 84 per kg with 140kg of KETEPA tea costing Sh. 105 per kg. Calculate the price at which he must sell 1 kg of the mixture to attain 15% profit. [3 marks]

12. Kiptoo earns a monthly basic salary of Kshs.25000. He is entitled to a tax relief of Kshs.480 per month, a house and medical allowances of Kshs.12000 and Kshs.3000 respectively. Calculate his annual taxable income in Kenyan Pounds. [3 marks]

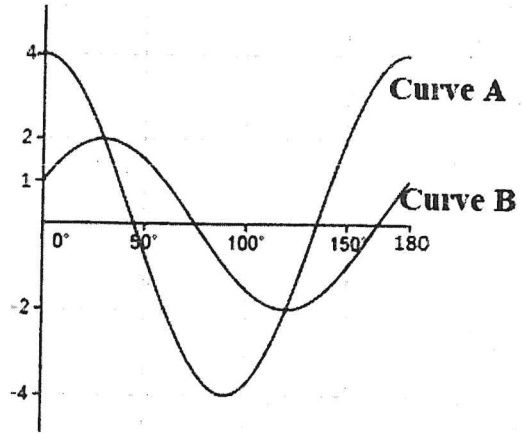
13. A quantity Q varies partly as quantity R and partly inversely as the square of R. Given that Q = 3 when R = 1 and Q = 5 when R = 0.5 Find the equation connecting Q and R. [3 marks]

14. The graph below is part of the straight line graph obtained from the initial equation $V = aP^n$



Write down the equation of the straight line in the form $y = mx + c$ hence use the graph to calculate the values of ***a*** and ***n*** [3 marks]

15. The graph below show two curves A and B drawn on the same axis.

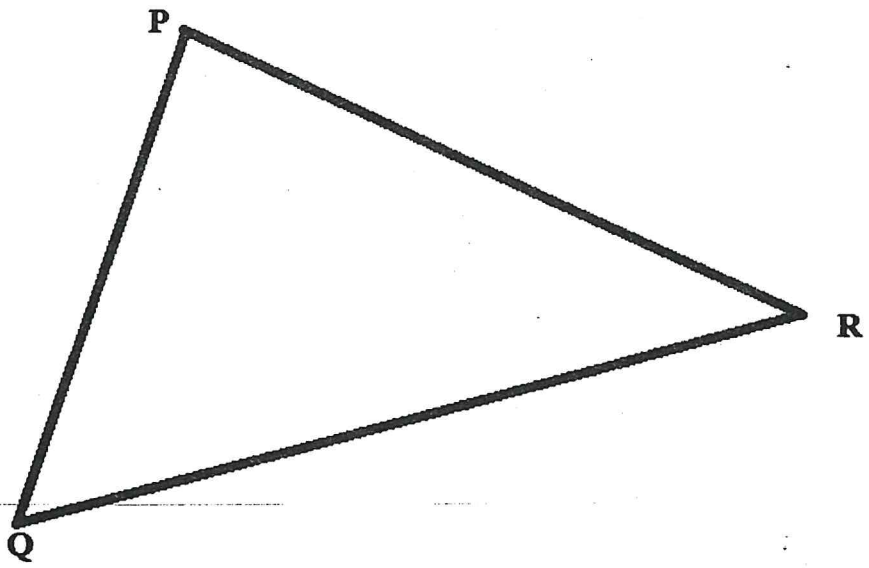


a) State the period of curve A. [1 mark]

b) State the amplitude of curve B. [1 mark]

c) Given that the first peaks of the two curves A and B are 30^0 apart state the translation that maps curve B onto A. [1 mark]

16. P, Q and R in the figure below represents three schools. A borehole is to be drilled such that it is closer to P than Q but 5cm from R. Shade the possible location of the borehole. [3 marks]



SECTION II (50 marks)

*Answer **only five** questions in this section in the spaces provided:*

17. The numbers 213, 205, 197,..., 37 represents an Arithmetic Progression

Determine the:

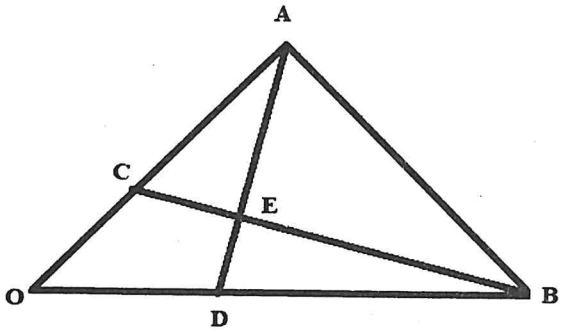
a) number of terms in the progression. [3 marks]

b) eighteenth term of the progression. [2 marks]

c) middle term of the progression. [3 marks]

d) sum of the first 20 terms of progression. [2 marks]

18. The diagram below shows triangle OAB. Vectors OA = **a** and OB = **b**. C divides OA in the ratio 2:3 and D divides OB in the ratio 3:4 while AD and BC meet at E.



a) Find in terms of **a** and **b** vectors:

i) **OC** [1 mark]

ii) **CB** [2 marks]

b) Given that **CE** = m**CB** and **DE** = n**DA** where m and n are scalar:

i) write down two distinct expressions for OE. [2 marks]

ii) find the values of m and n. [4 marks]

c) Express **OE** in terms of **a** and **b** only. [1 mark]

19. In a certain country, the probability of school A topping in county exams is $\frac{1}{3}$. If it tops the probability of it topping in KCSE is $\frac{5}{7}$ otherwise the probability of it topping in KCSE is $\frac{2}{5}$. If the school tops in KCSE the probability of its appearing in the newspaper is $\frac{2}{9}$, otherwise the probability of its appearing in newspaper is $\frac{4}{11}$.

a) Draw a tree diagram to represent the above information. [2 marks]

b) Use the tree diagram to find the probability that:

i) The school tops in the two exams and appears in the newspaper [2 marks]

ii) The school did not appear in the newspaper. [2 marks]

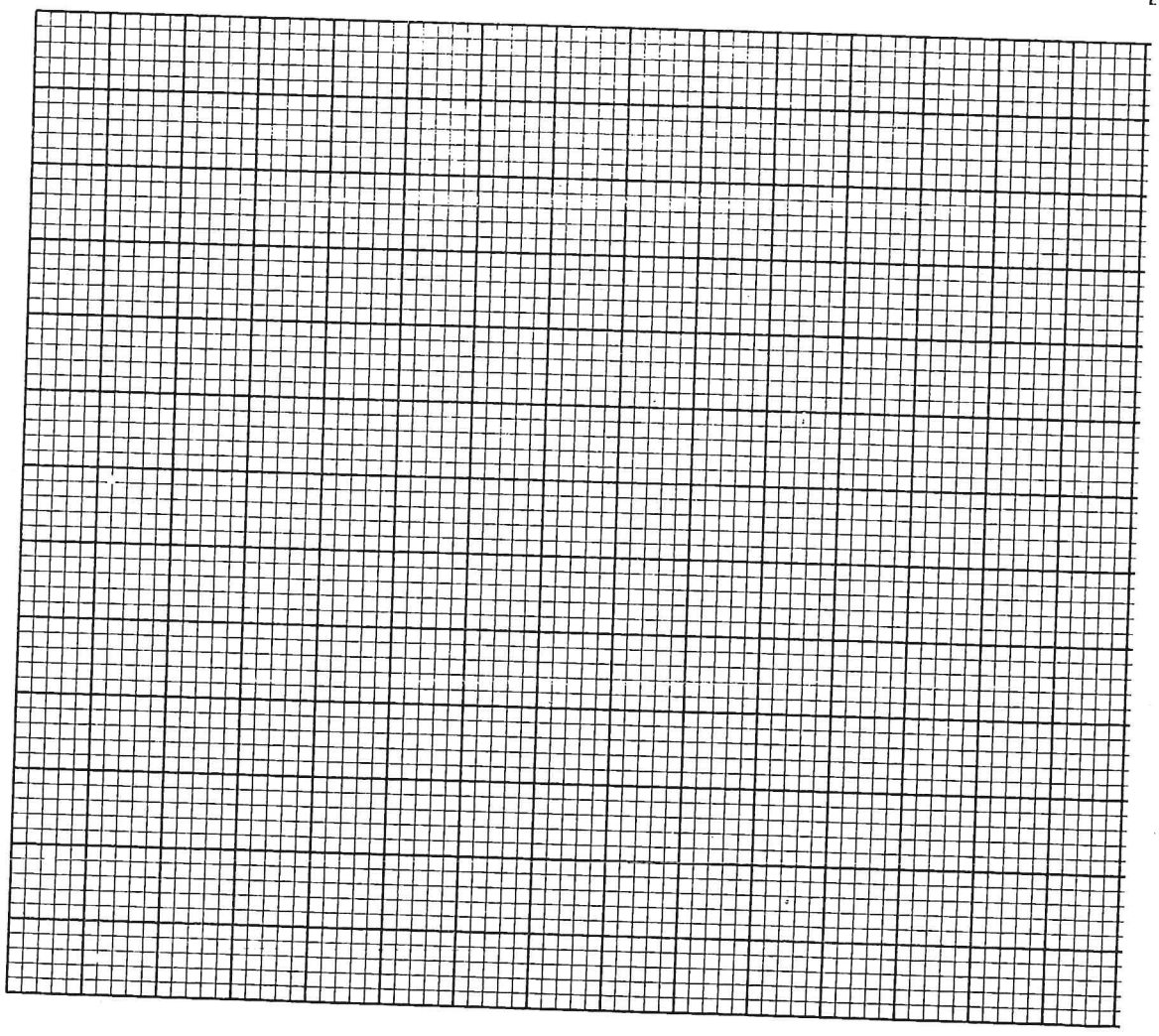
iii) The school will appear in the Newspaper anyway. [2 marks]

iv) The school tops in any one of the exams but does not appear in the Newspaper. [2 marks]

20. A triangular PQR has vertices at P(5,5), Q(10,15) and R(15,5).

a) Find the coordinates of the points P′, Q′ and R′ the images of P, Q and R respectively under a transformation, M whose matrix is $\begin{bmatrix} -0.6 & 0.8 \\ 0.8 & 0.6 \end{bmatrix}$. [2 marks]

b) Represent ΔPQR and its image ΔP′Q′R′ on the same Cartesian plane. [2 marks]



c) Triangle P″, Q″ and R″ is the image of P′,Q′ and R′ under a reflection in the y-axis.

(i) Draw Δ P″Q″R″ on the same grid in (b) above and state the co-ordinates of the vertices [2 marks]

(ii) Describe fully a single transformation that maps Δ PQR onto ΔP″ Q″R″. [2 marks]

(iii) Determine a 2x2 matrix representing the transformation in c(ii) above. [2 marks]

21. On the surface of the earth, A (50^0N, 80^0E) and B (50^0N, 120^0E) are two separate places. Given that the radius of the earth is 6370km, $\pi = \frac{22}{7}$ and the local time at B is 12.30 p.m.

a) Find the time at A. [2 marks]

b) Calculate the shortest distance between A and B in km. [3 marks]

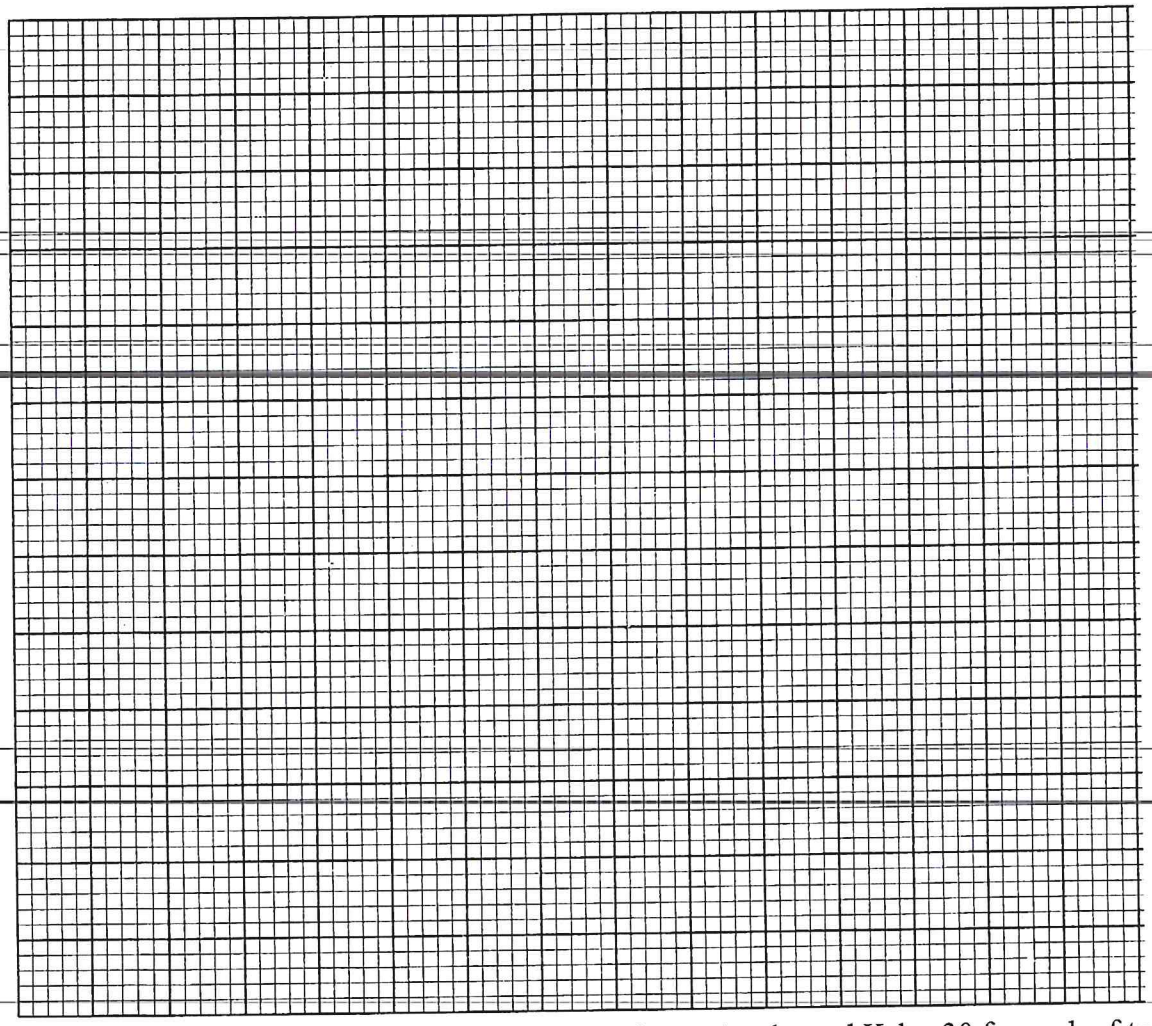
c) If C (0^0, 80^0E), find the distance between A and C in km. [3 marks]

d) Another town D is 3000nm west of A, find its position. [2 marks]

22. A baker makes two types of cakes, type A and type B. Type A requires 40g of fat and 320g of flour while type B requires 50g of fat and 300g of flour. On a particular day the baker had 1kg of fat and 4.8kg of flour.

a) Write down all the inequalities that can be used to represent this information. [3 marks]

b) Plot the inequalities above on the grid provided. [3 marks]



c) If the baker makes a profit of Kshs.25 for each of type A cake and Kshs. 30 for each of type B cake formulate an appropriate objective function hence use a search line to determine the maximum profit for that day if he sold all the cakes. [4 marks]

23. A curve has the equation $y = -x^3 - 3x$.

a) Determine the x-ordinates of the turning points of this curve. [2 marks]

b) Use mid ordinate rule with 4 strips to determine the area bounded by the curve, x=-2, x=2 and the x- axis. [3 marks]

c) Determine the exact area bounded by the same curve within the limits as in (a) above. [3 marks]

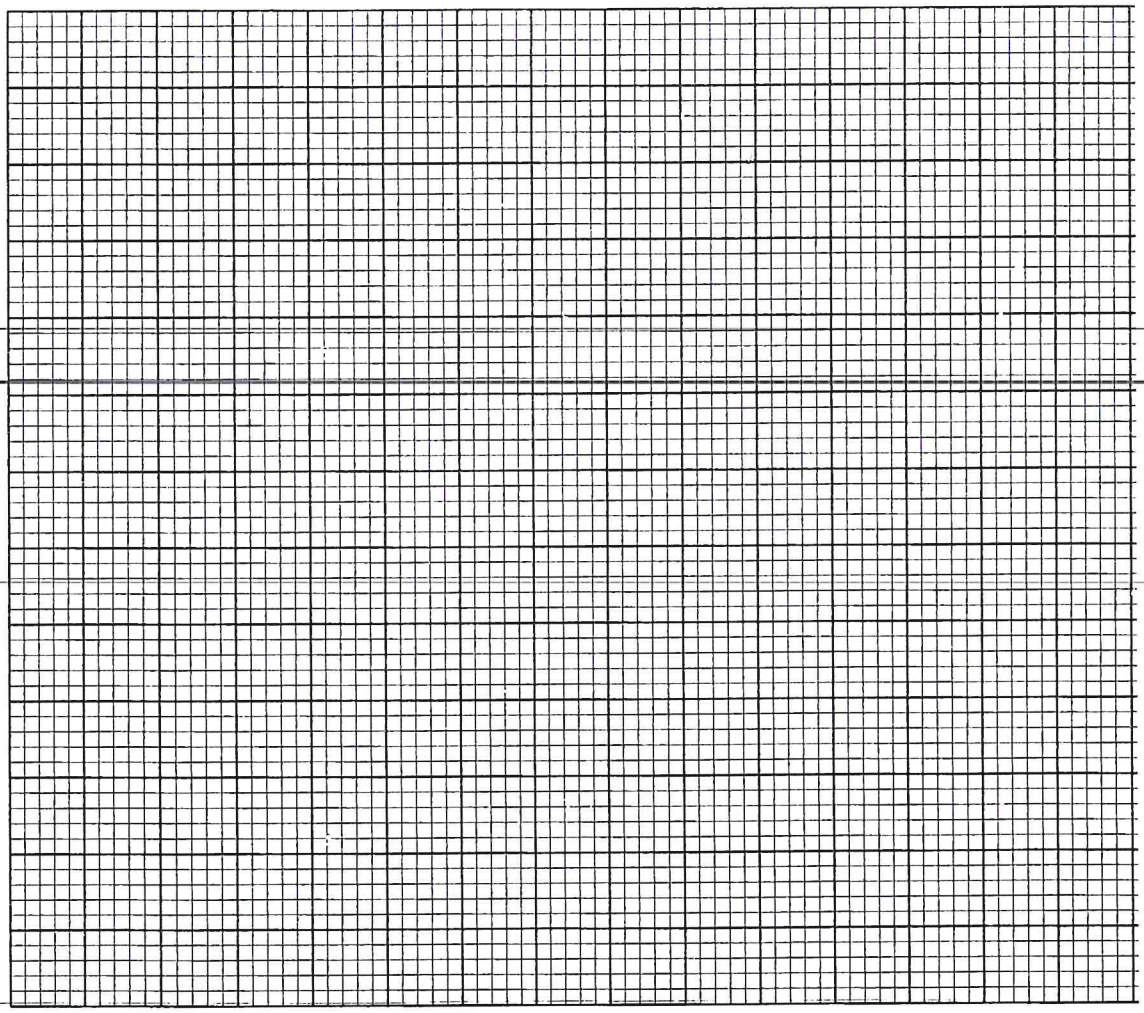
d) Calculate the percentage error in calculating the area of this curve using the mid-ordinate rule. [2 marks]

24. The life expectancy in hours of 106 bulbs are shown in the table below.

Life Expectancy (hrs)	90–94	95-99	100-104	105-109	110-114	115-119	120-124	125-129	130-134	135-139
Frequency (f)	5	14	16	17	24	12	11	4	2	1

a) Calculate the quartile deviation of the life expectancy of the bulbs. [4 marks]

b) On the grid provided plot the ogive representing the information in the table above. [3 marks]



c) Use the graph above to estimate the median life expectancy of the bulbs. [3 marks]

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