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121/2
MATHEMATICS
PAPER II
JULY/AUGUST 2014
2112 HOURS

MBOONI EAST SUB - COUNTY FORM FOUR JOINT EXAMINATION 2014
Kenya Cextificate of Secondary Education
MATHEMATICS

## PAPER II

JULY/AUGUST 2014

## $21 ⁄ 2$ HOURS

## INSTRUCTIONS TO CANDIDATES

1. Write your name, index number and class.
2. The paper contains two sections: Section I and II
3. Answer ALL questions in section I and ANY FIVE questions from section II.
4. All working and answers must be written on the question paper in the spaces provided below each question.
5. Marks may be awarded for correct working even if the answer is wrong.
6. Negligent and slovenly work will be penalized.
7. Non-programmable silent electronic calculators and mathematical tables are allowed for use.
8. This paper consists 16 of printed pages. Candidates should check the question paper to ensure that all the pages are printed indicated and no questions are missing.

## FOR EXAMINER'S USE ONLY

## SECTION 1

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | TOTAL |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## SECTION II

GRAND TOTAL

| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | TOTAL |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |



2014 Mbooni East sub - county Form Four Joint Examination
121/2
Mathematics
Paper 2

1. Use logarithm tables to evaluate
$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$
2. Solveffor x in the equation
$2 \operatorname{Sin}^{2} x-1=\operatorname{Cos}^{2} x+\operatorname{Sin} x$ for $0 \leq x \leq 360$
3. (a) Expand $\left(1+\frac{3}{x}\right)^{5}$ upto the fifth term
(b) Hence use your expansion to evaluate the value of $(2.5)^{5}$ to 3 d.p.
4. Make $p$ the subject of the formula

$$
\mathrm{E}+\mathrm{x}=\mathrm{x}+\sqrt{\frac{p-3 u}{y-3 x p}}
$$

5. The figure below shows a rectangular based right pyramid. Find the angle between the planes $A B C D$ and ABV.
6. A object $A$ of area $10 \mathrm{~cm}^{2}$ is mapped onto its image $B$ of area $60 \mathrm{~cm}^{2}$ by a transformation whose matrix is given by $\mathrm{P}=\left\{\begin{array}{cc}x & 4 \\ 3 & x+3\end{array}\right\}$. Find the possible value of x
(3 Marks)
7. The position vector of $A$ and $B$ are $\mathrm{a}_{\sim}=4 \mathrm{i}+4 \mathrm{j}{ }^{2} 6 \mathrm{k}$ and $\mathrm{b}_{\sim}=10 \mathrm{i}+4 \mathrm{j}+12 \mathrm{k}$. D is a point on $A B$ such that $\mathrm{AD}: \mathrm{DB}$ is $2: 1$. Find the co-ordinates of D
8. A deãler has two types of grades of tea, A and B. Grade A costs Sh. 140 per kg. Grade B costs Sh. 160 pré kg. If the dealer mixes A and B in the ratio 3:5 to make a brand of tea which he sells at Sh. 180 per kg , calculate the percentage profit that he makes
9. A variable Z varies directly as the square of X and inversely as the square root of Y . Find the percentage change in Z if X increased by $20 \%$ and Y decreased by $19 \%$
(3 Marks)
10. By rounding each number to the nearest tens, approximate the value of $\frac{2454 \times 396}{66}$

Hence calculate the percentage error arising from this approximation to 4 significant figures. (3 Marks)
11. Find the centre and radius of the circle whose equation is $2 x^{2}+2 y^{2}-8 x+12 y-2=0$
12. In the figure $\mathrm{OA}=15^{0 Q}$
(3 Marks)

13. Pipe A can fill a tank in 2 hours, pipes B and C can empty the tank in 5 hours and 6 hours respectively. How long would it take
(a) To fill the tank if A and B are left open and C closed
(2 Marks)
(b) To fill the tank with all the pipes open
(2 Marks)
14. (a) Find the inverse of the matrix $\left(\begin{array}{ll}4 & 3 \\ 3 & 5\end{array}\right)$
(b) Hence solve the simultaneous equation below using matrix method
15. Evaluate by rationalizing the denominator and leaving your answer in surd form.
16. Form the three inequalities that satisfy the given region $R$


## SECTION II - 50 MARKS

## Answer any FIVE questions from this section

17. Mr. Muema is a teacher and his monthly earnings are a basic salary of $\mathrm{Sh} .42,000$, a house allowance of Sh. 12,000, medical allowance of Sh. 2, 680 and hardship allowance equivalent of $30 \%$ of his basic salary. He is entitled to a personal relief of Sh. 1056 per month. He also has an insurance scheme for which he pays a monthly premium of Sh .4000 . He is therefore entitled to a relief on the premium of $15 \%$ of the premium paid. Using the taxation schedule below.

| Income (K£ p.a. | Rate (\%) |
| :--- | :--- |
| $1-5808$ | 10 |
| $5809-11,280$ | 15 |
| $11,281-16,752$ | 20 |
| $16,753-22,224$ | 25 |
| $22,225-27,696$ | 30 |
| 27,697 and above | 35 |

Calculate
(a) Mr. Muema's taxable pay in $\mathrm{K} £$ pa.
(c) Mr. Muema's net pay per month.
(2 Marks)
18. (a) Find the table for the curses given by $y=3 \sin \left(2 x+30^{\circ}\right)$ and $y=\cos 2 x$ for $x$ values in the range $0 \leq x \leq 180^{\circ}$

| $x$ | 0 | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 | 165 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{y}=3 \sin (2 \mathrm{x}+30)$ | 1.5 |  | 3 |  | 1.5 |  | -1.5 |  |  | -2.60 | -1.00 |  |
| $\mathrm{y}=\cos 2 \mathrm{x}$ | 1 |  |  | 0 |  | -0.866 |  | -0.866 | -0.5 |  | 1.5 |  |

(b) Using the scale Horizontal axis 1 cm represen̂t $30^{\circ}$, vertical axis 1 cm represent 1 unit, draw the graphs of $y=3 \operatorname{Sin}(2 x+30)$ and $y=C 882 x$

(c) Use your graph to solve the equation $3 \operatorname{Sin}(2 x+30)=\operatorname{Cos} 2 \mathrm{x}$
(d) Determine the following from your graph
(i) Amplitude of $y=3 \operatorname{Sin}(2 x+30)$
(1 Mark)
(ii) Period of $y=3 \operatorname{Sin}(2 x+30)$
(1 Mark)
(iii) Period of $y=\operatorname{Cos} 2 x$
19. The positions of two towns on the earths sugface are $\mathrm{A}\left(40^{\circ} \mathrm{S}, 45^{\circ} \mathrm{W}\right)$ and $\mathrm{B}\left(40^{\circ} \mathrm{S}, 135^{\circ} \mathrm{E}\right)$ Calculate:
(a) The difference in distance betweenfown A and B along the parallel of latitude and along the great circle (in nm)
(4 Marks)
(b) Two planes $X$ and $Y$ left town'A at 8:00 a.m. flying at 758 knots each towards town B. If plane $X$ flies along the parallel of datitude and plane Y along the great circle; then determine the position of one of the planes when ${ }^{2}$ other lands at town B
(c) What is the local tigne at town B when the second plane lands
20. The probability of passing KCSE depends on dhe performance in the KCPE. If the candidate passes the KCPE, the probability of passing $\operatorname{KCSE}_{\mathrm{Q}} \mathrm{i} \mathrm{S}^{4} \frac{4}{5}$. If the candidate fails in the KCPE, the probability of passing KCSE is $\frac{3}{5}$. If a candidate passes KCSE the probability that he/she will get employed is $\frac{5}{8}$. If he/she fails KCSE the probability a $_{y}^{2}$ getting employed is $\frac{1}{3}$. The probability of passing KCPE is $\frac{2}{3}$.
(a) Draw a well labelled tree diagram to represent the above information.
(2 Marks)
(b) Using the tree diagram, fifind the probability that a candidate:-
(i) Passes the KCSE $\boldsymbol{\gamma}^{\prime \prime}$
(2Marks)
(ii) Gets employed ${ }^{\wedge}$
(2 Marks)
(iii) Passes KCSE ${ }^{\text {E }}$ and get employed
(2 Marks)
(iv) Passes KQPE and does not get employed
21. The heights of 100 maize plants were measure to the nearest centimeter and the results recorded in the table shown below.

| Height x (cm) | Frequency | d | $\mathrm{d}^{2}$ | fd | $\mathrm{fd}^{2}$ | cf |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 25-29 | 5 |  |  | -15 |  | 5 |
| 30-34 | 12 | 4 |  | -24 |  | 17 |
| 35-39 | 18 | -1 | 1 | -18 |  | 35 |
| 40-44 | 30 | 0 | 0 | 0 |  | 65 |
| 45-49 | 17 cis ${ }^{\text {a }}$ | 1 | 1 |  |  |  |
| 50-54 | $11{ }^{\frac{1}{3}}$ | 2 |  |  |  |  |
| 55-59 | $7{ }^{-5}$ | 3 |  |  |  |  |

(a) Complete the table
(b) Calculate to $2 \mathrm{~d} . \mathrm{p}$.
(i) The mean
(iij) The standard deviation
(2 Marks)

# (c) Using the data above plot an ogive and used to find the quartile deviation 


22. Without plotting estimate the area bounded $\mathrm{b}_{2} \mathrm{a}^{-1}=\mathrm{x}^{2}+4$, the $\mathrm{x}-$ axis and the lines $\mathrm{x}=1$ and $\mathrm{x}=3$ by using
(a) Mid-ordinate rule with 4 strips of equal width
(3 Marks)
(b) Trapezium rule with 4 strips of equafl width
(3 Marks)
(c) The percentage error arising fropin using the Mid-ordinate rule
23. (a) Construct a parallelogram ABCD in which $\overbrace{\mathrm{R}}^{\mathrm{A}} \mathrm{B}=9 \mathrm{~cm}, \mathrm{AD}=5 \mathrm{~cm}$ and angle $\mathrm{BAD}=60^{\circ}$. (2 Marks)
(b) Measure the length AC
(c) Show the locus of point P which moves so that it is equidistant from A to C .
(d) Show the locus of point Q which whoves such that angle $\mathrm{BQD}=90^{\circ}$.
(e) The position of point X such that $\mathrm{AX} \geq \mathrm{XC}$ and angle $\mathrm{BXD}=90^{\circ}$
(f) Shade the region inside the parallelogram such that $\mathrm{AX} \geq \mathrm{XC}$ and angle $\mathrm{BXD} \geq 900$
24. Mumbua owns a restaurant where she stoeks two types of drinks called Kazuri and Malezi. The two drinks are produced in cans of the sameesize. She needs to order fresh supplies and has room for upto 1000 cans. Malezi is more popular and she decides to order at least twice as many cans of Malezi as Kazuri. She wishes however, to harye at least 100 cans of Kazuri and not more than 800 cans of Malezi. Taking X and Y to be the number of cans of Kazuri and Malezi respectively;
(a) Write down 4 inequalitiessinvolving X and Y which satisfy these conditions
(b) Using a scale 1 cm to reejpresent 100 cans on each axis, plot the inequalities and graph them ( 4 Marks)
(c) The profit of a can $\dot{\mathcal{G} f}$ Kazuri is Shs. 2. Using your graph determine the number of cans of each drink that the shopkeeper should order to give maximum profit

