

Name.....Adm
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121/2
Mathematics Paper 2
Form 4
2 ½ Hours
Term 2, July-2019

MOKASA II EXAMINATIONS
2019
Kenya Certificate of Secondary Education
(K.C.S.E)

INSTRUCTIONS TO CANDIDATES

- Write your name and Admission number in the spaces provided at the top of this page.
- This paper consists of two sections: Section I and Section II.
- Answer **ALL** questions from section I and **ANY FIVE** from section II
- All answers and workings must be written on the question paper in the spaces provided
below each question.
- Show all the steps in your calculation, giving your answer at each stage in the spaces
below each question.
- Non - Programmable silent electronic calculators and KNEC mathematical tables may be
used, except where stated otherwise.

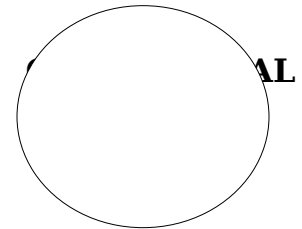
FOR EXAMINERS USE ONLY

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



SECTION I 50 MARKS

(Answer all the questions)

- 1.** Use logarithm tables of trigonometry and numbers to evaluate; (3 marks)

$$\sqrt{\frac{\sin 35^{\circ} \cos 50^{\circ}}{\log 6}}$$

- 2.** By rounding each number to the nearest tens, approximate the value of,

$$\frac{2454 \times 396}{66}$$

Hence, calculate the percentage error arising from this

approximation

to 4 significant figures.

(3 marks)

- 3.** Determine the value of x for which the matrix below is singular. (3 marks)

$$\begin{pmatrix} x & 4 \\ 1 & x-3 \end{pmatrix}$$

- 4.** Simplify without using tables or a calculator (3 marks)

$$\frac{\sin 480^\circ - \cos 765^\circ}{\tan 225^\circ - \sin 330^\circ}$$

- 5.** Find the value of x in the equation below. $0^\circ \leq x \leq 180^\circ$ (3 marks)

$$\cos(3x - 180^\circ) = \frac{\sqrt{3}}{2}$$

in the range listed

6. Z is directly proportional to x^2 and inversely proportional to $\frac{1}{y^{-1}}$. If x is increased by 22.5% and y is decreased by 19.76%. Find the percentage change in Z. (3 marks)

7. Triangle PQR has vertices P(-1, 2) Q(-1, 1) and R(1, -1). Find the matrix of transformation which maps triangle PQR onto triangle $P^1 Q^1 R^1$ whose vertices are $P^1(-3, 2)$ $Q^1(0, -1)$ $R^1(2, -1)$. Describe the transformation fully.
(3 marks)

8. The age distribution of 9 workers in a factory were: 32, 30, 28, 35, 33, 37, 33, 34, 32. Determine the semi-Interquartile range of the data.
(3 marks)

9. The first three terms of a geometric sequence are $2x$, $x-8$, $2x+5$ respectively. Find the possible values of x .
(3 marks)

10. 125 small white cubes are arranged to form one large cube. The sides of the large cube are then painted red, the cubes are then dismantled and one of the small cubes picked at random. Find the probability that the cube picked has two of its side painted red.
(3 marks)

11. The gradient function of a curve is given by the expression $2x+1$. If the curve passes through the point $(-4,6)$. Find the equation of the normal to the curve at this point.
(3 marks)

12. Find the area enclosed by the curve $y=81-x^2$ and the x - axis using mid-ordinate rule with 9 strips. (4 marks)

13. Two parallel chords of a circle are each 16cm long. If the radius of the circle is 10cm. Find the perpendicular distance between the chords. (3 marks)

14. Line AB is the diameter of a circle such that the co-ordinates of its ends A and B are (-1, -4) and (7,2) respectively.
(a) Determine the centre and radius of the circle. (2 marks)

(b) Hence find the equation of the circle.
(1 mark)

15. The table below shows income tax rates in Kenya.

Monthly taxable income in Ksh	Tax rate percentage % in each shilling
Upto 8680	10%
From 8681 to 18900	15%
From 18901 to 27920	20%

During the year, Mong'are paid a net tax of Ksh. 5360 after a relief of Ksh. 1256 in a certain month. Calculate Mong'are's net salary during the month if he enjoys a non-taxable travel allowance of Ksh. 5000.
(4 marks)

16. Write down the expansion of $\left(1 + \frac{1}{4}x\right)^4$, use the first three terms of the expansion to find out the value of $(1.025)^4$ correct to three decimal places. (3 marks)

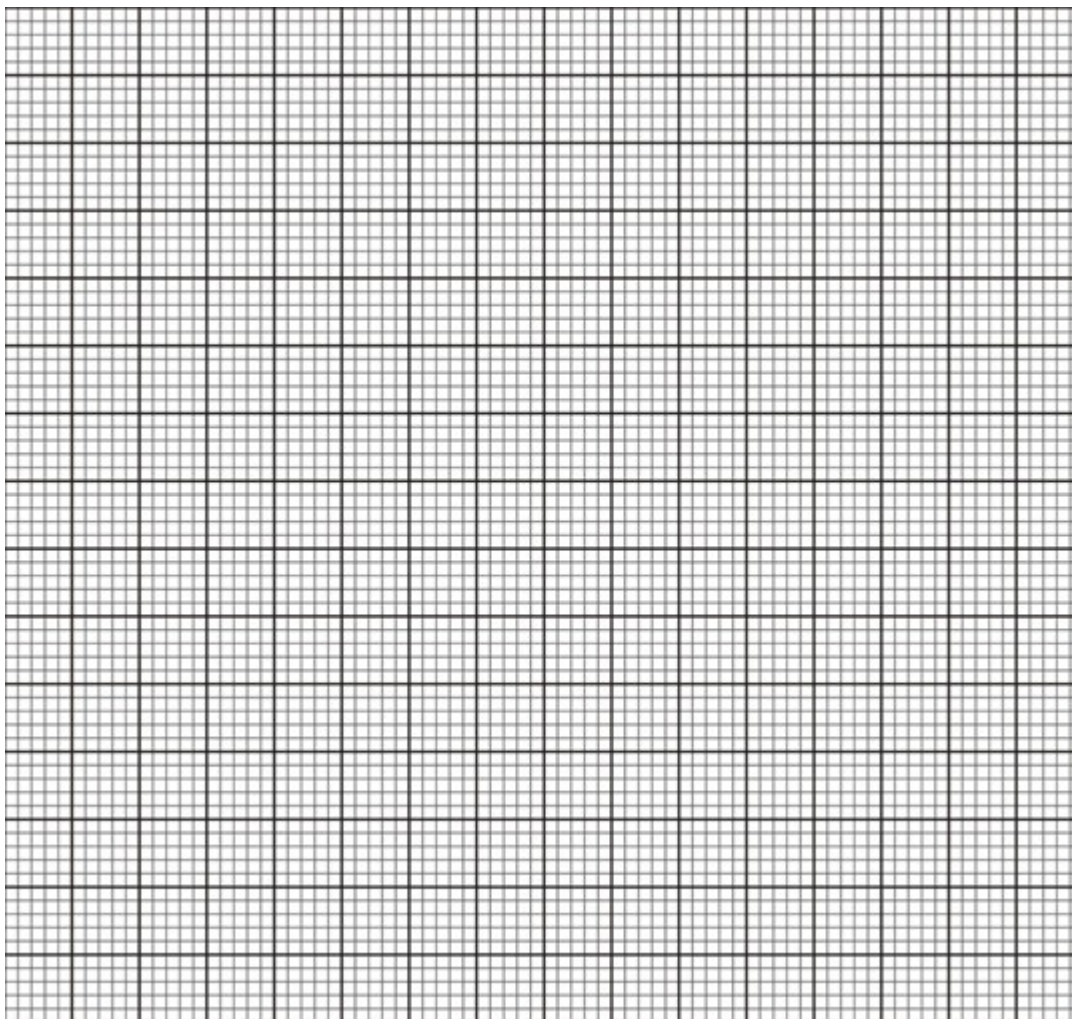
SECTION II (50 MARKS)

(Answer ANY FIVE questions in the spaces provided)

x°	-180°	-150°	-120°	-90°	-60°	-30°	0°	30°	60°	90°	120°	150°
$\cos x^\circ$	-1	-0.87		0	0.5		1		0.5	0	-0.5	
$\sin 2x^\circ$	0		0.87	0		-0.87		0.87		0		-0.87

17. (a) Complete the table below and use it to answer the question that follow. (2 marks)

(b) draw the graph of $y = \sin 2x$ and $y = \cos x$ on the same axis using a scale of 1cm for 30° on the x-axis and 1cm for 0.2 units on the y-axis. (5 marks)

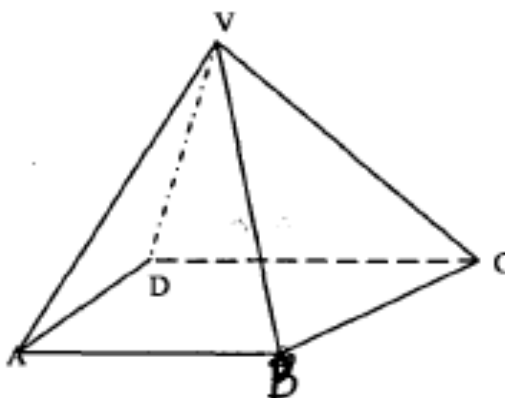


(c) Estimate the values of x for which

(i) $\cos x^\circ - \sin 2x^\circ = 0$ (2 marks)

(ii) $\cos x = -0.5$ (1 mark)

18. The diagram below represents a square based pyramid with equilateral triangles, $AB = 8 \text{ cm}$.



Calculate the:

(a) Height of the triangular faces. (2 marks)

(b) Length of AC (1 mark)

(c) Angle between VD and the base (3 marks)

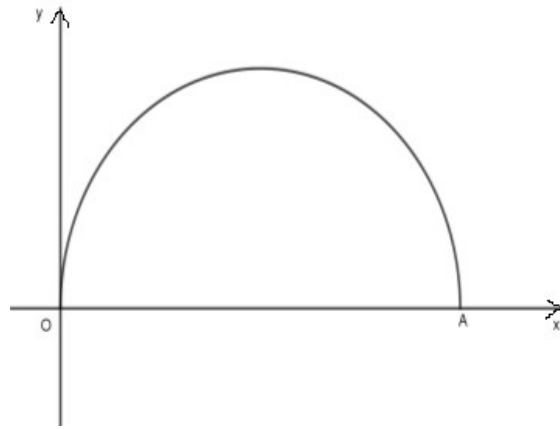
(d) Angle between VAB and VBC (4 marks)

19. (a) A farmer bought a tractor at Ksh.1800000. The tractor's depreciation rate is 12% p.a. Find the number of full years it will take for the value of the tractor to depreciate to Ksh. 800000. (3 marks)

(b) At the start of the eighth year, the tractor was sold at a value that is Ksh. 200,000 more than its actual value. If the selling price was to be taken as its actual value at the start of the eight year, find the tractors semi annual rate of depreciation.
(4 marks)

(c) The hire purchase of a table is Ksh.16800. If 25% is paid as deposit and the rest of the money is spread over 10 equal monthly installments. Find the amount of each installment.
(3 marks)

20. The diagram represents parts of a curve $y = 2x - x^2$



(a) Calculate:

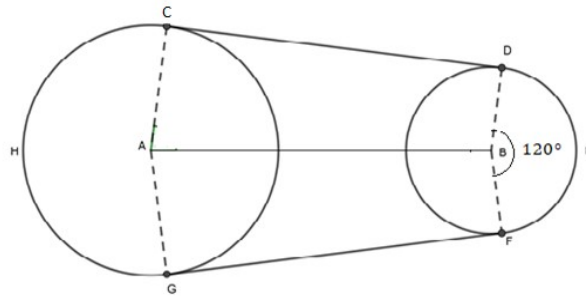
(i) the coordinates of A
(2 marks)

(2

(ii) the area bounded by curve and the x-axis.
(3 marks)

(b) The equation of the curve is $y=2x^3-5x^2-x$. Calculate the angle between the x -axis and tangent to the curve at (2, -6)
(5 marks)

21. The diagram represents two pulley wheels, centres A and B with a rubber band CDEFGHC stretched round them. Radius of the wheel centre A is 12cm, $AB = 20\text{cm}$, CD, GF are tangents to the circles. Angle $DBF = 120^\circ$



Calculate

(a) Length

(i) BD (2 marks)

(ii) CD (2 marks)

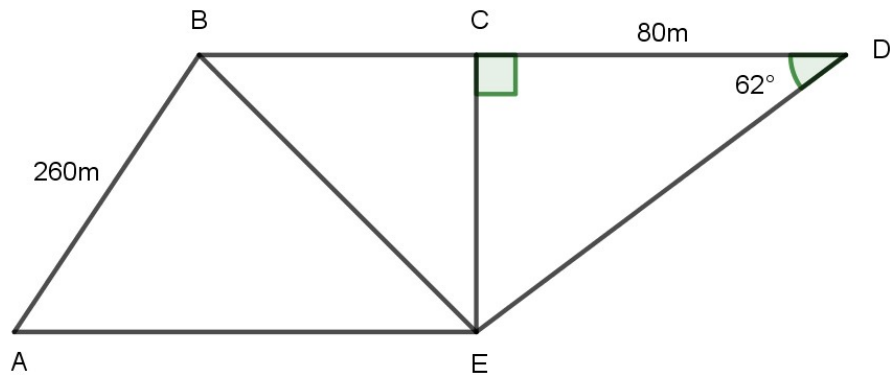
(b) Arc lengths;

(i) CHG (2 marks)

(ii) DEF (2 marks)

- (c)** The total length of the belt
(2 marks)

22. Figure ABDE below represents Koech's grazing land. It is divided into three paddocks. ABE, BCE and CDE. $\angle ABE = 80^\circ$, $\angle CBE = 60^\circ$ and $\angle CDE = 62^\circ$.
 $AB = 260\text{m}$ and $CD = 80\text{m}$.



- (a)** Calculate to the nearest metre;
(i) The length of CE
(2 marks)

- (ii)** The length of AE
(3 marks)

- (iii)** The perimeter of the grazing land
(3 marks)

(b) Koech fenced each side of the three triangular paddocks with three strands of wire. He left 2.4m wide gates at sides AB, BE and CE. If the wire that he used was bought in rolls of 500m, determine the number of rolls of wire that he bought.
(2 marks)

23. (i) Construct the triangle ABC in which $AB=5\text{ cm}$, angle $BAC=60^\circ$ and angle $ABC=90^\circ$. Measure the length BC
(1 mark)

(ii) Construct the circumcircle of triangle ABC (2 marks)

(iii) On the same side of AB as C, construct the locus of point P such that the area of triangle ABP is half the area of triangle ABC. (4 marks)

(iv) Mark and label clearly a point Q such that $\angle AQB$ is 30° . (3 marks)

24. **P** and **Q** are two points on a geographical globe of diameter 50 cm. They both lie on a parallel latitude 50° North. **P** has longitude 90° West and **Q** has longitude 90° East. A string **AB** has one end at point **P** and another at point **Q** when it is stretched over the North pole. Taking $\pi = 3.142$;

(a) Calculate the length of the string.
(3 marks)

(b) If instead the string is laid along the parallel of latitude 50° N with **A** at point **P**, calculate the longitude of point **B**.
(3 marks)

(c) State the position of **B** if the string is stretched along a great circle of **P** towards the South pole if point **A** is static at **P**.
(4 marks)

