



MASENO SCHOOL

Kenya Certificate of Secondary Education 2020

121/2-

MATHEMATICS

-Paper 2

(ALT A)

DEC. 2020 - 2 ½ hours

121/2-Mathematics- P2

Friday 11/12/2020

Time: 8:00am-10.30am

THE MASENO SCHOOL MOCK

Name **Index Number**.....

Candidate's Signature **Date**

Instructions to candidates

- (i) Write your name, index number and class in the space provided above.
- (ii) Sign and write the date of examination in the spaces provided above.
- (iii) This paper consists of two sections: Section I and Section II.
- (iv) Answer all the questions in Section I and only five questions from Section II.
- (v) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
- (vi) Marks may be given for correct working even if the answer is wrong.
- (vii) Non – programmable silent electronic calculators and KNEC Mathematical Tables may be used, except where stated otherwise.
- (viii) This paper consists of 15 printed pages. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

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

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SECTION I (50 Marks)

Answer *all* the questions in this section

1. The length and width of a rectangular sheet of paper measured to the nearest millimetre are 22.3 cm and 15.7 cm respectively. Calculate to four significant figures, the percentage error in area of the paper. (3 marks)

2. Make K the subject of the formula $R = \frac{d}{2\pi} \sqrt{\frac{F - hK}{K}}$ (3 marks)

3. Draw a line PQ of length 7 cm. On one side of the line PQ, construct the locus of a point R such that the area of triangle PRQ is 10.5 cm^2 . On this locus locate two positions of R, R_1 and R_2 such that $\angle PR_1Q = \angle PR_2Q = 90^\circ$. (3 marks)

4. A right – angled triangle has the length of its shorter sides as $(2x + 4)$ and $(8x + 8)$. If the length of the hypotenuse is $10x$. Find its perimeter. (4 marks)

5. A piece of wire 360 metres long is to be used to fence rectangular plot. One end of the plot has a wall already erected. Calculate the maximum possible area of the plot. (3 marks)

6. Simplify $\frac{\sqrt{3}}{2\sqrt{3} + \sqrt{5}} - \frac{\sqrt{5}}{2\sqrt{3} - \sqrt{5}}$ giving your answer in the form $a + b\sqrt{c}$ where a, b and c are rational numbers. (3 marks)

7. (a) Expand $\left(2 - \frac{1}{4}x\right)^6$ (1 mark)

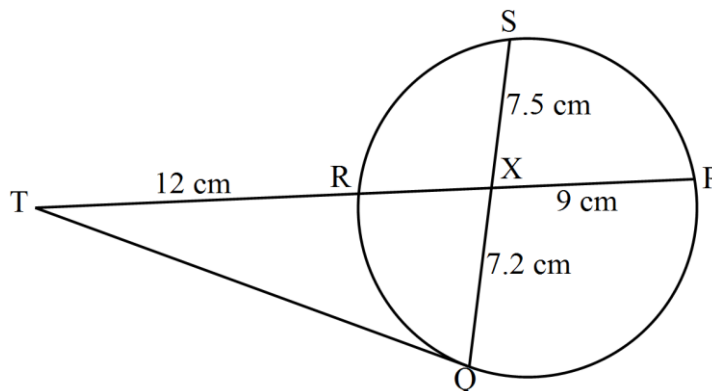
- (b) Use the expansion in (a) up to the fourth term to evaluate $(1.96)^6$ correct to four decimal places. (2 marks)

8. A trader sells two brands of coffee P and Q. The coffee is packed in sachets of same size. The shelves can only accommodate 1000 sachets. He requires at least 200 sachets of P and more than 600 sachets of Q. If he orders x sachets of P and y sachets of Q. Write down all the inequalities in terms of x and y which satisfy the above information. (3 marks)

9. Mr Wangombe a rice trader in Mwea mixed 8000kg of Pishori rice with 12000kg of ordinary rice. A kilogram of Pishori rice cost him Ksh.150 while a kilogram of ordinary rice cost him Ksh.80. He packed the rice in 2kg packets. Determine the price at which he sold each packet in order to realize a profit of 25% if 10% of the rice were damaged by rodents. (3 marks)

10. Onyango wants to buy a radio on hire purchase. The cash price of the radio is Ksh.28000. Onyango makes a down payment of Ksh.6000 followed by 16 monthly instalments of Ksh.2100 each. Calculate the rate of compound interest per month to four significant figures. (3 marks)

11. In the figure below, line TQ is a tangent to the circle at point Q. Line TRXP is a secant to the circle and line SXQ is a chord in the circle. The chord SXQ and the secant TRXP intersect at point X. The lines TR = 12 cm, XP = 9 cm, SX = 7.5 cm and XQ = 7.2 cm.



Calculate:

(a) The length of RX

(1 mark)

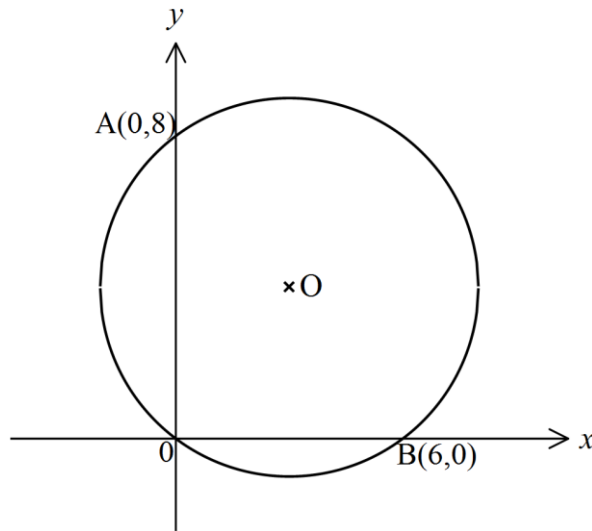
(b) Length TQ to two decimal places.

(2 marks)

12. Towns A and B lie on the same latitude south of equator. When it is 1.00 p.m. at A, the time at B is 7.00 p.m. Given that the longitude of town A is 20°E , find:
- (a) The longitude of Q. (2 marks)

- (b) The latitude where A and B lie given that the length of arc AB along the parallel of latitude is 3600 nautical miles. (2 marks)

13. In the figure below, O is the centre of the circle and A if joined to B, passes through the centre of the circle O.



- (a) Determine the circle.

(1 mark)

centre and the radius of the

- (b) Express the equation of the circle in the form $x^2 + y^2 + ax + bx + c = 0$ where a , b and c are constants. (2 marks)

14. Without using logarithm tables or a calculator, evaluate: (3 marks)

$$\log_{10} 200 - \frac{1}{3} \log_{10} 512 + 2 \log_{10} 20$$

15. Solve the equation, $3 \cos^2 x - 1 = 2 \cos x$ for $-180^\circ \leq x \leq 180^\circ$ (3 marks)

16. Given that O is the origin, $\mathbf{OA} = 2\mathbf{i} + 2\mathbf{j} - 4\mathbf{k}$ and $\mathbf{OB} = 6\mathbf{i} + 10\mathbf{j} + 2\mathbf{k}$. If R divides AB externally in the ratio 3:1. Find **OR**. (3 marks)

SECTION II: (50 Marks)

Answer any five the questions in this section

17. Mr. Kosgei a chief inspector in the police service earns a basic salary of Ksh.56 000, house allowance of Ksh.30 000, commuter allowance of Ksh.12 000 and risk allowance of Ksh.10 000. He has a life insurance policy for which he pays Ksh.6 000 per month and for which he is allowed 15% as insurance relief. He is also entitled to a personal tax relief of Ksh.1 162 per month.

Monthly income in Kenya shillings	Percentage tax rate in each shilling
0 – 10164	10
10165 – 19740	15
19741 – 29316	20
29317 – 38892	25
38893 and above	30

(a) Using the tax table above:

(i) Determine Mr Kosgei’s monthly taxable income. (2 marks)

(ii) Calculate net tax paid by Mr Kosgei per month. (4 marks)

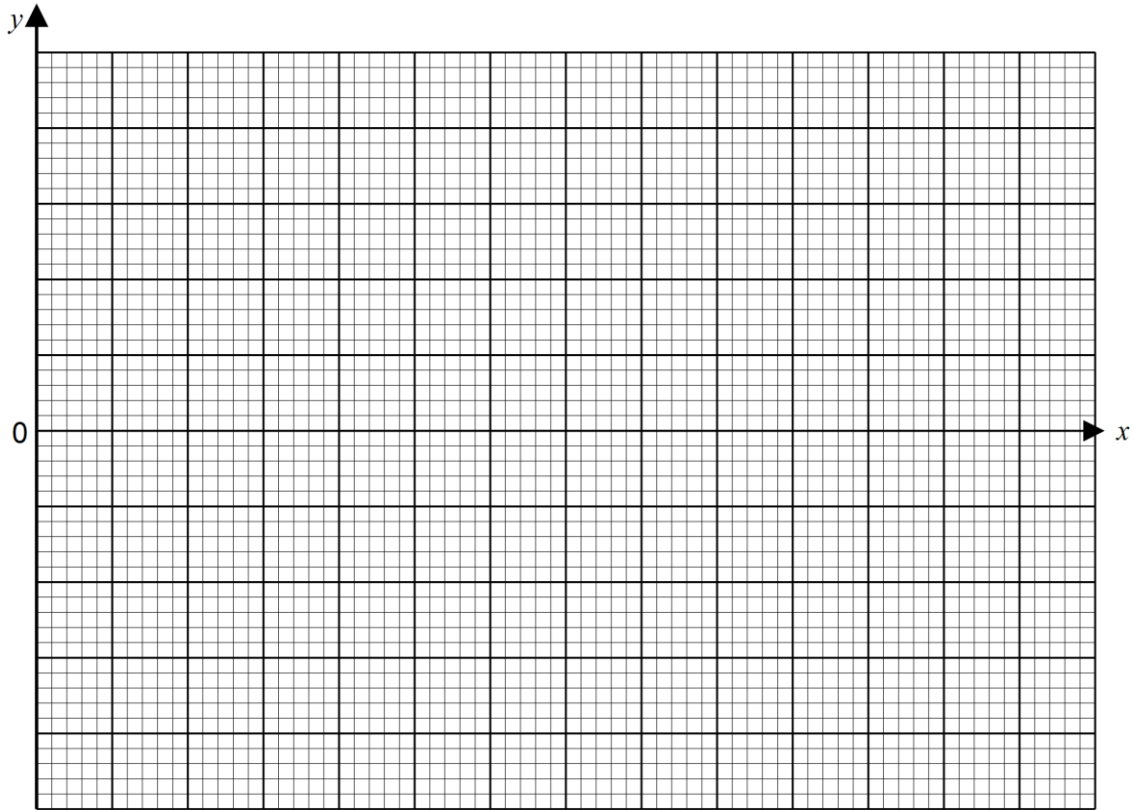
(b) Mr Kosgei also had the following monthly deductions from his salary: Sacco loan repayment Ksh.1 000, WCPS 2% of basic salary, NHIF Ksh.1 500. Determine his net monthly salary. (2 marks)

(c) If Mr. Kosgei got an annual increment of 20% in his basic salary, determine the percentage increase in net tax paid per annum. (2 marks)

18. (a) Complete the table given below by filling in the blank spaces. (2 marks)

x	0	15	30	45	60	75	90	105	120	135	150	165	180
$y = 4 \cos 2x$	4.00		2.00	0	-2.00		-4.00		-2.00	0	2.00		4.00
$y = 2 \sin (2x + 30)$	1.00	1.73	2.00	1.73		0	-1.00		-2.00	-1.73		0	1.00

(b) On the grid provided, draw on the same axes, the graph of $y = 4 \cos 2x$ and $y = 2 \sin (2x + 30)$ for $0^\circ \leq x \leq 180^\circ$. Take the scale, 1 cm for 15° on the x – axis and 1 cm for 1 unit on the y – axis. (5 marks)



(c) From the graph:

(i) State the amplitude of $y = 4 \cos 2x$ (1 mark)

(ii) Find the period of $y = 2 \sin (2x + 30)$ (1 mark)

(d) Use your graph to solve the equation $4 \cos 2x - 2 \sin (2x + 30) = 0$ (1 mark)

19. (a) A wedding committee consisting of three people is to be chosen from five men and seven women.

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

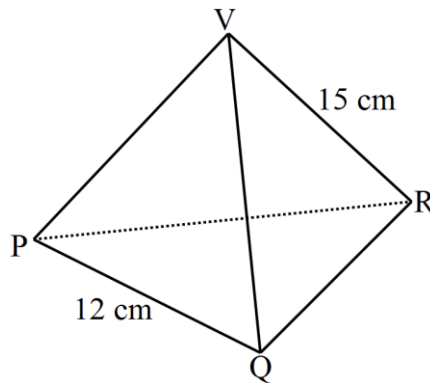
Using the tree diagram above, find the probability that:

(i) All committee members are of the same gender. (2 marks)

- (ii) At least two of the committee members are men. (3 marks)

- (b) A tetrahedron is biased such that the probability of a face showing up is given by $P(t) = m^t$ where m is a constant and $t = 1, 2, 3$ and 4 (number of the faces). Find the probability that when the tetrahedron is tossed twice the sum of the faces that will show up is 7. (3 marks)

20. The figure below shows a tetrahedron PQRV. $PQ = QR = RP = 12$ cm and $VP = VQ = VR = 15$ cm.



Calculate to **one**

decimal place:

- (a) Height of the tetrahedron. (3 marks)
- (b) Angle between VQ and the base PQR. (2 marks)
- (c) Angle between VPQ and the base PQR. (2 marks)

(d) Angle between VPQ and VQR. (3 marks)

21. (a) A carpenter wishes to make a ladder with cross – pieces. The cross – pieces are to diminish uniformly in lengths from 63 cm at the bottom to 28 cm at the top. Calculate:

(i) The length in centimetres of the seventh cross – piece from the bottom. (3 marks)

(ii) The length in centimetres of the fourth cross – piece from the top. (2 marks)

(b) The third, fifth and eighth terms of another Arithmetic Progression (A.P.) form the first three consecutive terms of a Geometric Progression (G.P.). If the common difference of the AP is 3, find:

(i) The first term of the Geometric Progression. (3 marks)

(ii) The sum of the first eleven terms of the Geometric Progression. (2 marks)

22. The data below shows the marks obtained by 50 students in a certain class.

<i>Marks</i>	25 – 34	35 – 44	45 – 54	55 – 64	65 – 74	75 – 84	85 – 95
<i>No. of students</i>	3	6	16	12	8	4	1

(a) Using an assumed mean of 59.5, calculate:

(i) The mean (3 marks)

(ii) The standard deviation of the distribution (3 marks)

(b) Estimate:

(i) The lower quartile of the distribution. (2 marks)

(ii) The pass mark if 34 students passed the exam. (2 marks)

23. (a) The speed V m/s of a moving particle is partly constant and partly varies as time t seconds. It is given that $V = 28$ m/s when $t = 2$ and $V = 53$ m/s when $t = 7$ seconds .
Find the speed of the particle when $t = 11$ seconds. (4 marks)

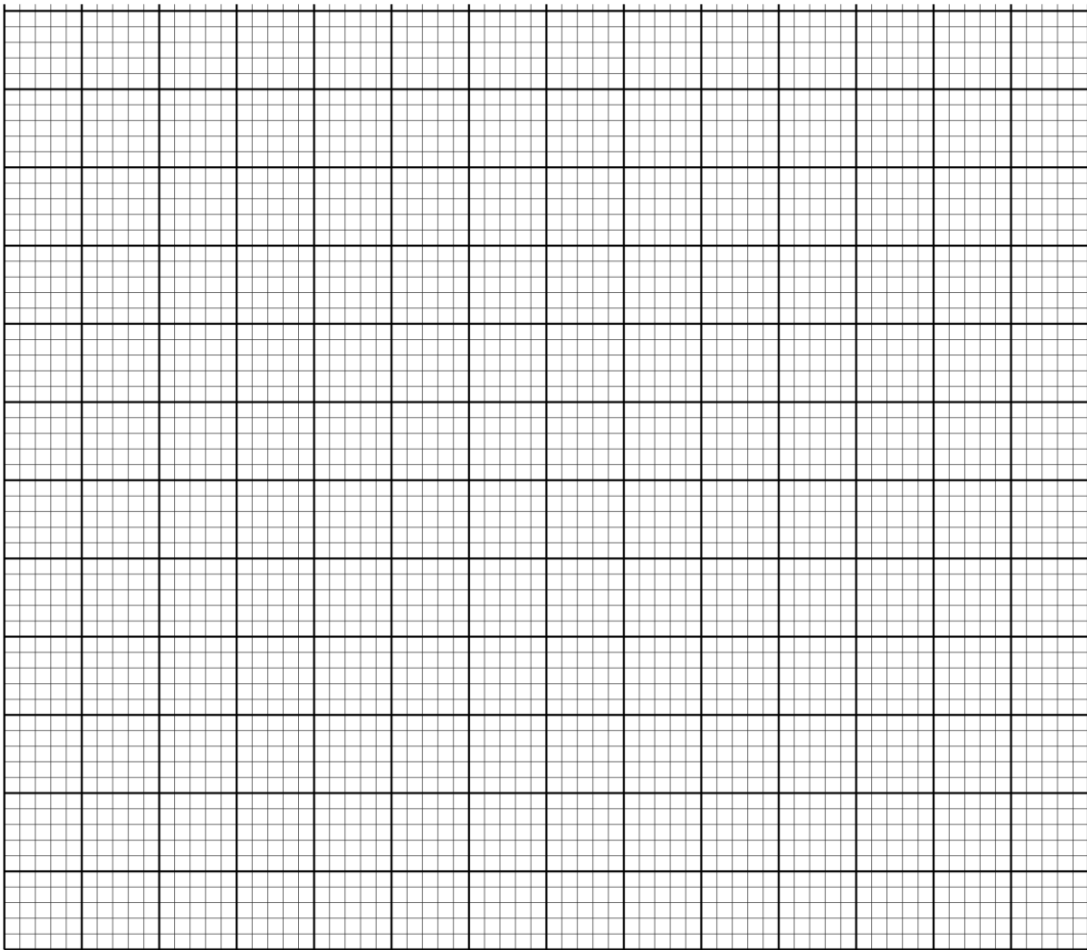
(b) A quantity R varies directly as T and inversely as the cube root of S . Given that $S = 64$ when $T = 6$ and $R = 30$;

(i) Find the formula connecting R , S and T . (3 marks)

(ii) Find the percentage change in R when T is decreased by 10% and S increased by 25%. (3 marks)

24. The vertices of a square PQRS are $P(1,1)$, $Q(1,3)$, $R(3,3)$ and $S(3,1)$. The vertices of its image under a transformation T are $P'(1,-2)$, $Q'(1,-6)$, $R'(3,-6)$ and $S'(3,-2)$.

(a) On the grid provided, draw PQRS and its image $P'Q'R'S'$ under T (2 marks)



(b) Determine the matrix of transformation represented by T . (3 marks)

(c) Find the vertices of $P''Q''R''S''$ the image of $P'Q'R'S'$ under transformation represented by

$U = \begin{pmatrix} 1 & -3 \\ 0 & 1 \end{pmatrix}$. On the same grid as in (a) above, draw $P''Q''R''S''$. (3 marks)

(d) Describe fully the transformation U .

(2 marks)

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