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121/2
MATHEMATICS ALT $A$
PAPER 2
JULY / AUGUST 2014
TIME: 2½ HOURS

## KURIA EAST SUB-COUNTY JOINT EXAMINATIONS COUNCIL 2014

Kenya Certificate of Secondary Education (KCSE)
MATHEMATICS
PAPER 2
TIME: 2½ HOURS

## INSTRUCTIONS TO CANDIDATES

a) Write your Name, School and Index Number in the spaces provided at the top of this page.
b) Sign and write the Date of examination in the spaces provided above.
c) This paper contains TWO sections: section I and section II.
d) Answer all the questions in Section I and only FIVE questions in section II.
e) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
f) 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 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |

1. Use logarithms, correct to 4 decimal. places, to evaluate:-
${ }_{2}{ }^{-}$(a) Simplify the following expression as far as possible:-

$$
\frac{a}{b-c}-\frac{a}{b+c}
$$

(b) Hence leaving your answer in the form of a simplified surd, simplify:-

$$
\begin{array}{lll}
\frac{\sqrt{21}}{\sqrt{7}-\sqrt{3}} & - & \sqrt{21} \\
\sqrt{7}+\sqrt{3}
\end{array}
$$

3. Grade A sugar costs sh. 75 per kg and grade $B$ sugar costs sh. 50 per kg. Ghati mixed the two grades and sold the mixture at sh. 72 per kg. In so doing, she made a profit of $20 \%$. In what ratio did she mix them?
(3mks)
4. The length and breadth of a rectangular paper were measured to the nearest centimeter and found to be 18 cm and 12 cm respectivelye ${ }^{2}$ Find the percentage error in its perimeter. (3mks)
5. The velocity V metres per second of a particle in motion is given by the equation: $c^{9} v=2 t^{2}-4 t+10$, where $t$ is time in seconds. Determine the total distance moved by the particle in the first 3 seconds of motion.
6. (a) Expand and simplify the binomial expression $(2-4 x)^{5}$ up to the fourth term.
(b) Use the expansion in part (a) above to find the approximate value of $(1.96)^{5}$ correct to 3 decimal places.
7. Make $x$ the subject of the formula:

8. The position vector of $P$ is $\left(\begin{array}{r}4 \\ -3 \\ 2\end{array}\right)$ and vector $P Q$ is $\left(\begin{array}{c}5 \\ 7 \\ -4\end{array}\right)$. Determine the coordinates of $Q$.
9. The volume V of a cylinder varies jointly with its height, h and the square of its radius r . Determine the percentage increase in the volume of cylinder if its radius increases in the ratio $3: 2$ and its height decrease by $30 \%$.
10. In the figure below, $A B$ is a tangent to the circle centre $O$ and radius 12 cm . The area of the triangle $A O B$ is $120 \mathrm{~cm}^{2}$. OXB is a straigh H line.


Calculate XB.
(4mks)
11. The figure below represents a triangular prism. The faces $A B C D, A D E F$ and CBFE are rectangles. $A B=8 \mathrm{~cm}, B C=14 \mathrm{~cm}, B F=7 \mathrm{~cm}$ and $A F=7 \mathrm{~cm}$.


Calculate the angle between faces BCEF and ABCD.
12. A group of young men decided to raise sh. 480,000 to start a business. Before the actual payment was made, four of the membersilled out and each of those remaining had to pay an additional sh. 20,000. Determine the original number of members.
13. Without using logarithms or a calculator, evaluate:-
$2 \log _{10} 5-3 \log _{10} 2+\log _{10} 32$.
14. The table below shows some values of the function $y=x^{2}+3$.

| $x$ | 0 | $1 / 2$ | 1 | $1^{1 / 2} 2$ | 2 | $2^{1 / 2}$ | 3 | $3^{1 / 2} 2$ | 4 | $4^{1 / 2}$ | 5 | $5^{1 / 2}$ | 6 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $y$ | 3 |  | 4 | $5^{1 / 4}$ | 7 |  | 12 | $15^{1 / 4}$ | 19 |  | 28 |  | 39 |

(a) Complete the table.
(1mk)
(b) Use the mid-ordinate with six ordinates to estimate the area bounded by $y=x^{3}+3$, the $y-$ axis, the $x$-axis and the line $x=6$.
(2mks)
15. The table below shows the number of defective bolts from 40 samples.

| No. of defective bolts (x) | 0 | $1 e^{2 e^{2}}$ | 2 | 3 | 4 | 5 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Frequency (y) | $200^{-2 .}$ | 8 | 6 | 4 | 1 | 1 |

Calculate the standard deviation.
16. Given that sum $\theta=$, find without using tables; $\operatorname{Cos}^{2} \theta$

Answer any five ofuestions in this section
17. Two variables $A$ and $B$ are connegred by the equation:
$A=K B^{n}$ where $k$ and $n$ are constants. The table below gives values of $A$ and $B$.

| A | 1.50 | 1.95 | $2.5 d^{4}$ | 3.20 | 4.50 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| B | 1.59 | 2.51 | +3.98 | 6.31 | 11.5 |

(a) Find a line equation connecting A and B .

(b) $)_{Q}$ Oัn the graph provided draw a suitable straight line graph to represent the relation in (a) above. (Scale 1 cm to represent 0.1 units on both axes).

(c) Use your graph to estimate the values of k and n to one decimal place.
18. (a) Using a ruler and a pair of compasses only, construct triangle $A B C$ such that $A B=A C=$ 4.3 cm and angle $\mathrm{ABC}=30^{\circ}$.
(b) Measure BC.
(c) A point $P$ is always on the same side of $B C$ as $A$. Draw the locus of $P$ such that angle BAC is always twice angle BPCS
(d) Drop a perpendicular fromat to meet BC at D. Measure AD.
(e) Calculate the area of tifangle ABC.
19. Veterinary researchers were experimenting a new drug on fowls in a research station. A sample of fowls which were known to hafe the disease was used. In this sample, 30 fowls were treated with the drug and the remaining 18 fowls were not treated.
(a) Calculate the possibility that afowl selected at random from the sample is:
(i) treated with the drug.
(ii) not treated with the drug.
(b) The probability that a fowl treated with the drug will die is $\frac{1}{10}$ while the probability that one which is not treated will die is ${ }^{7} / 10$. Calculate the probability that a fowl picked at random from the sample is:
(i) Treated with the sample and will die.
(ii) Not treated with the drug and will die.
(iii) Treated with the drug and will not die.
(iv) Not treated with the drug and will not die.
20. The position of two towns $X$ and $Y$ are givento the nearest degree as: $X\left(45^{\circ} \mathrm{N}, 10^{\circ} \mathrm{E}\right)$ and $\mathrm{Y}\left(45^{\circ} \mathrm{N}, 70^{\circ} \mathrm{E}\right)$
Find:-
(a) The difference in longitude.
(ii) Nautical miles (take 1 nautical mile to be 1.85 km )
(c) The local time at x when the local time at y is $2.00 \mathrm{p} . \mathrm{m}$.
21. A quadrilateral $A B C D$ has vertices $A(4,-4), B(2,-4), C(6,-6)$ and $D(4,-2)$
(a) On the grid provided, draw the quadrilateral $A B C D$.
(b) $A^{\prime} B^{\prime} C^{\prime} D^{\prime}$ is the image of $A B C D$ erder positive quarter turn about the origin. On the same grid, draw the image $A^{\prime} B^{3} C^{\prime} D^{\prime}$.
(c) $A " B " C " D$ " is the image of $A{ }^{\prime} B^{\prime} C^{\prime} C^{\prime}$ ' under the transformation given by the matrix $\left(\begin{array}{rr}1 & -2 \\ 0 & 1\end{array}\right)$

(ii) On the same grid, draw the quadrilateral A"B"C"D".
(d) Determine ás single matrix that maps $A B C D$ onto $A " B " C " D$ ".

22. Ochieng' bought a plot of land at sh. 30:0;000 per hectare in a town where land value appreciates at a constant rate of $10 \%$ per annum. After two years, he sold the whole plot to a customer who was willing to pay sRi. 500,000 per hectare. In the transaction, Ochieng' received sh. 274,000 more than the present value of the plot.
Determine:-
(a) The present land valueeper hectare.
(b) The size of the Ochieng's plot in hectares.
23. A diet expert makes up a food product for șale by mixing two ingredients N and S . One kilogram of $N$ contains 25 units of proteinánd 30 units of vitamins. One kilogram of $S$ contains 50 units of protein and 45 unifs of vitamins.
The food is sold in small bags eachorontaining at least 175 units of protein and at least 180 units of vitamins. The mass of the food product in each bag must not exceed 6 kg . If one bag of the mixture contains xkg ofedV and ykg of $S$.
(a) Write down all the inequalities, in terms of x and y , representing the information above.
(b) On the grid provided, draw the inequalities by shading the unwanted regions.

(c) If one kilogram of $N$ costs sh. 20 and one kilogram of S costs sh. 50, use the graph to determine the lowest cost of one bag of the mixture.
24. (a) The first term of an Arithmetic progressien (AP) is 2. The sum of the first 8 terms of the AP is 156 .
(i) Find the common difference of the AP.
(ii) $\qquad$
(b) The 3rd, 5th and 8th terms of another AP form the first three terms of a Geometric Progression (GP). If the common difference of the AP is 3 , find:-
(i) The first term of the GP.
(ii) The sum of the first 9 terms of the GP, to 4 significant figures.

