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121/2
MATHEMATICS ALT A
PAPER 2
JULY/AUGUST, 2014
TIME: $\mathbf{2}^{½} 2$ HOURS
$\qquad$

## CENTRAL KENYA NATIONAL SCHOOLS JOINT EXAM - 2014

Kenya Certificate of Secondary Education
MATHEMAJICS ALT A
PAPER 2.
TIME: $2^{0} \% / 2$ HOURS

## INSTRUCTION TO CANDIDATE'S:

(a) Write your name, index number and school in the spaces provided at the top of this page.
(b) Sign and write the date of examination in 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) Show all the steps in your calculation, giving your answer at each stage in the spaces provided below each question.
(f) Marks may be given for correct working even if the answer is wrong.
(g) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
(h) This paper consists of 16 printed pages.
(i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
(j) Candidates should answer the questions in English.

## FOR EXAMINER'S USE ONLY:

## SECTION I

| $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | 6 | 7 | $\mathbf{8}$ | $\mathbf{9}$ | $\mathbf{1 0}$ | $\mathbf{1 1}$ | $\mathbf{1 2}$ | $\mathbf{1 3}$ | $\mathbf{1 4}$ | $\mathbf{1 5}$ | $\mathbf{1 6}$ | TOTAL |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

SECTION II

| 17 | 18 | 19 | $\mathbf{2 0}$ | $\mathbf{2 1}$ | $\mathbf{2 2}$ | 23 | $\mathbf{2 4}$ | TOTAL |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |

Grand
Total

## SECTION I: (50 MARKS)

Answer all the questions in this sectignin the spaces provided.

1. Find the percentage error in:
$\frac{20 \times 25.0}{10.5}$
2. Use reciprocal and square tables to evaluate, to 4 significant figures.

$$
\begin{equation*}
\frac{1}{485.6}+8.254^{2} \tag{3mks}
\end{equation*}
$$

3. Make $K$ the subject of the formula and simplify.
$t=\frac{2 y+1}{\sqrt{2 K y+K}}$
4. Expand $\left(5-\frac{\chi}{2}\right)^{6}$ up to term in $\chi^{3}$ uses yoger expansion to estimate the value of $\left(4 \frac{1}{2}\right)^{6}$ correct to one decimal place.
5. Find the number of terms in the series. $a+3 a+9 a+----\quad 243 a$.
(3mks)
6. The number $\chi$ is chosen at random from the set $(0,3,6,9)$ and the number $y$ is chosen at random from the set $(0,2,4,6,8)$. Calculate the probability of each of the following separate evens.
(a) $\quad \chi>6$.
(1mk)
(b) $\quad \chi+y=11$.
7. Given that $4 y=3 \operatorname{Sin} \frac{2}{5} \theta$ for $\mathrm{O} \leq \theta \leq 360$.edetermine.
(a) Amplitude of the curve.
(65) Period of the curve.
8. Find the radius and centre of the circle whose equation is:

$$
\frac{\chi^{2}}{2}-2 \chi+\frac{y^{2}}{2}-5 y+2=0
$$

9. Simplify the following:

$$
\frac{1-\frac{\sqrt{5}}{3}}{\frac{2}{3}+\frac{\sqrt{5}}{3}}
$$

910. Construct the locus of point P such that $\angle \mathrm{APB}=120^{\circ}$ using a pair of compasses and ruler only. (3mks)
911. Given that $5^{\chi}=7^{y}$ find the ratio $\chi: y$.
(3mks)
912. Find the equation of the normal to a curve $\chi_{2}^{2} \sin ^{5} 4 y+1$ at the point $(2,0.75)$.
913. Calculate the standard deviation of $42,45,46,50,52,56,59$.
914. $\mathrm{OA}=3 \mathrm{i}+4 \mathrm{j}-6 \mathrm{~K}$ and $\mathrm{OB}=2 \mathrm{i}+3 \mathrm{j}+\mathrm{K}$. P divide line AB in the ratio 3: -2 . Write the coordinate of P .

(3mks)

15. Two variables y and $\chi$ are such that y varies $\boldsymbol{y}^{6}$ artly as $\chi$ and partly as the square of $\chi$. Determine the relationship between y and $\chi$ given wheen $\chi=2, \mathrm{y}=28, \chi=3, \mathrm{y}=48$.
$16 . e^{e}$ Draw the net of the solid below and calculate surface area of its surfaces $\mathrm{VA}=\mathrm{VB}=\mathrm{VC}=$ $V D=10 \mathrm{~cm}$.

## SECTION II: (50 MARKS)

Answer only five questions from this seetion in the spaces provided:
17. The first, fourth and thirteenth terais of an Arithmetic Progression (AP) correspond to the first three consecutive terms of an ibcreasing Geometric Progression (G.P). Given the first term of the AP is $\mathbf{a}$ and the commondifference is $\mathbf{d}$.
(a) Write down the gifist three terms of the G.P in terms of $\mathbf{a}$ and $\mathbf{d}$.

The sum of the third and the eleventh terms of the A.P is 30 . Calculate:
(i) the common difference of the A.P.
(ii) the first term of the A.P.
(iii) the common ratio of the G.P.
(iv) sum of the first 10 terms of the G.P.
18. (a) Complete the table below.

| $\theta$ | $0^{\circ}$ | $30^{\circ}$ | $60^{\circ}$ | $90^{\circ}$ | 20 $20^{\circ}$ | $150^{\circ}$ | $180^{\circ}$ | $210^{\circ}$ | $240^{\circ}$ | $270^{\circ}$ | $300^{\circ}$ | $330^{\circ}$ | $360^{\circ}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\operatorname{Tan} \frac{1}{2} \theta$ | $0.0^{\circ}$ | 0.27 |  | $e^{\alpha^{2}}$ | 1.73 | 3.73 |  | -3.73 | -1.73 |  |  |  |  |
| $2 \operatorname{Cos} \theta$ |  | 1.73 | 24 ${ }^{\text {Y }}$ |  |  | 1.73 |  |  |  | 0 | 1 | 1.73 | 2 |

(b) Using the grid provided and the table above, draw the graph of $Y=\tan 1 / 2 \theta$ and $Y=2 \operatorname{Cos} \theta$.
(c) Use your graph tô:
(i) Solvestan $1 / 2 \theta-2 \operatorname{Cos} \theta=O$
(ii) determine period of $\tan 1 / 2 \theta$

(1mk)
(1mk)
(1mk)

19. Income tax for all the income earned is charged at the rate shown in the table below.

| $a^{29}$ |  |  |
| :---: | :---: | :---: |
| Salary in $\mathrm{K} f$ per month | Tax in Shssper $f$ | Total tax per slab |
| The first 300 | 2 P |  |
| Next 300 | ${ }_{4}{ }^{\text {c }} 3$ |  |
| Next 300 | $8^{8} 5$ |  |
| Next 300 | 7 |  |
| Excess $\chi$ ss | 11 |  |

(a) Complete the table by filling the value for the total tax per slab.
(b) Empra claiming a tax relief of Ksh. 600 discovered that a total of Kshs. 5710 is deducted from herearnings in form of income tax. How much is her taxable amount in Ksh.
(c) Determine her net income if she earns a non-taxable entertainment allowance of Shs. 3010 and that she pays a bank loan of Kshs. 400 .
20. In the figure below O is the centre of the circte TN is a tangent to the circle of m

$$
\angle \mathrm{PQM}=15^{\circ}
$$



$$
\angle \mathrm{SMN}=33^{\circ}
$$

Giving reasons; find
(i) $\angle \mathrm{POM}$.
(ii) $\angle \mathrm{PMT}$
(iii) $\angle \mathrm{PRS}$.
(iv) $\angle \mathrm{OSM}$
(v) $\angle \mathrm{OPM}$
21. (a) Draw the table for the equation $\mathrm{y}=\chi_{0}^{36}\left(\frac{9}{2} 2 \chi^{2}\right.$.

| $\chi$ | -3 | -2.5 | -2 | -1,30 | -1 | -0.5 | 0 | 0.5 | 1 | 1.5 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $2 \chi^{2}$ | 18 | 12.5 | 8 | ${ }^{2} 4.5$ | 2 |  | 0 |  | 1 | 4.5 |
| $\chi^{3}$ | -27 |  | -8 ${ }^{5}$ |  | 1 |  | 0 |  | 1 |  |
| y | -9 |  | \% |  | 3 |  | 0 |  | 2 |  |

(b) On the grid provided, draw the graph of $y=\chi^{3}+2 \chi^{2}$ for $-3 \leq x \leq 1.5$. Take the scale 2 cm for 1 unit on the X -axis and 1 cm for 1 unit on the Y -axis.
(c) (i) Sofve the equation $\chi^{3}+2 \chi^{2}=0$.
(ii) $e^{2} e^{2}$ olve the equation $\chi^{3}+2 \chi^{2}-\chi-2=0$ using your graph and another line graph.(3mks)

22. The figure below shows a right pyramid withe square base $\mathrm{ABCD} . \mathrm{VC}=20 \mathrm{~cm}, \mathrm{AB}=\mathrm{BC}=10$.

-X X and Y are the mid-point of AB and BC respectively. Calculate (a) the vertical height VO to 2d.p.
(b) the angle between VD and ABCD.
(c) the angle which plane VXY makes with the base.
23. P and Q are two points on the same parallel eff $^{\circ} \mathrm{q}^{\circ}$ atitude $66^{\circ} 25^{1}$, whose longitudes differ by $120^{\circ}$. Calculate
(a) the radius of the parallel of latityide where P and Q lie $\mathrm{R}(6370 \mathrm{~km})$.

4(b) the distance of P and Q measured along the parallel of latitude.
(c) (i) the length of the straight line joining PQ.
(ii) the distance PQ along the latitude in nautical mile.
(d) If an aircraft took 30 min to fly P to Q . Calculate its speed in knots.
24. In a certain Mathematical relationship, the valuies of $A$ and $B$ are found to obey the relationship $B=C A+K A^{2}$ where $C$ and $K$ are constant. Below is a table of values of $A$ and $B$.

| A | 1 | 2 | 4 | 6 |
| :---: | :---: | :---: | :---: | :---: |
| B | 3.2 | $6.75^{0^{2}}$ | 15.1 | 25.2 |

(a) By drawing a suitablerstraight line graph, determine the values of C and K .

| , |  |  |  |  |  | * |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | ${ }^{1}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | $2^{5}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ${ }^{2}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | $Q^{\circ}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ${ }^{\text {x }}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | $2^{0}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ${ }^{\text {c }}$ | 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| \% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  | , |  | , |  | , | - |  |  |  |  |  |  | - |


(b) Hence write the relationship between $\mathrm{S}^{\circ}$ and $B$.

(c) Deterermine the value of B when $\mathrm{A}=7$.

