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121/2
MATHEMATICS
Paper 2
May/June 2016
2 ½ hours

ALLIANCE HIGH SCHOOL
PRE – TRIAL MOCK EXAMINATION - 2016
Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES:
- Write your name and index number in the spaces provided at the top of this page.
- The paper contains Two sections: **Section I and Section II.**
- Answer ALL the questions in Section 1 and any FIVE questions from Section II
- All working and answers must be written on the question paper in the spaces provided below each question.
- **Show all the steps in your calculations, giving your answers 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 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

This paper consists of 19 printed pages
Candidates should check the question paper to ensure that all the printed pages are printed as indicated and no questions are missing

SECTION 1; 50 MARKS

1. The volume V cm^3 of an object is given by $V = \frac{1}{4}\pi r^2 \left(\frac{1}{SC^2} - 2\right)$

   Express **C** in terms of π, r, s, and V

   (3mks)

2. Solve the equation **2sinx tanx = 3**; for $0^c \leq x^c \leq 2\pi^c$

   (3mks)

3. Use logarithms tables to evaluate $\left(\frac{\tan 77°36' \, Sin2°18'}{Cos34°54'}\right)^{0.5}$

   (3mks)

4. In the figure below (not drawn to scale) DC is a tangent to the circle center O. AOBC is a straight line
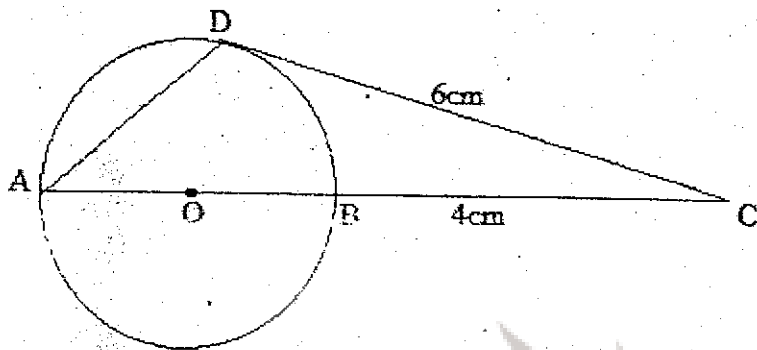
i) Show that ADC is similar to DBC. (2 mks)

ii) Given that BC = 4 and DC = 6. (2mks)

Calculate length AB.

5. The difference between the compound interest and simple interest of the same amount of money invested into the land at the same rate of 10% is ksh 2400 over a period of two years .calculate the amount invested   (3mks)

6. Line AB is the diameter of a circle. Given that the co-ordinates of A and B are (1,7) and (11,7) respectively, Find the equation of the circle leaving your answer in the form $x + y + gx + fy + c = 0$ (3mks)

7. Simplify the following without using mathematical tables
$$\frac{Sin\ 420 + Sin390}{Tan\ 405 + Sin\ 405}$$ (3mks)

8. A one litre kettle is full of tea in which 30% is milk and 70% water. If 200ml of the tea is drawn-out of kettle and replaced with water, find the new percentage of milk in the tea. (3mks)
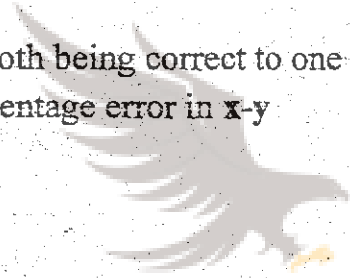
9. If $A = \begin{pmatrix} 4 & 0 \\ 6 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 1/4 & 0 \\ k & 1 \end{pmatrix}$

Find the value of k for which AB is a unit matrix (2mks)

10.   Show that **(x-2)** is a factor of $x^3 + 3x^2 - 7x - 6$. Hence solve the cubic equation

(4 marks)

11.   If x=33.5 and y=33.1 both being correct to one decimal place, calculate the maximum possible percentage error in **x-y**

(3mks)

12.   . Solve for x given that $\sqrt{x} + \sqrt{x - 11} - 11 = 0$

(3mks)

13   Two places P and Q are on parallel latitude 26° N.

The points lie on 10°W and 30° E longitudes respectively.

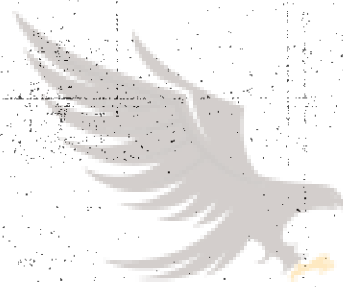Find the distance between P and Q along parallel of latitude
(i) in km   (2mks)

(ii) In nm   (2mk)

14. Three different quantities P,Q and R are such that P varies directly as the square of
Q and inversely as the square root of R, given that Q increases by 8% and R
reduces by 19%, calculate percentage change in P.   (3mks)

15. Expand the expression $(2 - \frac{x}{5})^4$ up to the term in x^3

Hence use the expansion to find the value of $(1.96)^4$ correct to 3d.p   (3mks)

16. The perimeter of triangle is 42 cm and one side is 14 cm. If the area is $21\sqrt{15}$ cm^2 calculate the length of the other two sides.   (4mks)

SECTION II ANSWER ANY FIVE QUESTIONS

17. For an in –science course in mathematics, at least four but not more than nine teachers are to be chosen from Alliance High School. The ratio of the number of male teachers to the number of female teachers must be less than 2:1 and there must be more males than females.

If x and y represent the number of male and female teachers respectively;

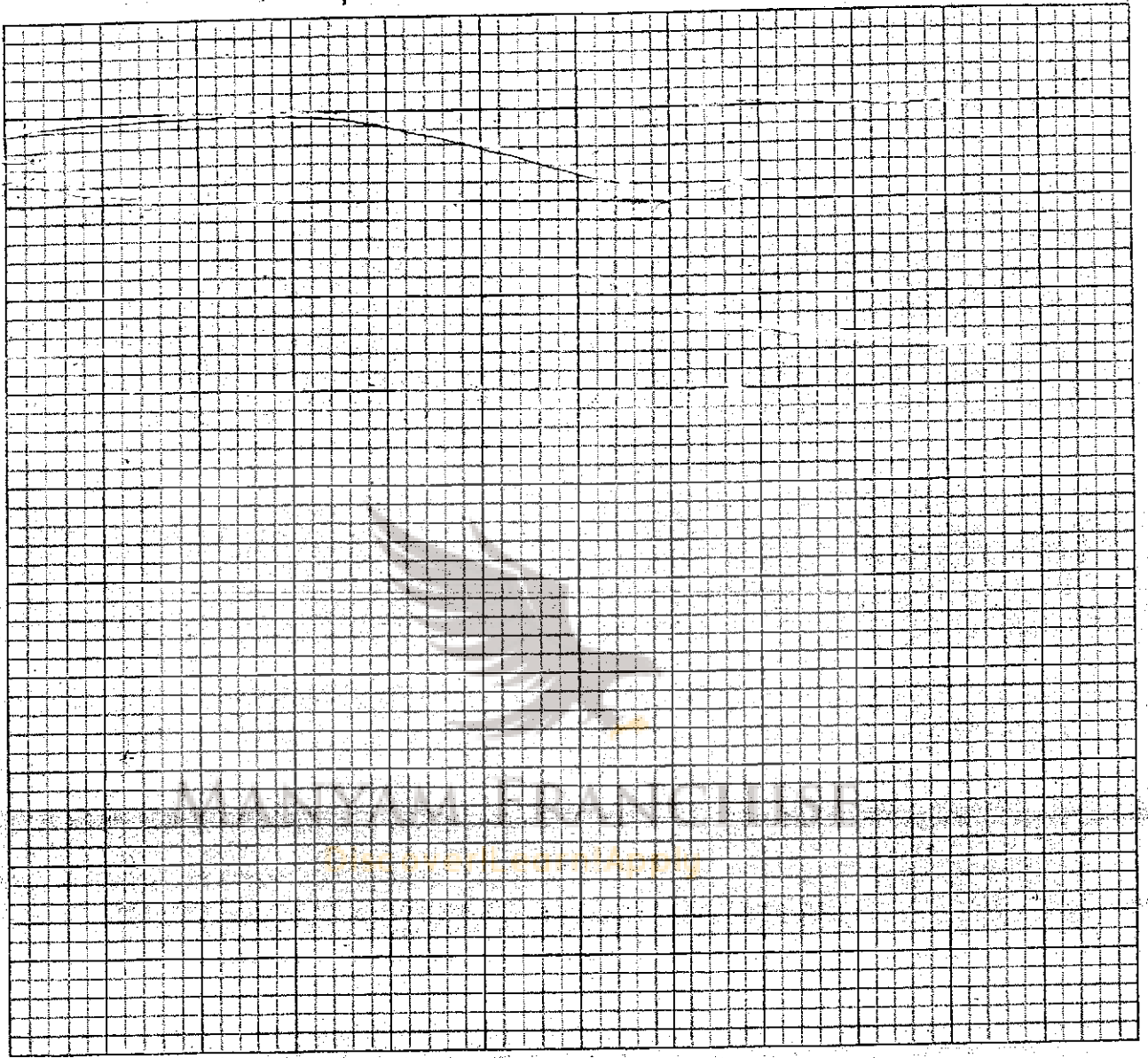I. Write down , in their simplest form, the inequalities that x and y must satisfy (4mks)

II. Represent three inequalities on a graph paper (4mks)

III. From the graph ,find the composition of the group of
a) The largest size (1mk)

b) The smallest size (1mk)

18. An arithmetic progression has the first term (a) and the common difference (d)

    a) Write down the third, the ninth and the twenty – fifth terms of the A.P

    (1mk)

    b) The A.P is increasing and the 3rd, 9th and 25th terms form the first three consecutive terms of th G.P. If the sum of the seventh term and twice the sixth term of the A.P is 78, Calculate

    i) The first term and the common difference of the A.P   (4mks)

    ii)   The common ratio of the G.P   (2mks)

    iii)   The sum of the first nine terms of the A.P   (3mks)

19. The following data was taken from different plots of carrots in Saba Saba Secondary School and tabulated as shown below.

Mass(kg)	x	f	CF	x-A	$t=\frac{(x-A)}{c}$	Ft	t^2	ft^2
20-24	22	1	1	-25	-5	-5	25	25
25-29	27	5	6					80
30-34	32	9	15					81
35-39	37	11	26					44
40-44	42	20	46					20
45-49	47	20	66	0	0	0	0	0
50-54	52	19	85					19
55-59	57	8	93					32
60-64	62	4	97					36
65-69	67	3	100	20	4	12	16	48

a) Complete the table above. (2 marks)

b) Determine the values of A and C (2 marks)

c) Calculate the 90th percentile (2marks)

d) Standard deviation. (4marks)

20. Ten playing cards are numbered 1,2,3,4,5,6,7,8,9,10 and then shuffled. These cards are chosen without replacement.

    i) Draw a tree diagram showing the various ways of choosing the three cards.

                    (2marks)
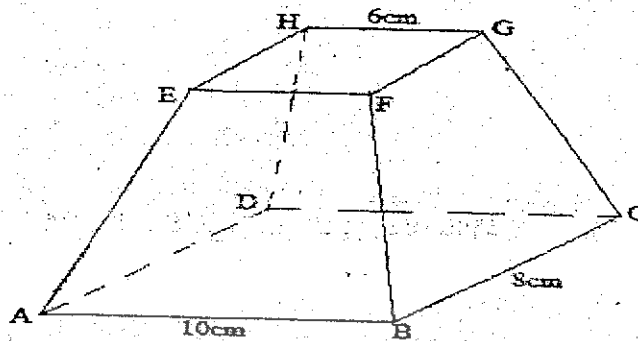
    ii) What is the probability that only one of the cards has an odd number on it?

                    (4marks)

    ii) That all the cards have odd numbers on them.   (2marks)

    iv) That at least one of the cards has an even number on it.   (2 marks)

21. The figure below shows a frustum of a rectangular pyramid with AB = 10cm, EF = 6cm, BC = 8cm and height of 5cm.

(a) Calculate

I. The height of the whole pyramid on the space beside the figure   (2mks)

II. The angle plane CDHG makes with ABCD   (3mks)

III. The angle AC makes with GC   (2mks)

IV. The angle CE makes with base ABCD   (3mks)

22. Use a ruler and compasses only for the construction below

a) Construct a triangle ABC with AC = 6cm, AB = 5.5cm and angle BAC = 75°

(3mks)

b) Draw Locus (L$_1$) of point P such that P is equidistant from AB and BC   (1mk)

c) Draw the locus (L$_2$) of point P such that P is equidistant from A and B   (1mk)

d) Indicate the region where P lies such that ABP ≤ PBC and AP ≥ PB   (3mks)

e) Construct an inscribed-circle and measure its radius.   (2mks)

23. a) Using the trapezoidal rule estimate the area under the curve $y = \frac{1}{2}x^2 - 2$, lines

$x = 0$, x – axis and x = 6 using 6 strips (4mks)

b) Use the integration to evaluate the exact area under the curve (3 mks)
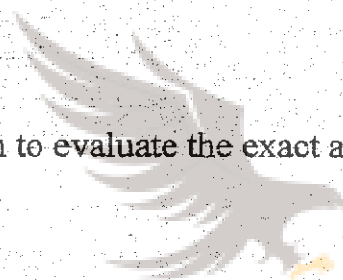
(c) Hence calculate the percentage error in calculating the area using trapezoidal rule (3mks)

24) A triangle has vertices A (-6, 5) , B(-3 ,3) and C (-6,3). Under a Transformation with Y-axis invariant two image points are A^1 (-6,4) and C^1 (-6,-6)

I. a) Draw object triangle and its complete image A^1 B^1 C^1 (2mks)
   b) Name the transformation and determine its matrix (2mks)
   c) Determine the coordinates if the invariant point (1mk)

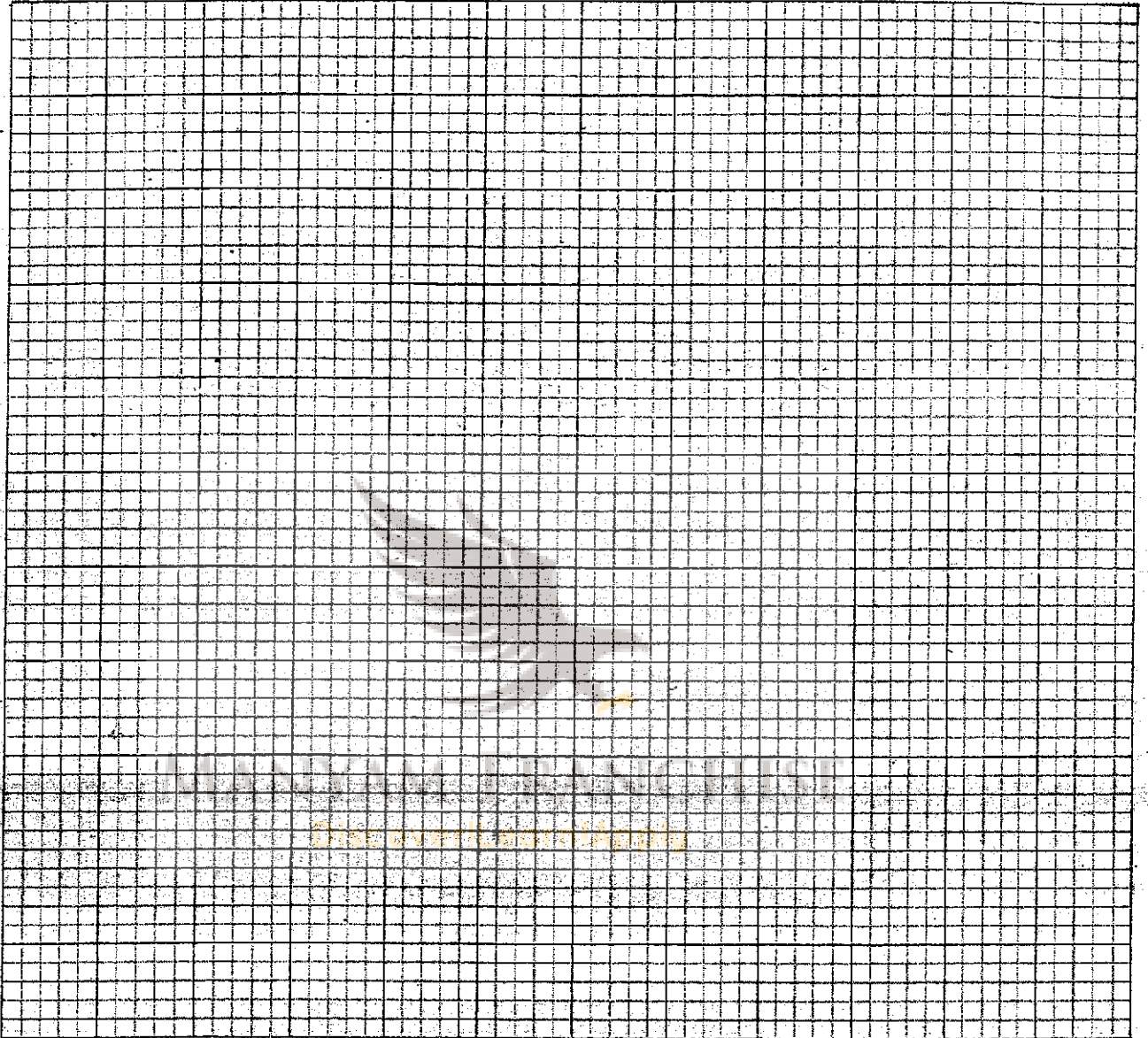II a) A^{11} B^{11} C^{11} is the image of A^1 B^1 C^1 under a transformation given by matrix $\begin{pmatrix} -1 & 0 \\ 1.5 & -1 \end{pmatrix}$
   Determine the co-ordinates of the image (3mks)

   b) Name a transformation that would map A^{11}B^{11} C^{11} onto ABC (2mks)

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