ALLIANCE HIGH SCHOOL

2015 TRIAL EXAMINATION

MATHEMATICS PAPER 2

TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES:

1. *Write your name, class and admission number in the spaces provided above.*

2. *This paper consists of two Sections; Section I and Section II.*

3. *Answer all the questions in Section I and only FIVE questions from Section II.*

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

5. *Show all the steps in your calculation, giving your answer at each stage in the spaces provided below each question.*

6. *Non-programmable silent electronic calculators and KNEC Mathematical tables may be used unless stated otherwise.*

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

GRAND TOTAL

17	18	19	20	21	22	23	24	TOTAL

SECTION A ASWER ALLTHE QUESTIONS IN THIS SECTION (50 MARKS)

1. The difference between two digits is 8. Find the value of the two digits if their product is to be maximum.

(3marks)

2. Make x the subject in $\dfrac{x^4-4}{x^2-2} = K$

(3marks)

3. Calculate the equation of a mirror line that reflects A(2,7) onto A' (6,-1)

(2marks)

4. Given that log 7 =0.84510 and log 5 =0.69897, find the logarithm of 980 without using tables or calculator

(3marks)

5. The following data shows sizes of shoes worn by eleven form ones of a certain class. 6,7,7,4,8,10,9,7,5,6,5. Determine the interquartile range of the shoe sizes (3 marks)

6. The length of a rectangle is increased by 10% and the width by 20%. Determine its percentage change in area. (3marks)

7. Solve the simultaneous equations $y^2 = x-2$ and $y^4 + 11x = 16$ (4marks)

8. Given that $\underset{\sim}{A} = \begin{bmatrix} 13 & 20 \\ -5 & 0 \end{bmatrix}$ and $\underset{\sim}{B} = \begin{bmatrix} 2 & 1 \\ 0 & -3 \end{bmatrix}$ find C if $C + B^2 = A$ (3marks)

9. Given that $6.5 \leq x \leq 10$ and $2.5 \leq y \leq 4$ find: .

    (a) The maximum value of x/y   (2marks)

    (b) The minimum value of x+ y   (2marks)

10. If sin x = 2b   and cos x =2b√3, find the value of b   (3marks)

                        Just

11. An observer on a hill sees a satellite in the sky. If the satellite is 23km vertically above the north pole, calculate latitude of the hill where the observer is. (Take radius of the earth to be 6400km).
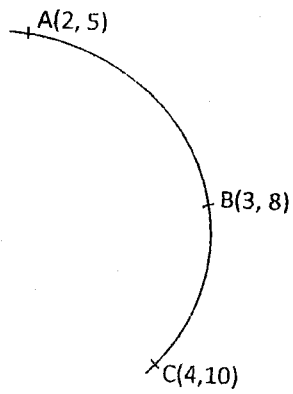
                                                                          (3marks)

12. A point on the line y = x+5 is mapped onto (0,-11) by a transformation matrix $\begin{bmatrix} 3 & p \\ 1 & -3 \end{bmatrix}$

Find the value of p (3marks)

13. The position vectors of points A and B are $2\underset{\sim}{i} - \underset{\sim}{j} + 4\underset{\sim}{k}$ and $4\underset{\sim}{i} + 3\underset{\sim}{j}$ respectively. If point R is the mid-point of $\overrightarrow{AB}$. Find the magnitude of $\overrightarrow{AR}$. (3 mark)
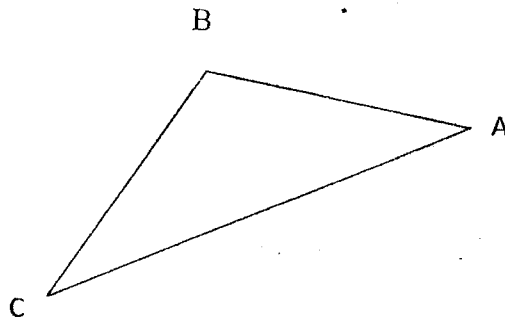
14 Expand $\left[\dfrac{2+x}{x} \right]^4$ hence evaluate $(6/5)^4$ (3marks)

15.   The figure **below** shows an arc of a circle through three points A, B and C.

A(2, 5)

B(3, 8)

C(4,10)

Calculate the co-ordinates of the centre of the circle.

(3marks)

B

A

C

16   On the triangle above, construct locus P such that angle <APC + angle <ABC =180^0.
Construct the locus of Q to meet the locus of P at R such that angle <ABQ = angle <CBQ.
Measure. BR.

(4marks).

17. (a) The cash price of a T.V set is Ksh. 26,000. Linda bought the set on hire purchase terms by paying a deposit of Ksh. 6,000 and the balance by 24 equal monthly installments of Khs. 1,045.30. Find the compound rate of interest per year.

(4marks)

(b) Use the taxation rates in the table below to answer the questions that follow:

Taxable income in Ksh.per month	Rate (%)
1 – 7,500	10
7,501 – 12,500	15
12,501 – 17,500	20
17,501 – 22,500	25
22,501 – 27,500	30
Over 27,500	35

Mr Kweba is a manager of a certain company who is entitled to a monthly personal relief of sh. 1,162. His tax is sh. 2,563 per month and cooperative shares of sh. 2,000 per month is contributed. Calculate

(a)   Total gross tax per month.

(1mark)

(a)   Mr. Kweba's taxable income per month

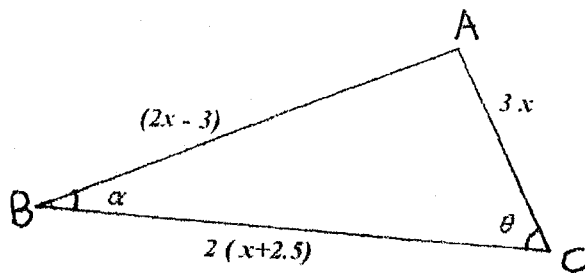(3marks)

(b)   Mr. Kweba's monthly net income

(2marks)

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18   The velocity of a particle, Vm/s, moving in a straight line after t seconds is given by:-
      $V = 3t^2 - 3t - 6$. Find:-
      (i)   The acceleration of the particle after 2 seconds.   (2 marks)

      (ii)   The distance covered by the particle between $t = 1$ and $t = 4$ seconds.   (3 marks)

      (iii)   The time when the particle is momentarily at rest.   (2 marks)

      (iv)   The minimum velocity attained by the particle.   (3 marks)

19. The triangle below shows a triangular prism. AB=20m, BC=10m. AE=ED=BF=FC=8cm.
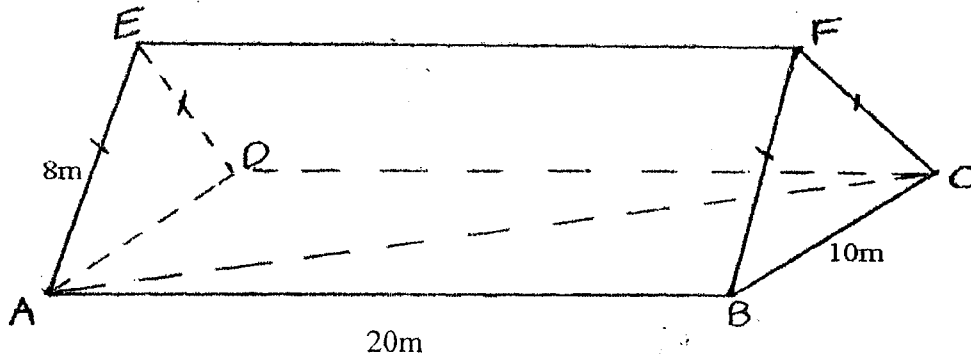
(a) Find the length
   (i) AC   (1mark)

   (ii) AF   (2marks)

(b) (i) Calculate the angle between line AF and the base ABCD   (3marks)

   (ii) Find the angle between plane ADF and the base ABCD   (2marks)

(c) Find the volume of the prism   (2marks)

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20. Triangle ABC below has an area of 30 cm². In triangle,$< ABC = \alpha$, $<ACB = \theta$ and $\sin \alpha - \cos \theta = 0$. Sides AB = (2x – 3) cm, AC = 3x cm and BC = 2 (x + 2.5) cm.

From the triangle, find;

(a)   The value of x.

(3marks)

(b)   The perimeter of the triangle.

(2marks)

(c)   The perpendicular height from A to base BC

(2marks)

d)   The size of angles α

(1 marks)

e)   The radius of an arc of a circle that passes through B, A and C

(2marks)

21. (a) An arithmetic progression whose first term is 2 and n^{th} term is 32 has the sum of its n terms equal to 357. Find the number of term.

(3marks)

(b) The product of the first three terms of geometric progression is 729. If the first term is **a** and the common ratio is **r**.

(i) Express **r** in terms of **a**.

(2 marks)

(ii) Find the values of **a** and **r** given that the sum of the three terms is 39.

(4 marks)

(iii) Hence write two possible sequences each up to the 4th term

(1mark)

22 (a) The probability of Dave, Mark and Steve winning a chess game in a tournament is 0.3, 0.2 and 0.5 respectively. Find the probability that,

(i) Only one wins the game

(2marks)

(ii) Two of them win

(2marks)

(iii) At least one of them wins

(2marks)

(a) The ages in years of six boys are 7, 8, 6, 9, 7, and 10 while that of four girls is 11,9,10 and 8. A girl and a boy are picked at random and the sum of their ages recorded.

(i)   Write the probability space to show all the possible outcomes

(2marks)

(ii)   Find the probability that the sum of their ages is at most 16 years

(1marks)

(iii)   Find the probability that the sum of their ages is at least 18 years
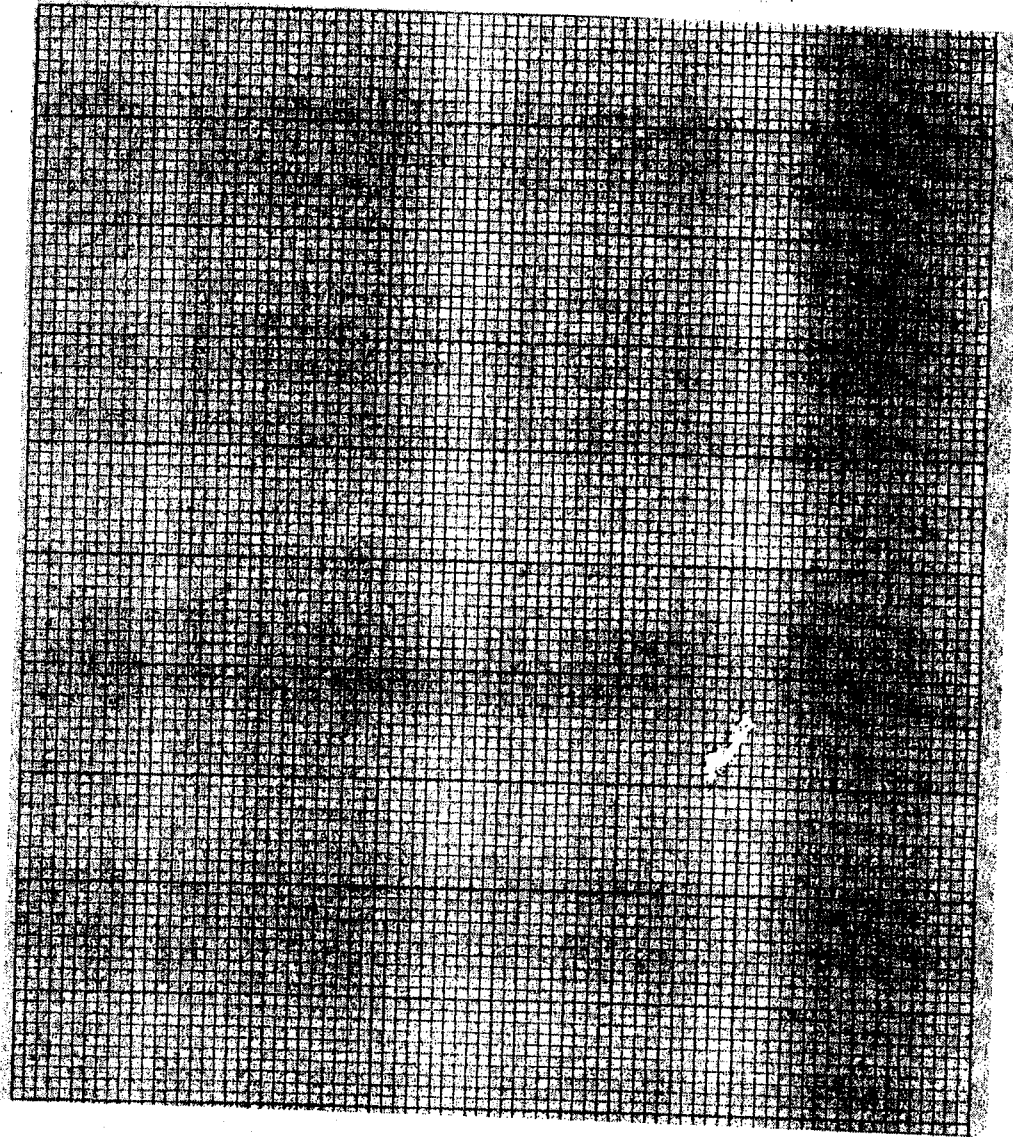
(1marks)

23. Boeing 707 plane flies from Nairobi to South Africa It has 800m² of cabin space and can carry 9,000kg of luggage. A first class passenger gets 2m² of space is allowed 20kg of luggage. A economy class passenger gets 1m² of space and is allowed 15kg of luggage. There must be space for at least 100 first class passengers and the number of first class seats plus twice the number of economy class seats should be more than 400.

Let x be the number of first class seats and y be the number of economy class seats

(i)   List down all inequalities that satisfy these conditions.

(4marks)

(ii)   Use the grid provided to represent the region where x and y must lie.

(4marks)

(iii)   The profit per flight from an economy seat is sh.4000 and from a first class seat is sh.10,000. Use your graph to determine the allocation of seats which will give maximum profit.

(2marks)

24 (a) Given triangle A(2,-3), B(4,-6) and C(1,2) draw the image of triangle A_1 B_1 C_1 after the transformation defined by $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$ Describe the transformation fully   (2marks)

(b) Triangle A_2 (-4, 1), B_2 (-8,2) and C_2 (-2,4) is the image A_1 B_1 C_1 under a certain transformation. Find the matrix of the transformation and describe the transformation fully.   (3marks)

(c) Draw triangle A_3 B_3 C_3 the image of triangle A_2 B_2 C_3 after a positive quarter turn about the origin. State the coordinates of triangle A_3 B_3 C_3 (2marks)

(d) Find the matrix of a single transformation that maps triangle A_3 B_3 C_3 onto triangle A B C (3marks)