121/1
MATHEMATICS
PAPER 1
Time: 2½ Hours

ALLIANCE HIGH SCHOOL
MOCK EXAM

Instructions to candidates:

1. Write your name and Index Number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. The paper contains **TWO** Sections I and Section II.
4. Answer **ALL** the questions in Section I, any **five** in and Section II.
5. Answers and working must be written on the question paper in the spaces provided below each question.
6. Show all the steps in your calculation, giving your answers at each stage in the spaces below each question.
7. Non-programmable silent electronic calculators and **KNEC** Mathematical tables may be used, except where stated otherwise.

For Examiner's use only

Section I

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

Section II

Question	17	18	19	20	21	22	23	24	Total
Marks									

Grand Total	

This paper consists of 8 printed pages.

Candidates should check the question paper to ensure that all the pages are printed as indicated and that no questions are missing.

SECTION I (50 MARKS)

Attempt *ALL* the questions in this section.

1. Simplify and express your answer as a mixed number. (3 marks)

$$\frac{\frac{2}{5} \div \frac{1}{6} \text{ of } 1\frac{3}{25} - \frac{1}{2}}{\left(1\frac{1}{4} + \frac{2}{3}\right) \div 5\frac{1}{9} - \frac{1}{7}} =$$

2. The centre of a circle is a point C(3,7). A tangent to the circle passes through point A (5,3) lying on the circle. Find the equation of the tangent. (3 marks)

3. If the roots of the equation $2x^2 - px + 8 = 0$ are equal, find the value of p. (3 marks)

4. Mutoro had walked two-third way across a bridge when he saw an approaching train 60m away. He ran back only to reach the end of the bridge at the same time as the train. If the train was moving at 25m/s and Mutoro ran at 10m/s, find the length of the bridge. (3 marks)

5. Use reciprocal tables only, to find the value of x. (3 marks)

$$\frac{2}{x} = \frac{3}{10.3} + \frac{2}{15.5}$$

6. Given that $\log_{10} 2 = 0.3010$ and $\log_{10} 3 = 0.4771$, evaluate $\log_{10} 15$. (3 marks)

7. A is a point (3,4) and C is (8,2). O is the origin and P is a point such that $\underset{\sim}{OP} = \underset{\sim}{OA} + \frac{1}{2}\underset{\sim}{AC}$ Find the coordinates of P. (3 marks)

8. Simplify: (3 marks)

$$\frac{(x-y)^2-(x+y)^2}{(x^2+y^2)^2-(x^2-y^2)^2}$$

9. The total surface area of two metallic spheres is $16\pi cm^2$ and their radii differ by 3cm. Find the radius of each sphere. (3 marks)

10. Rationalise the denominators and simplify the answer completely. (3 marks)

$$\frac{\tan 60}{1+\frac{1}{\cos 45}}+\frac{2+5\tan 60}{\tan 60-\frac{1}{\sin 45}}$$

11. List down all the integral values of the following inequalities and represent the solutions on a number line. (3 marks)

$$\frac{y}{2}-1<\frac{y}{5}$$

$$\frac{3}{8}+\frac{y}{3}\geq\frac{y}{4}$$

12. A trader bought three kinds of rice at sh. 80 per kg, sh. 120 per kg and sh. 150 per kg. He mixed them in the ratio 3:5:4 respectively and sold the mixture to make a profit of 25%. At what price per kg did he sell the mixture? (3 marks)

13. Three towns A, B and C are situated so that AB = 65km and AC = 115km. The bearing of B from A is 062° and the bearing of C from A is 278°. Calculate,

(a) the distance BC. (2 marks)

(b) the bearing of B from C. (2 marks)

14. Use the trapezium rule to estimate the area under the curve $y = x^2 + x - 6$ over the interval $0 \leq x \leq 8$ using 8 trapezia. (4 marks)

15. Without using a calculator, evaluate: (4 marks)

$$\frac{27^{\frac{2}{3}} \times \left(\frac{1}{3}\right)^2 \times 729^{\frac{-5}{6}}}{2^{\frac{1}{2}} \times \left(\frac{1}{62}\right)^{\frac{-1}{4}} \times 72^{\frac{-1}{4}}}$$

16. The unfinished table and histogram give information about the survival times of a group of elephants in the Nairobi National Park.

Time (t hours)	Frequency
$0 \leq t < 0.5$	10
$0.5 \leq t < 1$	
$1 \leq t < 2$	13
$2 \leq t < 4$	
$4 \leq t < 6$	8

(a) Use the histogram to complete the table. (2 marks)

(b) Use the table to complete the histogram. (1 mark)

SECTION II (50 MARKS)

Attempt ANY FIVE questions.

17. (a) Three men, Maina, Koech and Maundu form a business partnership. Maina invested sh. 80,000 for 2 years, Koech sh. 50,000 for three years and Maundu invested his money for four years. They agreed that the profits should be shared in proportion to the amount invested and the time for which it was invested. How much did Maundu invest if Maina's share of the profit of sh. 129,000 was sh. 48,000? (5 marks)

(b) A nurse buys a fridge for sh. 40,000 paying sh. 16,000 down payment and the remainder in installments of sh. 8,000, paid at the end of each of the first three quarters, together with a final payment at the end of the fourth quarter to clear the debt. Interest at 3% per quarter, reckoned on the amount owing at the beginning of each quarter, is added at the end of each quarter. Calculate the amount of the final payment to clear the debt giving your answer to the nearest shilling. (5 marks)

18. In triangle AOB, $\underset{\sim}{OA} = \underset{\sim}{a}$, $\underset{\sim}{OB} = \underset{\sim}{b}$. M is the mid-point of AB and N is a point on OB such that ON:NB = 1:2. AN and OM intersect at P.

(a) Express $\underset{\sim}{AB}$, $\underset{\sim}{OM}$ and $\underset{\sim}{AN}$ in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$. (3 marks)

(b) If $\underset{\sim}{OP} = s\,\underset{\sim}{OM}$ and $AP = t\,AN$, express $\underset{\sim}{OP}$ in two different ways. (3 marks)

(c) Using your results in (b) above, find the values of s and t. (3 marks)

(d) Hence state the ratio AP:PN. (1 mark)

19. O and P are points on a line. A particle moves along the line in such a way that t seconds after leaving O, its velocity is vm/s where $v = kt - t^2$ where k is a constant. At the time when $t = 6$ seconds the particle is momentarily at rest at P.

Find:

(a) The value of k. (2 marks)

(b) The distance OP (3 marks)

(c) The average speed of the particle between O and P. (2 marks)

(d) The acceleration of the particle when it is at P. (3 marks)

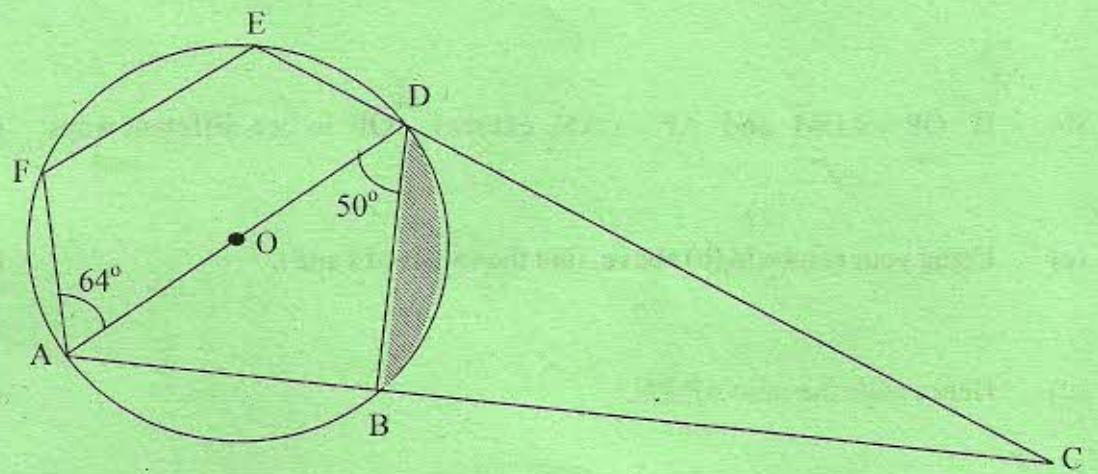
20. A shopkeeper stocks 2 brands of drinks called Kula and Kunywa which are produced in cans of the same size. He needs to order fresh supplies and has room for upto 1000 cans. Kunywa is more popular and he decides to order at least twice as many cans of Kunywa as Kula. He wishes however, to have at least 100 cans of kula and not more than 800 cans of kunywa. Taking x and y to be the number of cans of kula and kunywa respectively,

(a) write down 4 inequalities involving x and y which satisfy these conditions. (4 marks)

(b) using a scale of 1cm to represent 100 cans on each axis, draw a graph of the above inequalities. (4 marks)

(c) the profit of a can of Kula is sh. 3 and n a can of Kunywa is sh. 2. Use your graph to determine the number of cans of each drink that the shopkeeper should order to give the maximum profit. (2 marks)

21. In the figure below AD is a diameter of a circle centre O. Angle FAD = 64°, angle EFD = 30°, angle ADB = 50° and length AD = 7cm.



(a) Giving reasons, determine the size of the angles:

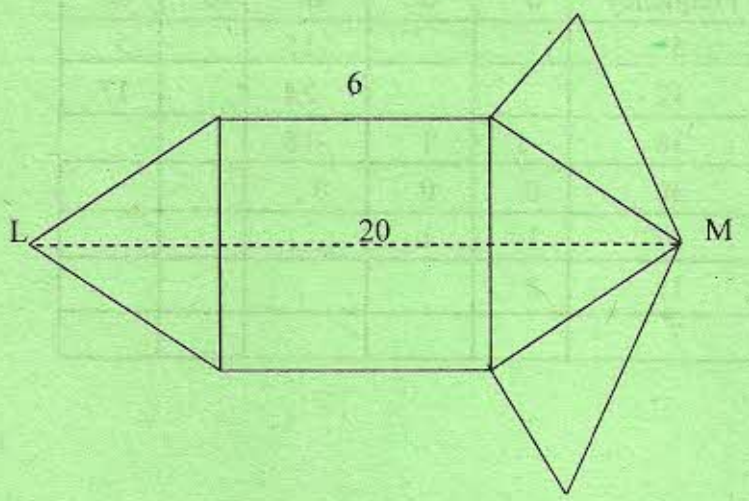
(i) FED (2 marks)

(ii) DCB (3 marks)

(iii) Reflex EOB (2 marks)

(b) Determine the area of the shaded region. (3 marks)

22.



The figure above (not to scale) consists of a square of side 6cm and four congruent isosceles triangles. It represents the net of a pyramid on a square base. The distance LM is 20cm. Calculate:

(a) The total surface area of the pyramid. (3 marks)

(b) The perpendicular height of the pyramid formed when the net is folded. (2 marks)

(c) The angle of inclination of a triangular face to the base of the pyramid. (2 marks)

(d) The angle between a slanting edge and the base. (3 marks)

23. (a) Construct a parallelogram ABCD in which AB = 9cm, AD = 5cm and angle BAD = 60°. (2 marks)

(b) Measure the length of AC. (1 mark)

(c) Show the locus of a point P which moves so that it is equidistant from A and C. (1 mark)

(d) The locus of a point Q which moves so that angle BQD = 90°. (2 marks)

(e) The position of a point X so that AX $\geq$ XC and angle BXD = 90°. (2 marks)

(f) Shade the region inside the parallelogram such that AX $\geq$XC and angle BXD $\geq$ 90°. (2 marks)

24. The heights of 100 millet plants were measured to the nearest centimeter. The results were recorded in a grouped frequency distribution table as shown below:

Height x (cm)	x	Frequency	d	d^2	fd	fd^2	cf
25 - 29		5			-15		5
30 - 34		12			-24		17
35 - 39		18	-1	1	-18		
40 - 44		30	0	0	0		
45 - 49		17	1	1			
50 - 54		11	2				
55 - 59		7					

(a) Complete the table. (2 marks)

(b) Calculate to two decimal places:

(i) The mean (2 marks)

(ii) The standard deviation (2 marks)

(c) Using the data above, plot an ogive and use it to find the quartile deviation. (4 marks)