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## GATUNDU SOUTH SUB-COUNTY FORM FOUR 2014 EVALUATION EXAM

121/2
MATHEMATICS
PAPER II
JULY/AUGUST 2014
TIME: $2 ½$ HQURS

## KENYA CERTIFICATE OF SECONDARY EDUCATION

## FORM FOUR EVALUATION EXAMINATION

## Y'STRUCTIONS TO CANDIDATES

a) Write your name and index number in the space 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 the section I and only five questions from section II.
e) All answers and working must be written on the question paper in the space provided below each question.
f) Show all the steps in your calculations giving your answers at each stage in the spaces provided in each question.
g) Non-programmable silent electronic calculators and KNEC Maths tables may be used except where stated otherwise.
h) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

## FOR EXAMINERS' 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 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
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| GRAND |  |
| :--- | :--- |
| TOTAL |  |

## SECTION I (50 Marks)

## ATTEMPT ALL QUESTIONS INTHIS SECTION

1. Simply without using tablies or calculators:
$\log _{10} 2+\log _{1} \times 18$
$\log _{10} 24 \times \log _{10} 9$$\quad$ (3 marks)


2, Using a ruler, a set square and a pair of compasses only, ,
a) Draw a line $\mathrm{AB}=5 \mathrm{~cm}$ (1 mark)
b) Divide the above line into 9 equal parts. (2 marks)
3. Simplify $\frac{2-10 x+12 x^{2}}{36 x^{2}+3-21 x}$
4. a) Expand and simplify $\left[1-\frac{3 \mathrm{x}}{20}\right] \underset{51}{20} e^{44^{5^{e}}}$


b) Henee use the above expansion to evaluate $(1.03)^{4}$ to 4 s.f
5. A circle whose equation is $(x-1)^{2}+(y-k)^{2}+(y-k)^{2}=10$ passes through the point $(2,5)$. Find the coordinates of the two possible centres of the circle. (3 marks)
6. a) Find the inverse of the matrix $\left(\begin{array}{ll}1 & 1 \\ 3 & 1\end{array}\right)$
b) Hence determine the point of intersection of the:
lines:
$y+x=7$
$3 x+y=15$
7. Watíuru invested shs. 6000 for $1 \frac{1}{2}$ years at $12 \%$ p.a compounded quarterly. Determine:
a) The amount accruing at the end of $11 / 2$ years. ( 3 marks)
b) Interest earned. (1 mark)
8. Given that $\mathrm{y}^{2}$ is inversely proportional to x and $\mathrm{y}=1.5$ when $\mathrm{x}=\frac{2}{3}$, find the value of y when $\mathrm{x}=6$. (3 marks)
9. A single unbiased dice is thrown once. Find the probability that the score will be:
a) even (1 mark)
b) a multiple of 3 (1 mark)

10. Two types of tea whick cost ksh. 200 per kg and ksh 250 per kg are mixed so that their weights are in the ratio $5: 3$ respectively. Calculate the cost of 20 kg of the mixture. ( 3 marks)

11. A plane flies from Cairo $\left(40^{\circ} \mathrm{N}, 30^{\circ} \mathrm{E}\right)$ to Harare $\left(9 \mathrm{~S}^{\circ}, 30^{\circ} \mathrm{E}\right)$ a distance of $3,300 \mathrm{~nm}$. Determine the latitude $\theta \mathrm{S}^{\circ}$. (3 marks)
12. Find the percentage error in evaluating $(x+y)-z$; if $x=3.2 \mathrm{~cm}, \mathrm{y}=5.6 \mathrm{~cm}$ and $\mathrm{z}=2.4 \mathrm{~cm}$. ( 3 marks)
13. Without using calculator or mathematical tables; Find the sums of the first 20 terms of the series:

$$
\log 2+\log 4+\log 8+\log 16+\text {----------------(3 marks) }
$$

14. $Q$ represent a positive quarter turn about $(0,0)$ and $R$ is the reflection in the line $y-x=0$. Find $Q R(2,1)$ (3 marks)

15. Find the acute angel y if $\cos 4 y=\sin 2 y$. (2 marks) ふ
16. In the diagram below, O is the centre of the circle SPQ . Angle $\mathrm{SOQ}=130^{\circ}$.


Calculate angle:
(a) $\mathrm{r}^{\mathrm{o}}$ (1 mark)
(b) $\mathrm{p}^{\mathrm{o}}$ (2 marks)

## SECTION II (50ダarks)

ATTEMPT ANY 5 QUESTING IN THIS SECTION
17. The vectors $\mathbf{a}$ and $\mathbf{b}$ are not parallel. Given that
a) $3 \mathbf{a}+\mathrm{hb}=\mathrm{ka}+\mathbf{2 b}$. Find the values of the scalars h and k. (3 marks)
b) The position vectors of points $A$ and $B$ relative to a point of origin $O$ are $\mathbf{a}$ and $\mathbf{b}$ respectively. $C$ is the point on $A B$ such that $A C: C B=5: 3$. Express in terms of $\mathbf{a}$ and $\mathbf{b}$ the vectors.

(ii) $\overrightarrow{\mathbf{A C}}$ (1 mark)
(iii) $\overrightarrow{\mathbf{O C}}$ (2 marks)
c) (i) D is a point on OB such that $\mathbf{O D}=\lambda \mathbf{b}$. Express $\overrightarrow{\mathbf{D C}}$ in terms of $\mathbf{a}, \mathbf{b}$ and $\lambda$. (2 marks)
(ii) Find the value of $A$ ? ${ }^{3} 1_{1}^{2} \mathrm{OA}$ is parallel to DC. (1 mark)
18. Complete the table below for graphs of:
$y=3 \sin \left(2 x-30^{\circ}\right)$ and $y=\sin x$ for $-120^{\circ}<x<120^{\circ}$
ã) Correct to 2 d.p.

| $\mathrm{x}^{\mathrm{o}}$ | $-120^{\circ}$ | $-90^{\circ}$ | $-60^{\circ}$ | $-30^{\circ}$ | $0^{\circ}$ | $30^{\circ}$ | $60^{\circ}$ | $90^{\circ}$ | $120^{\circ}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{y}=\sin \mathrm{x}^{\mathrm{o}}$ | -0.87 | -1.00 |  | -0.50 | 0 |  | 0.87 | 1.00 |  |
| $\mathrm{y}=3 \sin \left(2 \mathrm{x}-30^{\circ}\right)$ |  | 1.50 |  | -3.00 | -1.50 | 1.50 |  | 1.50 |  |

b) On the grid provided; draw the graphs on the same axes of:

$$
y=\sin x \text { and } y=3 \sin \left(2 x-30^{\circ}\right)
$$

Take the scale: 1 cm for $15^{\circ}$ on x -axis and 2 cm for 1 unit on the y -axis.
c) State the amplitude and period of each wave. (2 marks)
d) Find the value of $x$ : for which

$$
\operatorname{Sin}\left(2 x-30^{\circ}\right)-\frac{1}{3} \sin x=0 . \quad(2 \text { marks })
$$

19. The heights to the nearest centimeter of 100 boys were recorded as shown below

| Heights | $140-145$ | $146-151$ | $152-157$ | $158-$ <br> 163 | $164-169$ | $170-75$ | $176-181$ | $182-187$ | $188-193$ | $194-199$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Frequency | 3 | 4 | 7 | 10 | 10 | 15 | 25 | 16 | 8 | 2 |

Using an assumed mean of 166.5
a) Calculate the mean (5 marks)
b) The variance (3 marks)
c) The standard deviation (2 marks)
20. P and V are connected by the law $\mathrm{P}=\mathrm{KV}^{\mathrm{n}}$ where k and n are constants. The table below shows values of $P$ and $V$.

| V | 2 | 2.3 | 3 | 3.5 | 4 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| P | 288 | 503.7 | 1458 | 2701 | 4608 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

a) Express $\mathrm{P}=\mathrm{KV}^{\mathrm{n}}$ in linear form. (1 mark)
b) Complete the table and draw a linear graph to represent the information given above.

c) Find the values of k and n (2 marks)

d) Find the law connecting p and v . (1 mark)
e) Find the value of p when $\mathrm{v}=6$. (2 marks)
21. An institute offers two types of courses, veterinary and Agriculture. The institute has a capacity of 500 student. There must be more Agriculture students than Veterinary students. At least 200 students must take veterinary courses. If $x$ represent the number of veterinary students and $y$ the numbers of Agriculture students.
a) Write down three inequalities that describe the given conditions. (3 marks)

c) (i) If the institute makes a profitio shs. 25,000 to train one veterinary student and shs. 10,000 to train one Agriculture studene, determine:
(i) The number of the the must be enrolled in each course to maximize the profit. ( 2 markss)

(ii)The maximum profit. (2 marks)
22. Use a ruler and compasses only in this question.

The diagram below shows a square ABCD .

a) Construct two circles with centife O , with one passing through the vertices ABCD and the other one, touching the four sides of the square ABCD (4 marks)
b) (i) Locate point P if $\mathrm{BP} \mathrm{P}^{\circ}$ is the tangent of the smaller circle. (1 mark)

(i) Point Q is the point where the locus b (ii) above meets side AD . Label the locus of point Q . (1 mark)
(ii) Shade the locus of a region R inside the square such that $\left\langle\mathrm{QRP} \geqslant 90^{\circ}\right.$. and above the locus of point T . (1 mark)
23. In the figure below Angle $\mathrm{CBD}=37^{\circ}$, angle $\mathrm{BCD}=20^{\circ}$ and ABC is a tangent to the circle at B .

a) Find:
(i) Angle BED (2 marks)
(ii) Angle ABE (1 mark)
(iii) Angel BDC (1 mark)

b) With reasons state whether triangle BDC is similar to triangle CBE. (2 marks)

eciniven that the radius of the circle is 2.5 cm and the length $\mathrm{BC}=6 \mathrm{~cm}$, find the length EC using the cosine rule. (4 marks)
24. The displacement in metres of a particle from a point $O$ after $t$ seconds is given by $s=t(t-2) t-1)$; Find :
a) The speed of the particle when $t=2$ seconds. (3 marks)
b) Its minimum speed. (2 marks)
c) The time when the particle is momentarily at rest. (3 marks)

d) It acceleration when $t=32$ seconds. (2 marks)



$\mathrm{E}^{5}$

