NAME ……. Index number …

…….

Admission number……

121/2

…….

Candidate's signature

MATHEMATICS ALT A

Class: ……

Paper 2

16th July, 2019

Date……

TIME: 2 ½ HRS

ALLIANCE GIRLS' HIGH SCHOOL

FORM 4 2019 MOCK EXAMINATIONS

Kenya Certificate of Secondary Education

Instructions to candidates

*(a) Write your **name, index** and **admission** number in the spaces provided above.*

(b) Sign and write the date of the examination in the spaces provided above.

*(c) The paper contains **TWO** Sections: **Section I** and **Section II.***

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

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

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

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

*(h) **Non-programmable** silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.*

(i) This paper consists of 16 printed pages.

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

(k) Answer all the questions in English.

FOR EXAMINER'S USE ONLY

SECTION I

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

17	***18***	***19***	***20***	***21***	***22***	***23***	***24***	***Total***

SECTION II

Grand Total

SECTION I (50 marks)

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

1. Evaluate without using calculator or mathematical tables

$$\frac{3\log_2 4 - \log_3\left(\frac{1}{27}\right)}{\frac{1}{2}\log_7 343}$$

(3 marks)

2. Given that $\underset{\sim}{a} = -5\underset{\sim}{i} + 6\underset{\sim}{j}$ and $\underset{\sim}{b} = 3\underset{\sim}{i} + 4\underset{\sim}{j}$. Find $|\underset{\sim}{a} + \underset{\sim}{b}|$ to 2 decimal places. (3 marks)

3. A quantity P is partly constant and partly varies as the square of Q. When $Q=2$, $P=40$ and when $Q=3$, $P=65$. Determine the law connecting P and Q.
(4 marks)

$X\hat{P}Y=90^0$

4. Given the line XY below, locate two positions of point P such that $XP_1=XP_2=3.5cm$ and
(3 marks)

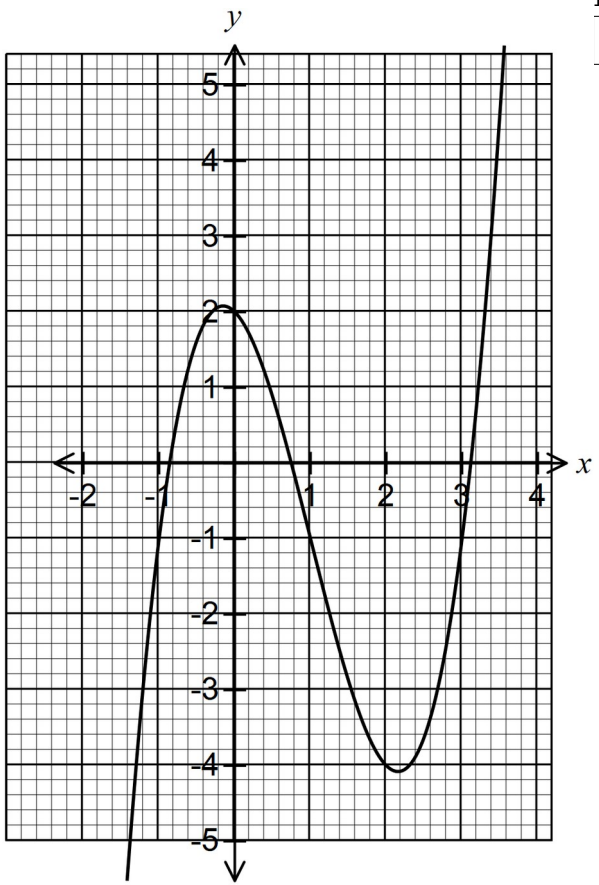
X_____Y

5. Without using mathematical tables or calculator, simply the following leaving your answer in surd form. (3 marks)

$$\frac{2+\cos 30^0}{1-\sin 60^0}$$

6. A shopkeeper mixes sugar costing $\text{Ksh}\,40$ per kilogram with another type costing $\text{Ksh}\,60$ per kilogram. Find the ratio in which the two types should be mixed so that if a kilogram of the mixture is sold at $\text{Ksh}\,55$, a profit of 10% is realized. (3 marks)

7. The figure below is a graph of the cubic function $y = x^3 - 3x^2 - x + 2$ for $-1.5 \leq x \leq 3.5$.



Use the graph to

(a) Solve the equation $x^3 - 3x^2 - x + 2 = 0$
(2 marks)

(b) Find the average rate of change at $x = 0$ and $x = -1$
(2 marks)

8. Solve for θ in the range $0^0 \leq \theta \leq 180^0$
(3 marks)

$$4Cos^2 3\theta = 3$$

9. (a) Expand $\left(2 - \frac{1}{x}\right)^6$ upto the term in x^3.
(2 marks)

(b) Use the expression above to approximate the value of $(1.75)^6$.

(2 marks)

10. A triangle PQR has an area of $3.2cm^2$.It's image under a transformation matrix $\begin{pmatrix} 4x^2 & 5 \\ -x & 1 \end{pmatrix}$ has an area of $19.2cm^2$.Find the value of x
(3 marks)

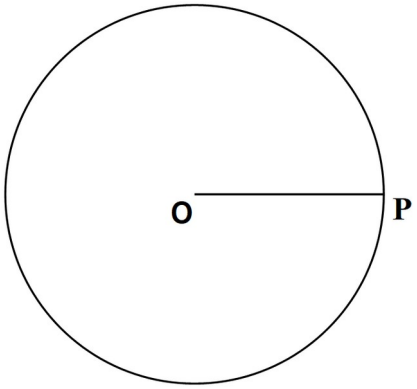
11. Make t the subject of the formula $M = \sqrt{\frac{6t^2 + k}{k^2}}$
(3 marks)

12. Find the radius and the centre of a circle whose equation is $3x^2 + 3y^2 + 18y - 12x - 9 = 0$
(3 marks)

13. The probability of Jackie hitting the bull's eye in a game of darts is 80%. Each time she attempts and misses, her chances of hitting the bull's eye decreases by 15%. She plays the game till she wins. Find the probability that she wins in the third attempt. (3 marks)

14. Mr. Korir bought a tractor valued at Ksh.1, 800,000. If the value of the tractor is depreciating at 20% p.a. Calculate the value of the tractor after 4 years. (3 marks)

15. The figure below shows a circle centre **O**. Draw a tangent to the circle at point **P**. (2 marks)



16. The gradient of a curve at any point (x, y) is $6x^2$. Given that the curve passes through the point $(1, 5)$, find its equation.
(3 marks)

SECTION II (50 marks)

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

17. Water flows through a cylindrical pipe of diameter 4.2 cm at a speed of 50 m/min.

(a) Calculate the volume of water delivered by the pipe per minute in litres. (3 marks)

(b) A cylindrical storage tank of depth 3 m is filled by water from this pipe at the same rate of flow. Water begins flowing into the empty storage tank at 8.30 am and is full at 3.10 pm.

Calculate the area of cross-section of this tank in square meters. (4 marks)

(c) A family consumes the capacity of this tank in one month. The cost of water is sh. 40 per

thousand litres plus a fixed basic charge of sh. 1650. Calculate this family's water bill for a

month.

(3 marks)

18. P and Q are points on latitude 30^0S. The two points lie on longitudes 30^0E and 150^0W respectively.

(a) Calculate the;

(i) distance in kilometres from P to Q along a parallel of latitude correct to 2 decimal places

$\left(\text{Use } \pi = \frac{22}{7} \text{ and } R = 6370 \text{ km} \right)$

(3 marks)

(ii) shortest distance from P to Q along a great circle in nautical miles

(3 marks)

(b) An aircraft left P for Q at a speed of 160 knots, along a great circle on Monday at $0500h$.

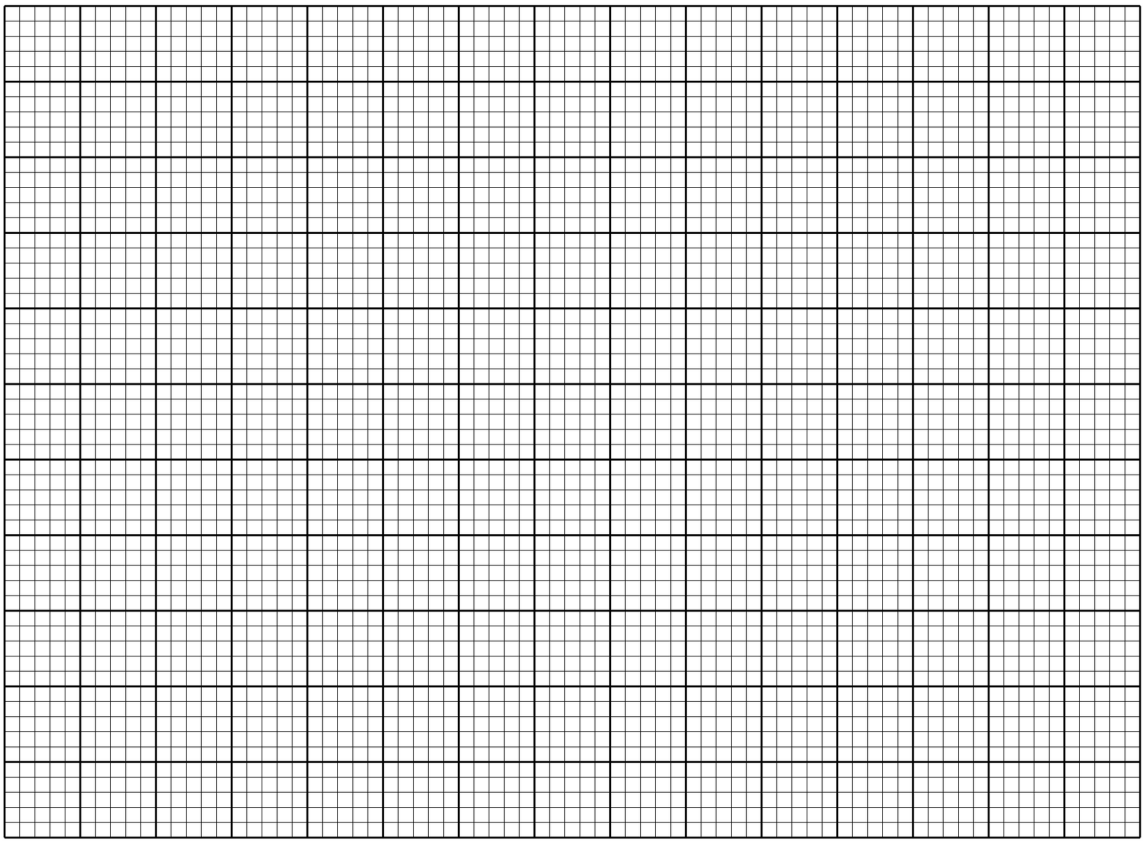
Find the local time and day when the aircraft arrived at Q.
(4 marks)

19. The data below shows the masses in kilograms of 50 animals in a farm

Mass (kg)	125-134	135-144	145-154	155-164	165-174	175-184	185-194
Number of Animals	3	6	16	12	2x	x	1

(a) Complete the table by finding the value of x
(1 mark)

(b) On the grid provided, draw a cumulative frequency curve for the data
(4 marks)



(c) Use the graph in (b) above to estimate:

(i) The 3rd and the 7th decile
(2 marks)

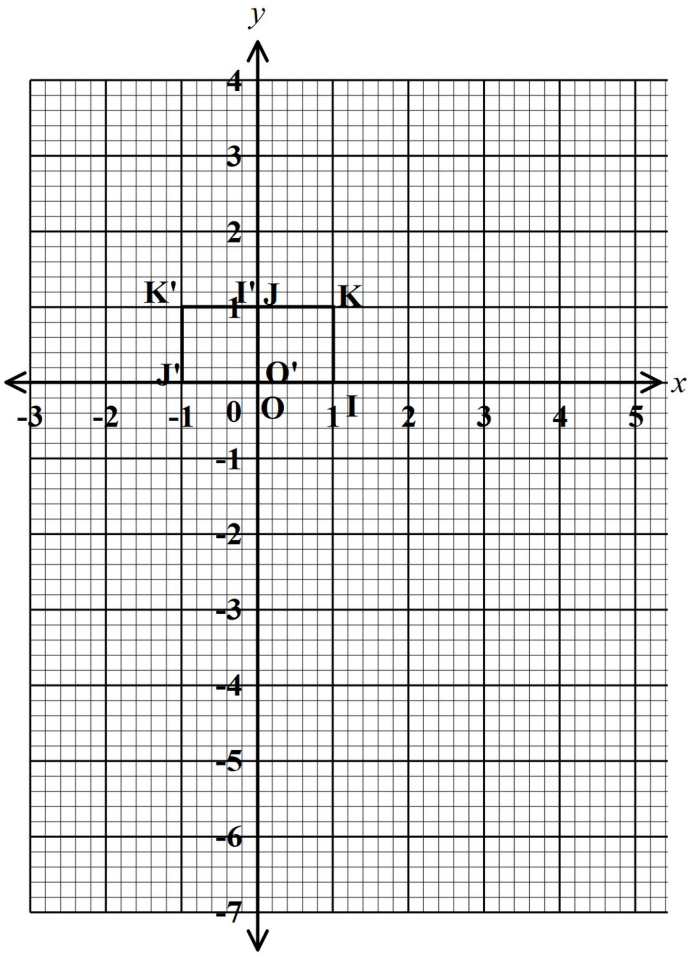
(ii) The percentage number of animals in the farm whose mass is less than or equal to

169.5kg
(3 marks)

20. (a) The diagram below represents a unit square OIKJ and its image O' I' K' J' under a certain

transformation. Write down the matrix of transformation that maps $OIKJ$ onto $O'\ I'\ K'\ J'$.

(1 mark)



(b) $OABC$ is a quadrilateral with vertices O(0,0), A(2,0), B(3,2) and C(1,2). The quadrilateral

undergoes the same transformation as the unit square in (a) above to produce the image

$O'\ A'\ B'\ C'$.

(i) Find the coordinates of $O'\ A'\ B'\ C'$.
(2 marks)

(ii) On the grid provided in (a) above, draw OABC and $O'A'B'C'$.
(2 marks)

(c) (i) Find $O''A''B''C''$ the image of $O'A'B'C'$ under the transformation matrix $\begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}$

(2 marks)

(ii) On the grid provided in (a) above, draw $O''A''B''C''$.
(1 mark)

(d) Find the single matrix that maps $O''A''B''C''$ onto OABC.
(2 marks)

21. The table below shows income tax rates for a certain year.

Monthly income in Ksh	Rate (%)
1 – 10164	10
10165 – 19740	15
19741 – 29316	20
29317 – 38892	25
Over 38892	30

Johnstone`s monthly earnings were as follows:

Basic salary of Sh. 62 000
House allowance of Sh. 12 000
Medical allowance of Sh. 3 000
Hardship allowance of Sh. 6 200

He was entitled to a personal relief of Sh. 1162 per month. He also had an insurance scheme for which he paid a monthly premium of Sh. 4 000. He was entitled to an insurance relief of 15% of the premium paid.

Calculate

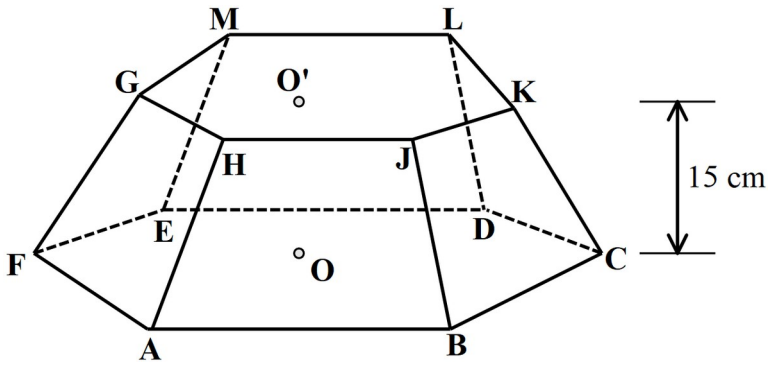
(a) His monthly taxable income in kenya shillings.
(2 marks)

(b)His net tax per month.
(6 marks)

(c) Apart from income tax the following monthly deductions were made; Insurance premium
4 000 and 5% of his basic salary to a Co-operative Society, find his net pay for that month.

(2 marks)

22. The figure below shows a frustum cut from a pyramid whose base is a regular hexagon. The planes ABCDEF and GHJKLM are parallel to each other. AB = 12cm and HJ = 8cm. The altitude of the frustum OO' is 15cm.



Calculate:
(a) The vertical height of the original pyramid from which the frustum was obtained; (3 marks)

(b) The angle between the edge FG and the base of the frustum;
(3 marks)

(c) The angle between the face AFGH and the base ABCDEF of the frustum.
(4 marks)

23. (a) The n^{th} term of a series is given by $2n + 5$.

(i) Write down the first four terms of the sequence.
(2 marks)

(ii) Find the sum of the first twenty terms of the sequence.
(3 marks)

(iii) Find the 50^{th} term of the sequence.
(2 marks)

(b) The fourth term of geometric sequence is 54 and the sixth term is 486. Find the

common ratio and the first term.
(3 marks)

24. (a) Complete the table below for the function $y = x^2 - 4x + 5$ in the range $0 \leq x \leq 5$
(2 marks)

x	0	1	2	3	4	5
y						

(b) Using the trapezium rule with 6 ordinates, estimate the area bounded by curve $y = x^2 - 4x + 5$,

the lines $x = 0$, $x = 5$ and the x- axis.
(3 marks)

(c) Find the exact area bounded by the curve, lines $x = 0$, $x = 5$ and the x- axis. (3 marks)

(d) Find the percentage error arising from using the trapezium rule in determining the area.

(2 marks)