

Name..... Admission Number Class:.....

Candidate's Signature

Date.....

12 1/2
MATHEMATICS ALT A
Paper 2
March/April 2013
2 ½ hours

ALLIANCE GIRLS HIGH SCHOOL
MATHEMATICS PreMock Exams
TERM 1, 2013

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **TWO** sections: **Section I** and **Section II**.
- (d) Answer **ALL** the questions in **Section I** and **any 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.

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

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SECTION I : 50MARKS

1. Use logarithms correct to 4 decimal places to evaluate.

$$x = \frac{0.04873 \sin 65^\circ}{683.7}$$

(4marks)

2. Make y the subject of the formula.

(3marks)

$$q = \sqrt{\frac{r^2 - y^2}{y^2 + 8}}$$

3. Water flows through a pipe at a rate of 1.5m/s. If the pipe has a diameter of 2cm, find the volume of water that can be drawn from this pipe in 1 minute. (3marks)

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4. The position vector \mathbf{R} is $2\mathbf{i} + 3\mathbf{j} - 4\mathbf{k}$ and vector \mathbf{RS} is $3\mathbf{i} - 2\mathbf{j} + \mathbf{k}$. Express the position vector of \mathbf{S} in the terms of \mathbf{i} , \mathbf{j} and \mathbf{k} and hence state the coordinate of \mathbf{S} . (3marks)

5. Solve the equation $4\cos^2 x + 4\sin x = 5$ for $0^\circ \leq x \leq 360^\circ$. Give the answer in degrees. (3marks)

6. The equation of a circle is given by $3x^2 + 3y^2 + 30x + 42y + 30 = 0$. Determine the coordinates of the centre and the radius of the circle. (3marks)

7. Kamau deposited sh.50,000 in a fixed deposit account for a period of 21 months. The bank pays compound interest, compounded quarterly. At the end of the period, Kamau's account had sh.82952.50. Determine the rate at which interest was paid. (3marks)

8. The heights, in centimetres, of 100 tree seedlings are shown in the table below.

Height (cm)	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69
Number of seedlings	9	16	19	26	20	10

Using 44.5 as the assumed mean calculate the mean of the heights. (4marks)

9. Solve the simultaneous equations below using matrix method. (3marks)
- $$5x + y = 19$$
- $$3y - x = 9$$

10. Without using a calculator or mathematical tables, express $\frac{\sqrt{3}}{1 - \sin 60^\circ}$ in surd form and simplify. (3marks)

11. Form three students measured the length and width of their classroom and recorded the measurements as 7.4m and 5.7m respectively. To the nearest 0.1m. Calculate the percentage error in the area of the classroom to 2 decimal places. (3marks)

12. a) Expand and simplify the binomial expression $(2 - 4x)^7$ up to the fourth term. (2marks)

b) Hence estimate the value of $(1.96)^7$ correct to 3 decimal places. (2marks)

13. Solve for x in the equation below

$$49^{x+1} + 7^{2x} = 350$$

(3marks)

14. Two similar cylindrical tanks are such that the larger one has a capacity of 810 litres, and the smaller one a capacity of 240 litres. If the height of the smaller tank is 1.2m, find the height of the larger tank.

(2marks)

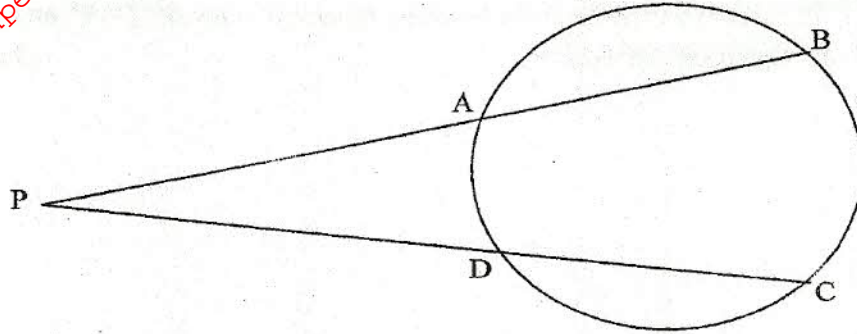
15. Three quantities P, Q and R are such that P varies directly as Q and inversely as the square of R. Find the percentage change in P when Q decreases by 15% and R increases by 5%.

(4marks)

16. In the figure below PA is 12mm shorter than PD . It is also given that $AB = 156\text{mm}$, $CD = 96\text{mm}$ and $PA = X\text{mm}$.

Find the value of X

(2marks)



SECTION II : 50MARKS

Answer any five questions in this section

17. Three consecutive terms in a geometric progression are 3^{2x+1} , 9^x and 81 respectively.

a) Calculate the value of x.

(3marks)

b) Find the common ratio of the series.

(2marks)

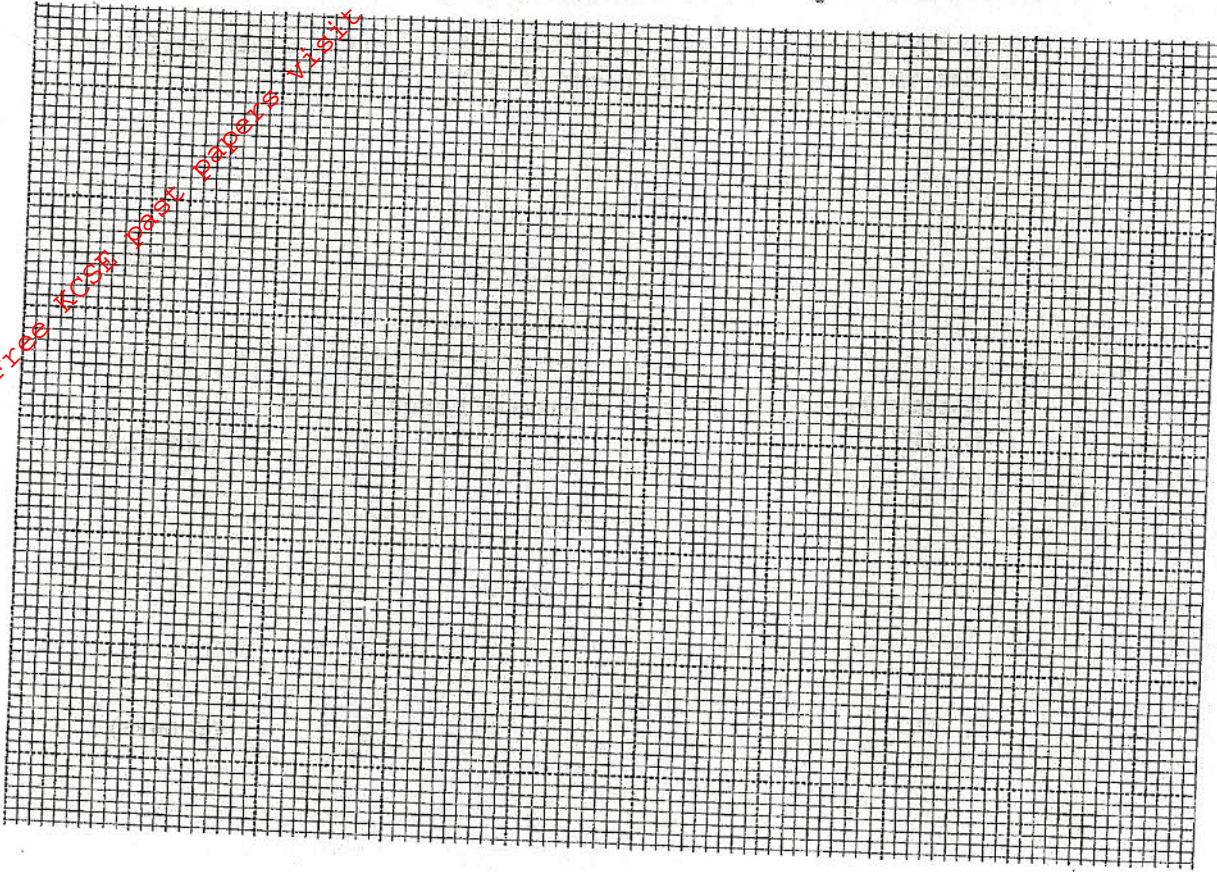
c) Calculate the sum of the first 10 terms of the series.

(2marks)

d) Given that the fifth and the seventh terms of this G.P form the first two consecutive terms of an arithmetic sequence, calculate the sum of the first 20 terms of the arithmetic sequence.

(2marks)

18. a) The triangle ABC has vertices A (1, 4), B (1,1) and C(3,3). Draw triangle ABC in the grid provided below. (2marks)



- b) Triangle ABC is reflected in the line $y = -x$ to produce $A'B'C'$. Find the coordinates of $A'B'C'$ and draw triangle $A'B'C'$ on the same axes. (2marks)
- c) Triangle $A'B'C'$ is rotated about the point (0,0) through $+90^\circ$. Find the coordinates of its image $\Delta A''B''C''$ and draw it on the same axes. (2marks)
- d) Triangle $A'''B'''C'''$ is the image of $A''B''C''$ under a shear, with y axis invariant and shear factor 3. Find the coordinates of $A'''B'''C'''$ and draw it on the same axes. (3marks)
- e) Find the area of $\Delta A''B''C''$ and hence the area of $\Delta A'''B'''C'''$. (2marks)

19. In a triangle OAB, $OA = a$ and $OB = b$. A point C on OA is such that $OC : OA = 2:5$. D divides AB in the ratio 2:1. OD bisects BC at X.

a) Express the following vectors in terms of a and b .

i) OC

(2marks)

ii) OD

(2marks)

iii) BC

(1mark)

b) Given that $OX = nOD$ and $BX = mBC$ where m and n are scalars, express OX in two ways and hence find the value of m and n .

(5marks)

20. Maxwell a banker, earns a basic salary of Ksh. 20,713 per month. He also gets a house allowance of 12,000 per month, medical allowance of Ksh. 1635 per month, and transport allowance of Ksh 1452 per month. He has a life insurance relief policy for which he pays Ksh 800 per month and claims an insurance relief of Ksh 3 per pound on monthly premiums. He is entitled to a personal relief of Ksh 1162 per month.

a) Calculate his taxable income in Ksh. Per month. (2marks)

b) Using the tax table below, calculate PAYE per month in Ksh. (5marks)

Income K£ per month	Rate %
1 – 484	10
485 – 940	15
941 – 1396	20
1397 – 1852	25
Over 1852	30

c) In addition to PAYE the following deductions are made on his pay every month.

i) Window children pension scheme (WPCS) at 4% of basic salary:

ii) NHIF Kshs. 320

iii) Shares and loan repayment Ksh.6500

iv) Life insurance policy Ksh.800.

Calculate his net monthly salary in Ksh. (3marks)

21. a) Using a ruler and a compass only construct triangle ABC where $AB=7\text{cm}$, Angle $CBA = 82.5^\circ$ and $BC = 5\text{cm}$. (4marks)

- b)i) Locate a point T inside the triangle which is equidistant from points A and B and also equidistant from lines AB and AC. (3marks)

- ii) Measure and record the distance TB. (1mark)

- c) By shading the unwanted region show the area inside the triangle where point P lies if it is nearer to point B than to point A and also nearer to the line AB than line AC. (2marks)

22. Two bags A and B contain identical balls except for the colours. Bag A contains 4 red balls and 2 yellow balls. Bag B contains 2 red balls and 3 yellow balls.

- a) If a ball is drawn from each bag, find the probability that both balls are of the same colour. (4marks)

b) If two balls are drawn at random from each bag, one ball at a time without replacement, find the probability that;

- i) The two balls drawn from bag A or bag B are red, (4marks)

- ii) All the four balls drawn are red. (2marks)

23. A garden measure 10m by 8m wide. A path of uniform width is made all round the garden. The total area of the garden and the path is 168m^2 .

a) Find the width of the path.

(4marks)

b) The path is to be covered with square concrete slabs. Each corner of the path is covered with a slab whose side is equal to the width of the path.

The rest of the path is covered with slabs of side 50cm. The cost of making each corner slab is sh 600 while the cost of making each smaller slab is sh50.

Calculate

i) The number of the smaller slabs used.

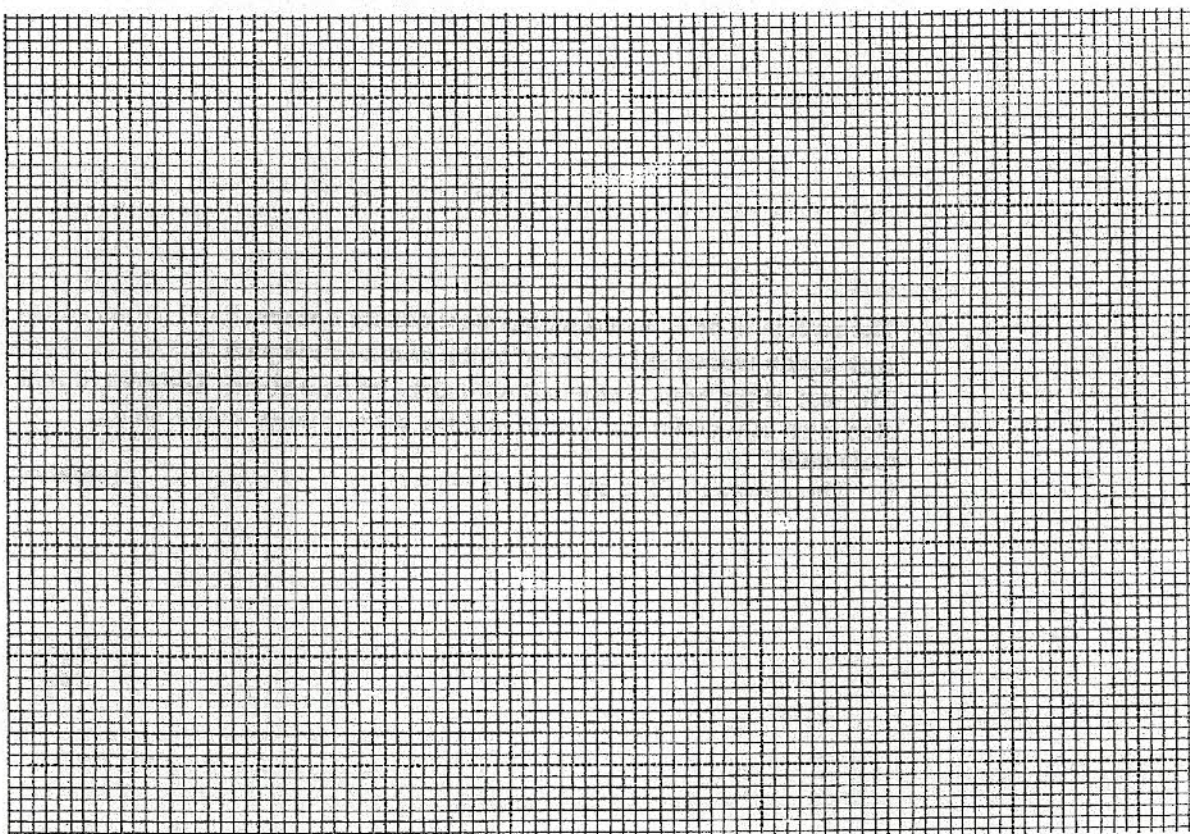
(3marks)

ii) The total cost of the slabs used to cover the whole path. (3marks)

24. The table below shows values of x and some values of y for the curve $y = x^3 + 2x^2 - 3x - 4$ for $-3 \leq x \leq 2$.

x	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
y	-4.0	-0.4		1.6	0		-4.0	-4.9			6

- a) Complete the table by filling in the missing values of y , correct to 1 decimal place. (2marks)
- b) On the grid provided, draw the graph of $y = x^3 + 2x^2 - 3x - 4$. Use the scale: 1cm represents 0.5 units on x -axis. 1cm represents 1 unit on y -axis. (3marks)



- c) i) Use the graph to solve the equation $x^3 + 2x^2 - 3x - 4 = 0$. (3marks)
- iii) Use the graph to estimate the coordinate of the turning points of the curve. (2marks)