MARANDA HIGH SCHOOL
FORM 4 PRE-MOCK EXAMINATIONS
MARCH-APRIL 2024

121/2 **MATHEMATICS** **PAPER 2**

Alt. A – 2½ hours

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

Signature: …….

Mathematics Alt A

Friday 29th March 2024

Time: 8.00 **a.m** – 10.30 **a.m**

Instructions to candidates

(a) Write your name, stream, Adm No. and sign in the spaces provided above.

*(b) This paper consists of **TWO** sections: **Section I** and **Section II**.*

*(c) Answer **ALL** the questions in **Section I** and only five from **Section II**.*

*(d) All answers and working must be written on the question paper in the spaces provided **below each question.***

*(e) **Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.***

(f) Marks may be given for correct working even if the answer is wrong.

(g) KNEC Mathematical tables may be used except where stated otherwise.

*(h) **This paper consists of 15 printed pages.***

*(i) **Students should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.***

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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

SECTION I (50 marks)

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

1. A fruit blender makes a profit of 30% by selling a super mix mango juice at Kshs. 1300 for 250 ml tin. He makes a super mix mango juice by blending two varieties of mango, A and B which cost him Kshs. 3 600 and Kshs. 4 800 per litre respectively. In what proportion were the mango types A and B mixed? (3 marks)

2. Given that $\tan 67.5° = 1+\sqrt{2}$. Find without using mathematical table or calculator $\tan 22.5°$ in the form $a+b\sqrt{c}$. Hence state the values of a, b and c. (3 marks)

3. Solve for t in: $\log_3 8t + 2\log_3 t = -6$. (4 marks)

4. Expand $\left(2y-\frac{3}{y^2}\right)^6$ up to the term independent of y. Hence use your expansion to estimate $\left(19\frac{97}{100}\right)^6$. (3 marks)

5. Draw a line AB of length 7 cm. On one side of the line AB, construct the locus of a point C such that the area of a triangle ACB is $10.5\ cm^2$. On this locus locate two positions of C, C_1 and C_2 such that $\angle AC_1B = \angle AC_2B = 90°$. (3 marks)

6. Make Q the subject of the formula (3 marks)

$$B = \frac{3d}{k}\sqrt{\frac{X-Q^2}{5c}}$$

7. Evaluate $\int_{2}^{5}\left(x^3+2x-3\right)dx$. (3 marks)

8. Given that $\mathbf{x}=2\mathbf{i}+\mathbf{j}-2\mathbf{k}$, $\mathbf{y}=5\mathbf{i}+4\mathbf{j}-\mathbf{k}$ and $\mathbf{z}=5\mathbf{i}+3\mathbf{j}+2\mathbf{k}$, then $\mathbf{q}=3\mathbf{x}-\mathbf{y}+2\mathbf{z}$. Calculate $|\mathbf{q}|$ to 2 decimal places. (3 marks)

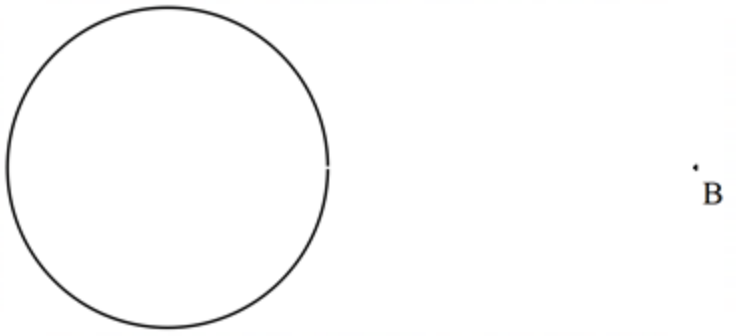
9. Calculate the standard deviation of the numbers correct to 3 decimal places. (3 marks)
3, 7, 9, 13, 17, 11

10. The equation of a trigonometric wave is $y = 4\sin\left(\frac{1}{2}x - 70\right)^0$. State the period and phase angle.

(2 marks)

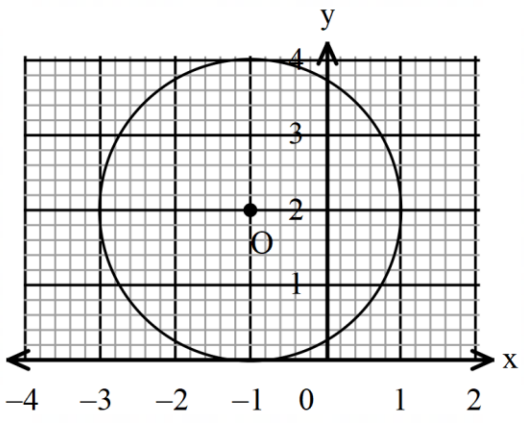
11. A ship leaves an island $(10^\circ N, 45^\circ E)$ and sails due east for 120 hours to another island. The average speed of the ship is 27 Knots. Find the position of the second island. (3 marks)

12. The figure below shows a circle and a point B outside the circle.



Using a ruler and pair of compasses, construct a tangent to the circle from B. (4 marks)

13. Below is a circle center O.



Find the equation of the circle in the form $ax^2 + by^2 + cx + dy + e = 0$. Where a, b, c, d and e are integers. (3 marks)

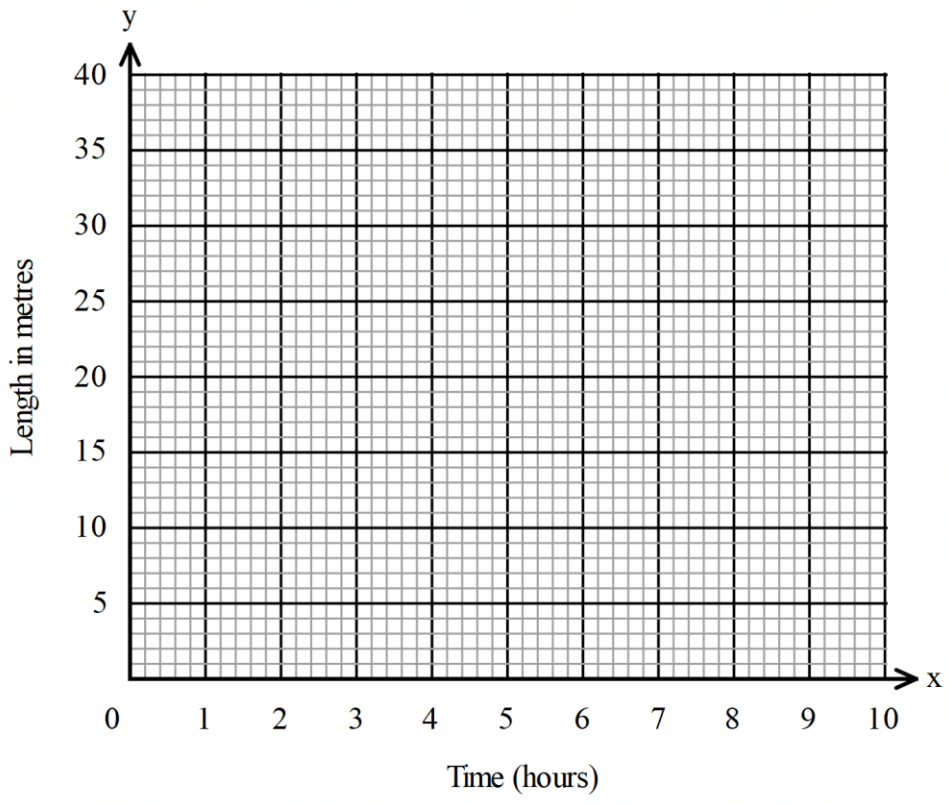
14. Given that Q is directly proportional to square of R and inversely as the cube root of P. find the relationship connecting Q, R and P, given that Q=12, R=6 and P= 27 hence find Q when R=9 and P=64. (3 marks)

15. A welder requires 6 hours to make a bed and 9 hours to make a door. It takes the welder at least 316 hours to make k beds and m doors. The labour cost of making a bed is Ksh. 1 000 and that of a door is Ksh 2 000. The total labour cost should not exceed Ksh. 34 000. The welder must make at least 20 beds and more than 14 doors in order to make a profit. Form all the linear inequalities which will represent the given information in simplest form where possible. (3 marks)

16. The length of a shadow of a tree was measured at intervals of 1 hour and recorded as shown in the table below.

Time (h)	0	2	4	6	8	10
Length (m)	37.4	17.4	10.0	5.8	2.6	0.0

a) On the grid provided, draw the graph of length against time. (2 marks)



b) Determine the gradient of the shadow length at t = 4. (2 marks)

SECTION II (50 marks)

Answer any **five** questions in this section in the spaces provided.

17. Muchiri deposited Ksh. 500 000 in a financial institution which paid a compound interest at the rate of 8% p.a. At the end of 2 years, he withdrew all the money. He then invested 75% of the amount in shares. The value of the shares depreciated at 4% p.a during the first two years of investment. In the next 36 months, the value of the shares appreciated at the rate of 8% every 3 months.

a) Calculate the amount Muchiri invested in shares. (3 marks)

b) Calculate the value of Muchiri's share:

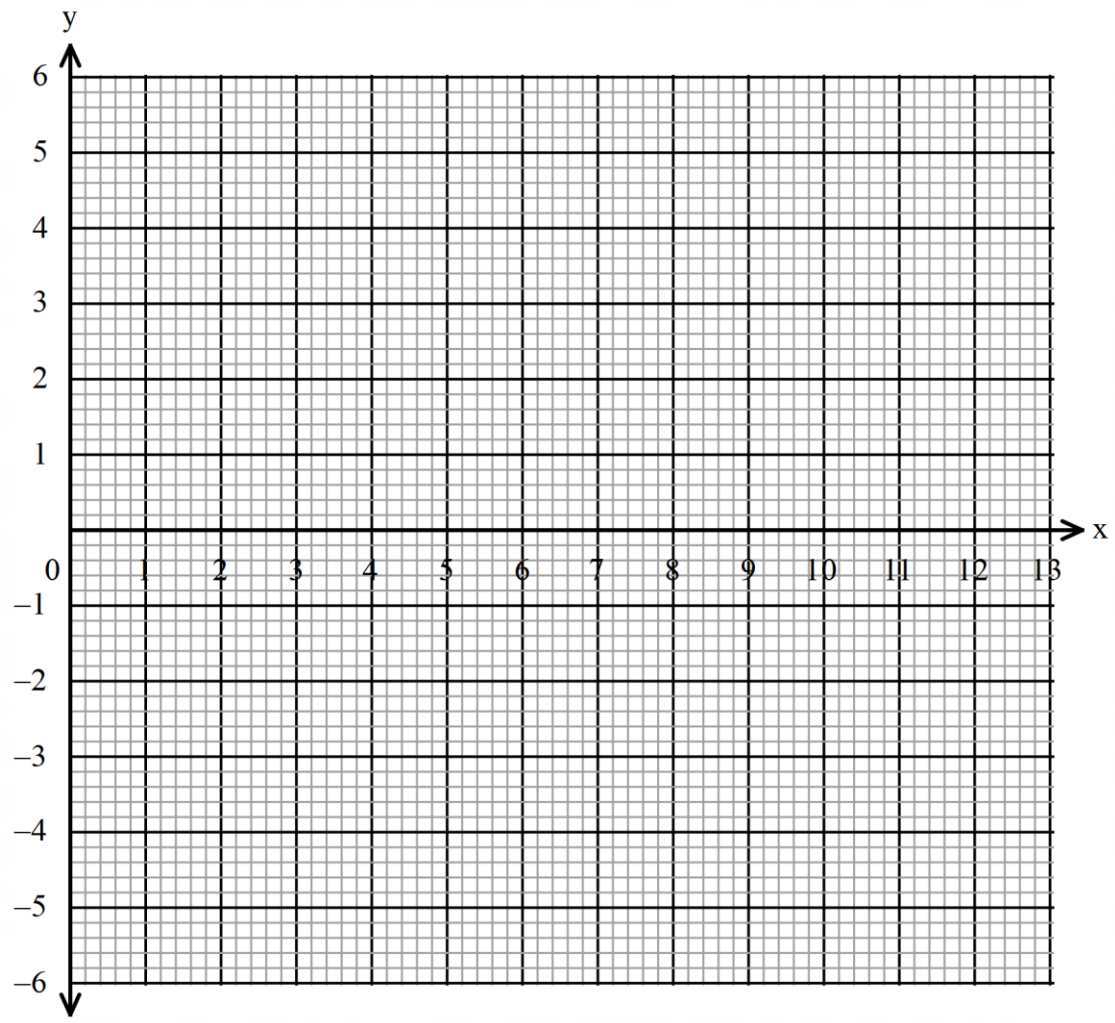
i) At the end of second year. (2 marks)

ii) At the end of 5^{th} year, to the nearest shilling. (3 marks)

c) Calculate Muchiri's gain from the shares as a percentage. (2 marks)

18. Rectangle PQRS in which P(1,3),Q(8,3),R(8,5) and S(1,5) undergoes a shear with y = 3 as the invariant line.

a) Plot the rectangle PQRS on the grid provided. (1 mark)



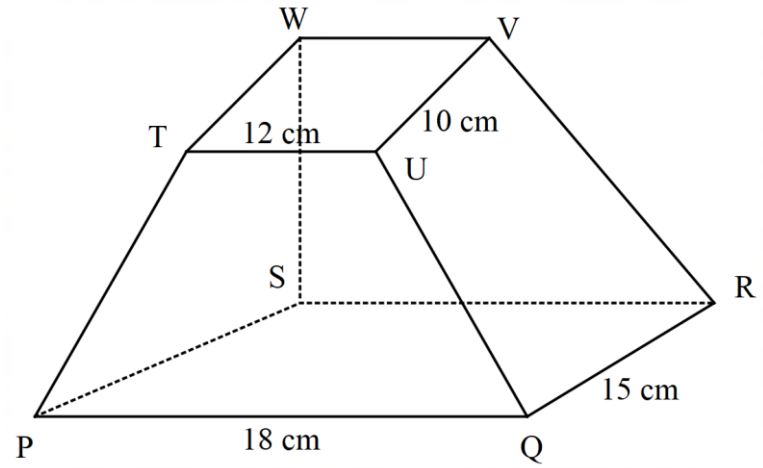
b) If the point R is mapped on to the point R' (12, 5) under this transformation, determine the coordinates of P'Q' and S'. (3 marks)

c) Plot the figure P'Q'R'S' (1 mark)

d) Find the matrix representing this transformation. (3 marks)

e) The image P'Q'R'S' was reflected on the mirror line y = 0. Draw the image P''Q''R''S'' and state its coordinates. (2 marks)

19. The figure below is a frustum of a rectangular pyramid with PQ = 18 cm, TU = 12 cm, QR = 15 cm and height 9 cm.



Calculate:

a) The height of the pyramid (2 marks)

b) Angle that the plane PQUT makes with the base PQRS. (2 marks)

c) Angle that PV makes with the base PQRS. (3 marks)

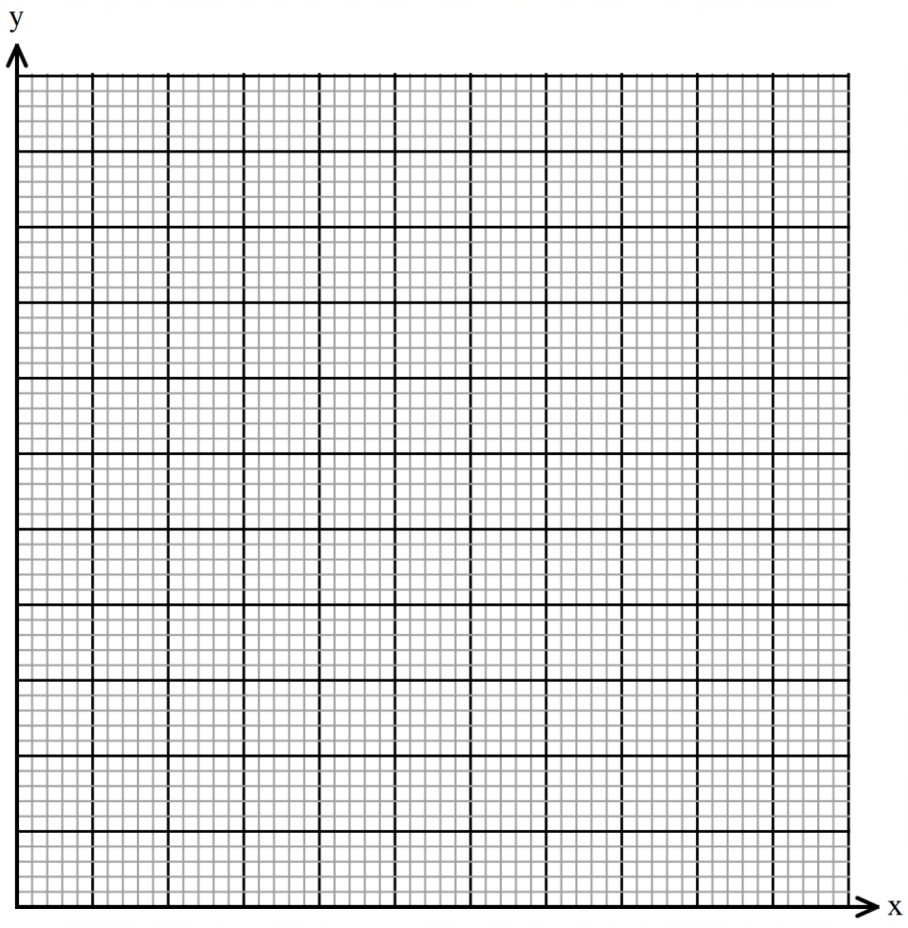
d) Angle that PR makes with line PT. (1 mark)

e) Angle that plane QRVU makes with the base PQRS. (2 marks)

20. The table below shows the marks scored by 100 form 4 students in Maranda high school.

Marks	0-10	10-20	20-30	30 – 40	40 -50	50-60	60-70	70-80	80-90	90-100
Number of students	2	4	6	10	16	30	14	10	6	2
C. F										

a) By completing the column for C.F draw the cumulative frequency curve on the grid provided.



b) Use the graph to estimate:

i) The 50^{th} percentile. (1 mark)

ii) Semi-interquartile range. (3 marks)

iii) Pass mark given that at least 66 students passed. (2 marks)

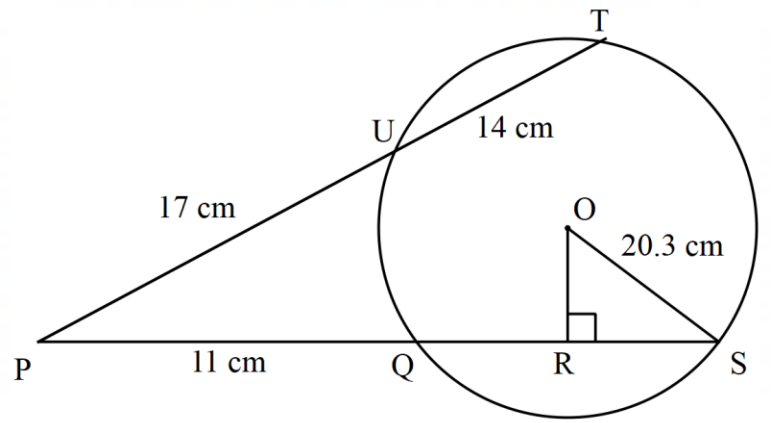
21. The product of the first three consecutive terms of a geometric progression is 5832. If the first term is **a** and the common ratio is **r**.

(a) Express r in terms of a. (2 marks)

(b) Given that the sum of the three terms above is 78, find the values of **a** and **r** hence write down two possible sequences each up to the 4^{th} term. (5 marks)

(c) The sum of the first **n** terms of the sequence is 6558. Find **n**. (3 marks)

22. In the figure below, OS is the radius of the circle centre O. Chords SQ and TU are extended to meet at P and OR is perpendicular to QS at R. OS = 20.3 cm, PU = 17 cm, UT = 14 cm and PQ = 11 cm.



a) Calculate the length of:

i) QS (2 marks)

ii) OR (2 marks)

b) Calculate, correct to 1 decimal place:

i) The size of angle ROS. (3 marks)

ii) The length of the minor arc QS. (3 marks)

23. A candidate at Maranda boys high school is to sit for three series of exams by August 2024 in the preparation for KCSE. These exams include, pre-mock, mock and post mock 1. Given that the probability of a candidate passing first exams is 50%. However, due to revision of the previous exams the probability of passing next series of exams increases by 20%. Use this data to answer the questions that follows:

a) Draw a tree diagram to represent this data. (2 marks)

b) Calculate the probability that;

i) A candidate passes in the three trials. (2 marks)

ii) A candidate fails not exceeding twice. (3 marks)

iii) A candidate passes in the last trial. (3 marks)

24. The velocity of a particle moving in a straight line after t seconds is given by $v = 3 + 5t - 2t^2$.
Calculate:

a) The acceleration of the particle after 2 seconds. (3 marks)

b) The distance covered during the fourth second. (3 marks)

c) Find the distance covered during the first 4 seconds. (2 marks)

d) The time the particle is momentarilly at rest. (2 marks)