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## DATE

121/2
MATHEMATICS

## PAPER 2

JULY/AUGUST, 2014
TIME: $\mathbf{2}^{1 ⁄ 2} 2$ HOURS

## KURIA WSST SUB-COUNTY JOINT EXAMINATION - 2014

## Kenya'Certificate of Secondary Education

MA ${ }^{\text {TH }}$ THEMATICS
PÁPER 2
TIME: $\mathbf{2}^{1 ⁄ 2}$ HRS.

## INSTRUCTION TO CANDIDATE'S:

1. Write your name, index number and school in the spaces provided above.
2. Sign and write the date of examination in spaces provided.
3. This paper consists of two Sections; Section I and Section II.
4. Answer all the questions in Section I and any five questions from Section II.
5. All 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 answer at each stage in the spaces provided below each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
9. 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

## SECTION I: (50 MARKS)

Answer all the question in this section 2 年 the spaces provided:

1. Use a tables to find the value of $\chi$ if $2^{\chi}=3$. Give your answer correct to 4 sf.
2. Make $\chi$ the subject of the formula:

$$
\begin{equation*}
A=\sqrt{\frac{3+2 \chi}{5-4 \chi}} \tag{3mks}
\end{equation*}
$$

3. It would take 18 men 12 days to dig a piece of land. If they work for 8 hours a day, how long will it take 24 men if they work 12 hours to cultivate three quarters of the same land.
4. Kinyua bought soya and millet at sh. 65 per $k \hat{夕}^{5}$ and sh. 40 per kg respectively. He then mixed them and sold the mixture at sh. 60 per kg ©haking a profit of $20 \%$. Determine the ratio of soya to millet in mixture.
5. Chord AB is of length 8 cm and the maximum distance between chord and lower part of circle is 2 cm . Determine the radius of the circle.

6. Use the inverse matrix method rule to solve simultaneous equations.

$$
2 \chi+y=10
$$

(3mks)
$2 \chi+2 y=14$
7. Solve $\log _{2}^{(x+7)}-\log _{2}^{(x-7)}=3$
8. Construct a circle centre K and radius 2.5 cm . Construct a tangent from a point Q which is 6 cm from K to touch the circle at M . Measure the length QM .
9. Given $4.6 \div 2.0$ find
(a) the absolute error in the quotient.
(2mks)
(b) the percentage error in the quotient correct to four significant figures.
10. A variable P varies jointly with the square of $\mathrm{S}^{2}$ and inversely with the square root of Q . If R is increased by $10 \%$ and Q decreased $20 \%$, what is the percentage change in the value of $P$.
11. The figure below shows a circle with segments cut off by a triangle whose longest side $A B$ issthe largest possible chord of a circle. Determine the area shaded given that $A B=14 \mathrm{~cm}$ sand $\mathrm{AC}=\mathrm{BC}$.

12. A bucket in the shape of a frustrum as shown in the diagram. It has diameters of 36 cm and 24 cm . Calculate the volume of the bucket.

13. Without using a Mathematical tables or a cilculator, evaluate.
$\frac{2.7 \times 2.04}{300 \times 0.054}$
14. Find the length represented by $y$ in the figure below.

15. (a) Expand $(1+2 \chi)^{8}$ in ascending powers of $\chi$ up to and including the term $\chi^{3}$.
(b) Hence evaluate $(1.02)^{8}$ to 3d.p.
16. The difference between the exterior and interior angle of a regular polygon is $100^{\circ}$. Determine the number of sides of the polygon.

Answer any five questions from this section in the spaces provided:
17. (a) Fill the table below for the curves given by $\mathrm{y}=3 \sin \left(2 \chi+30^{\circ}\right)$ and $\mathrm{y}=\operatorname{Cos} 2 \chi$ for $\chi$ values in the range $\mathrm{O} \leq 8$

| $x$ | $0^{\circ}$ | $15^{\circ}$ | $30^{\circ}$ | $45^{\circ}$ | 60 | $75^{\circ}$ | $90^{\circ}$ | $120^{\circ}$ | $150^{\circ}$ | $180^{\circ}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $y=3 \operatorname{Sin}\left(2 x^{\chi}+30^{\circ}\right)$ |  |  |  |  |  |  |  |  |  |  |
| $y=\operatorname{Cos} 3 \hat{\chi} \tilde{\chi}^{\circ}$ |  |  |  |  |  |  |  |  |  |  |

(b) Drawe the graphs of $y=3 \operatorname{Sin}\left(2 \chi+30^{\circ}\right)=\operatorname{Cos} 2 \chi$ on same axes.


(c) Use your graph to solve the equation $y^{5^{\circ}}=3 \operatorname{Sin}\left(2 \chi+30^{\circ}\right)$ and $y=\operatorname{Cos} 2 \chi$.
(d) $Q^{\partial^{\delta^{\alpha}}}$ Determine the following from your graph:
(i) Amplitude of $y=3 \operatorname{Sin}\left(2 \chi+30^{\circ}\right)$.
(ii) Period of $y=3 \operatorname{Sin}\left(2 \chi+30^{\circ}\right)$.
(iii) Phase difference for $\mathrm{y}=3 \operatorname{Sin}\left(2 \chi+30^{\circ}\right)$.
18. OAB is a triangle in which $O \underset{\sim}{A}=\underset{\sim}{a}$ and $O \underset{\sim}{\mathcal{R}^{-5}} \underset{\sim}{5} \underset{\sim}{b} . \mathrm{M}$ is a point on OA such that $\mathrm{OM}: \mathrm{MA}=2: 3$ and $N$ is another point on $A \bar{A}$ such that $A \widetilde{d} \tilde{S} \cdot \tilde{B}=1: 2$. Lines $O N$ and $M B$ intercept at $X$.
(a) Express the following vectors ia ${ }^{\wedge}$ terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$.
(i)
$\underset{\sim}{A B}$
(ii) ON
(b) If $\mathrm{O} \underset{\sim}{X}=\mathrm{KON}$ and $\mathrm{B} \underset{\sim}{X}=\mathrm{hB} \underset{\sim}{\mathcal{N}}$ express $\underset{\sim}{\mathrm{OX}}$ in two different ways. Hence or otherwise find the values of $h$ and $K$.
(c) Determine the ratio OX: XN.
19. (a) Using only a ruler and a pair of compasses draw a line AB of length 8 cm long. Hence draw the locus of all points ${ }^{\circ}$ such that angle APB $=52.5^{\circ}$.
(b) If the region above represents a map of an estate drawn to a scale of 1 cm representing 1 km . Show the region to be fenced if $\mathrm{AMB} \leq 90^{\circ}$ by shading the unwanted region.
(c) Find the area of this region.
20. The data below is a daily record of sugar solded in one of the supermarkets in Kerugoya town which sells any proportion in kg of sugar.

| Kg of sugar | Number of ople |
| :---: | :---: |
| 0.5-0.9 | 229 |
| $1.0-1.4$ | ¢ 38 |
| 1.5-1.9 | 14 |
| $2.0-2.4$ | 12 |
| $2.5-2.9$ | 10 |
| 3.0-3.4 | 4 |

(a) Howdrany people bought sugar from this supermarket on that day.
(b) Calculate mean of sugar bought that day. Calculate also the standard deviation from this data.
(c) Draw a cumulative frequency curve of the data above and determine the number of people who bought sugar between $\mathcal{R} R 2$ and 1.9 kg .

21. A plane take of f from airport P at $\left(0^{\circ}, 40^{\circ} \mathrm{W} \gamma \mathrm{a}^{\circ}\right.$ nd flies 1800 nautical rules due East to Q then 1800 nautical rules due South to R and finally 1800 nautical rules due West before landing at S .
(a) Find to the nearest degree the lafitudes and longitudes of $\mathrm{Q}, \mathrm{R}$ and S .
(4mks)
(b) If the total flight time is 16 hours, find the average speed in knots for the whole journey.
(3mks)
(c) Find the time taken to fly from R to S , given that this was two hours shorter than the time taken from P to Q to R .
(2mks)
22. The $2^{\text {nd }}$ and $5^{\text {th }}$ terms of an arithmetic progress $s^{\circ}$ on are 8 and 17 respectively. The $2^{\text {nd }}, 10^{\text {th }}$ and $42^{\text {nd }}$ terms of the A.P. form the first three terms of a geometric progression. Find
(a) the $1^{\text {st }}$ term and the common difference.

4\& (b) the first three terms of the G.P and the $10^{\text {th }}$ term of the G.P.
(c) The sum of the first 10 terms of the G.P.
23. (a) The acceleration of a particle $t$ seconds after passing a fixed point $P$ is given by $a=3 t-3$. Given that the velocity of the partigRe when $t=2$ is $5 \mathrm{~m} / \mathrm{s}$, find
(i) its velocity when $\mathrm{t}=4$ séeronds.
(ii) its displacement at this time.
(b) Find the exact area bounded by the graph $\chi=9 \mathrm{y}-\mathrm{y}^{3}$ and the Y -axis.
24. A girl's school has a store a far off distance for food. It has 20 sacks of rice and 35 sacks of maize. The weight, volume and number of meal rêtions for each sack are as follows.


A delivery van is to carry the largest possible total number of meals. It can carry up to 600 kg in weight and $2 \mathrm{~m}^{3}$ in volume.
(a) If a load is made up of $\chi$ sacks of rice and y sacks of maize, write four inequalities other than $\chi \geq 0, y \geq 0$ which satisfy these conditions.
(b) Illustrated these inequalities graphically by shading unwanted region.

(b) Write down an expression for the number of meals that can be provided from $\chi$ sacks of rice and y-sacks of maize. Use your graph to find best values to take for $\chi$ and $y$. ( 3 mks )

