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SCHOOL: DATE: $\qquad$
CANDIDATE'S SIGN $\qquad$

121/1
MATHEMATICS
PAPER 1
JULY/AUGUST 2014
TIME: $\mathbf{2}^{1 / 2}$ HOURS $^{\ell}$

## KISUMU WEST DISTRICT JOINT EVALUATION EXAM

## Kenya Certificate of Secondary Education (K.C.S.E)

## MATHEMATICS

## PAPER 1

## INSTRUCTIONS TO THE CANDIDATES

- Write your name and school and index number in the spaces provided above
- This paper contains two sections; Section 1 and Section 11.
- Answer all the questions in section 1 and any five questions from Section 11
- All necessary workings and answers must be written on the question paper in the spaces provided below each question.
- Marks may be given for correct working even if the answer is wrong.
- Non-calculators and KNEC Mathematical tables may be used EXCEPT where stated otherwise.
- Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.


## FOR EXAMINERS'S USE ONLY

## Section 1

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

## Section 1I

| Question | 17 | 18 | 19 | 20 | 21 | 22 | 13 | 24 | Total |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Marks |  |  |  |  |  |  |  |  |  |



This paper consists of 14 printed pages. Candidates should check carefully to ascertain that all the pages are printed as indicated and no questions are missing.

## SECTION A (50 MARKS)

## Anfswer all questions in this section

1. Evaluate without using a calcalator

$$
\begin{equation*}
\frac{1 / 4+1 / 5 \div 1 / 2 \text { of } 1 / 3}{1 / 2 \text { of }(4 / 5-3 / 4+51 / 2)} \tag{3mks}
\end{equation*}
$$

2. Simplify completely.

$$
\begin{equation*}
\frac{3 a^{2}+5 a b-2 b^{2}}{b^{2}-9 a^{2}} \tag{3mk}
\end{equation*}
$$

3. An artisan has 63 kg of metal of density $7000 \mathrm{~kg} / \mathrm{m}^{3}$. He intends to use it to make a rectangular pipe with external dimensions 12 cm by 15 cm and internal dimensions 10 cm by 12 cm . Calculate the length of the pipe in metres.
4. Given that $\operatorname{Sin} \theta=2 / 3$ and $\theta$ is anacte angle, find without using tables or calculators
(a) $\tan \theta$, giving your answer in surd form.
5. Four machines give out signals at intervals of $24,27,30$ and 50 seconds respectively. At 5.00 pm all the four machines give out a signal simultaneously. Find the time this will happen again. (3mks)
6. Two pipes $\mathbf{A}$ and $\mathbf{B}$ can fill an empty tank in 3 hrs and 5 hrs respectively. Pipe $\mathbf{C}$ can empty the full tank in 4 hours. If the three pipes $\mathbf{A}, \mathbf{B}$, and $\mathbf{C}$ are opened at the same time, find how long it will take for the tank to be full.
7. A tourist arrived in Kenya with 2 sterling pound (£) 4680 all of which he exchanged into Kenyan money. He spent Ksh. $51,790{ }^{2}$ while in Kenya and converted the rest of the money into U.S dollars. Calculate the amount he received in U.S dollars. The exchange rates were as follows.


| Buying | Selling. |
| :--- | :--- |
| 65.20 | 69.10 |
| 123.40 | 131.80 |

8. The gradient of a straight line $\mathbf{L}_{1}$ passing through the points $\mathbf{P}(3,4)$ and $\mathbf{Q}(a, b)$ is ${ }^{-3} / 2$. A line $\mathbf{L}_{\mathbf{2}}$ is perpendicular to line $\mathbf{L}_{\mathbf{1}}$ and passes through the points $\mathbf{Q}$ and $\mathbf{R}(2,-1)$. Determine the values of $\mathbf{a}$ and b.
9. Determine the quartile deviation of the set of numbers below.
$8,2,3,7,5,11,2,6,9,4$
10. The distance from a fixed point of particle in motion at any time $\mathbf{t}$ seconds is given by $S=t^{3}-5 / 2 t^{2}+2 t+5$ metres.
Find it's;
(a) Acceleration $\boldsymbol{a}^{2}$ ter $\mathbf{t}$ seconds
(b) Velocity when acceleration is zero.
11. Without using tables or calculators, find the value of $\mathbf{t}$ in

$$
\begin{equation*}
\log _{8}(t+5)-\log _{8}(t-3)=2 / 3 \tag{3mks}
\end{equation*}
$$

12. Use the tables of cube roots, squares, and reciprocals to evaluate the following correct to 4 s.f

$$
\frac{3}{(0.0136)^{1 / 3}}-\frac{2}{(3.72)^{2}}
$$

13. Three years ago John was four times as old as his son Peter. In five years time the sum of their ages will be 56 . Find their present ages.

Find the inverse of the matrix $\left(\begin{array}{ll}1 & 1 \\ 3 & 1\end{array}\right)$. Hence determine the point of intersection of the lines.
$y+x=7$

$$
\begin{aligned}
& y+x=7 \\
& 3 x+y=15
\end{aligned}
$$

15. The volumes of two similar solids are $800 \mathrm{~cm}^{3}$ and $2700 \mathrm{~cm}^{3}$. If the surface area of the larger one is $2160 \mathrm{~cm}^{2}$, find the surface area of the smaller figure.
16. Find the number of sides of a regular polygon whose interior angle is five times the exterior angle.
( 3mks)

## 8. SECTION II (50 MARKS)

## answer any five questions in this section.

17. (a) Complete the tablè D elow for the equation $y=x^{2}+3 x-6$ given $-6 \leq \mathrm{x} \leq 4$

(b) ${ }_{c}{ }^{6}$ Ssing a scale of 1 cm to represent 2 units in both axes; draw the graph of $y=x^{2}+3 x-6$ ( 3 mks )

(c) Use your graph to solve the quadratic equations.
(i) $\mathrm{x}^{2}+3 \mathrm{x}-6=0$
(ii) $x^{2}+3 x-2=0$
18. (a) Plot a triangle $\mathbf{A B C}$ with coordinates $\mathbf{A}(-2,6) \mathbf{B}(2,3)$ and $\mathbf{C}(-2,3)$
(b) Reflect $\triangle \mathbf{A B C}$ 通 the line $x=-3$. Plot $\Delta \mathbf{A}^{\mathbf{I}} \mathbf{B}^{\mathbf{I}} \mathbf{C}^{\mathbf{1}}$ the image of $\Delta \mathbf{A B C}$ under this transformation.

(c) Translate $\mathbf{A}_{\mathbf{I}}, \mathbf{B}_{\mathbf{I}}, \mathbf{C}_{\mathbf{I}}$ through $\left(10\right.$ Label the image $\mathbf{A}_{\mathbf{2}} \mathbf{B}_{\mathbf{2}} \mathbf{C}_{\mathbf{2}}$ and write down the coordinates of the points $\mathbf{A}_{2}, \mathbf{B}_{2}, \mathbf{C}_{2}$
(d) $\mathbf{A}_{\mathbf{3}}(6,-6), \mathbf{B}_{\mathbf{3}}(2,-3)$ and $\mathbf{C}_{\mathbf{3}}(6,-3)$ is the image of $\mathbf{A}_{\mathbf{2}} \mathbf{B}_{\mathbf{2}} \mathbf{C}_{\mathbf{2}}$ after a transformation $\mathbf{P}$ plot $\mathbf{A}_{\mathbf{3}} \mathbf{B}_{3} \mathbf{C}_{3}$ and describe the transformation.
(e) Describe fully a single transformation fliat would have mapped $\mathbf{A B C}$ to $\mathbf{A}_{\mathbf{3}} \mathbf{B}_{\mathbf{3}} \mathbf{C}_{\mathbf{3}}$.
19. The figure below shows a triangle $\mathbf{A B C}$ inscribed in a circle. $\mathbf{A C}=10 \mathrm{~cm}, \mathbf{B C}=7 \mathrm{~cm}$ and $\mathbf{A B}=10 \mathrm{~cm}$.

(a) Find the size of angle BAC.
(b) Find the radius of the circle.
(c) Hence calculate the area of the shaded region.
20. The figure below shows a crớss-section of a bottle. The lower part ABC is a hemisphere of radius 5.2 cm and the upper partis a frustrum of a cone. The top radius of the frustrum is one third of the radius of the hemispliere. The hemispherical part is completely filled with water as shown.


When the container is inverted, the water now completely fills only the frustrum part.
(a) Determine the height of the frustrum.
(b) Find the external surface area of the bottle.
21. In the figure below, $\mathbf{A B C D}$ is ar trapezium. $\mathbf{A B}$ is parallel to $\mathbf{D C}$, diagonals $\mathbf{A C}$ and $\mathbf{D B}$ intersect at $\mathbf{X}$ and $\mathbf{D C}=2 \mathbf{A B}, \underset{\sim}{\mathbf{A B}}=\underset{\sim}{\mathbf{B}} \underset{\sim}{\sim}=\mathbf{d}_{\sim} \mathbf{A X}=\mathbf{k A C}$ and $\mathbf{D X}=\mathbf{h D B}$, Where $\mathbf{h}$ and $\mathbf{k}$ are constants.

(a) Find in terms of a and d
(i) BC .
(ii) $\mathbf{A X}$.
(iii) $\mathbf{D X}$.
(b) Determine
(i) The values of $\mathbf{h}$ and $\mathbf{k}$.
(ii) The ratio in which $\mathbf{X}$ divides $\mathbf{B D}$.
22. (a) Complete the table below. for the function $y=x^{2}+3$

| $x$ | 1 | 1.5 | $x^{25}$ | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 |
| :--- | :--- | :---: | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $y$ | 4 | $j^{2} y^{\text {s. }} 7$ |  |  | 15.25 | 19 |  | 27 |  | 39 |  |

(b) Use the ${ }^{\text {(hid-ordinate rule }}$ with five strips to estimate the area bounded by the curve, the line

(c) Use integration to find the exact area in (b) above.
(d) Calculate the percentage error arising from the use of mid-ordinate rule.
23. Four cities A, B,C, and $\mathbf{D}$ are suef that town $\mathbf{B}$ is 1500 km due East of town $\mathbf{A}$. Town $\mathbf{C}$ is 1800 km due North of town $\mathbf{B}$. Town $\mathbf{D} \mathbf{D}^{\prime \prime}$ is on a bearing of $330^{\circ}$ from town $\mathbf{A}$ and on a bearing of $300^{\circ}$ from C.
(a) Use a ruler and compasses only to show the position of town $\mathbf{A}, \mathbf{B}, \mathbf{C}, \mathbf{D}$ (Take a scale ${ }^{\circ}$ bf $1 \mathrm{~cm}=300 \mathrm{~km}$ )
(b) Determine
(i) The distance AD.
(ii) The distance $\mathbf{C D}$
(iii) The bearing of town $\mathbf{D}$ from town $\mathbf{B}$.
24. A car leaves town $\mathbf{X}$ from town 120 km away at an average speed of $70 \mathrm{~km} / \mathrm{h}$ at 8.00 am . At the same time a bus leaves town ${ }^{2} \mathbf{F}^{2}$ for town $\mathbf{X}$ at an average speed of $50 \mathrm{~km} / \mathrm{hr}$. At 8.15 am , a cyclist leaves town $\mathbf{Y}$ for town $X^{\text {shat }}$ an average speed of $30 \mathrm{~km} / \mathrm{hr}$.
(a) Calculate the time $e^{\prime \prime}$ when the bus meets the car.
(b) Calculate the distance between the car and the bus by the time the cyclist meets the car. ( 4 mks )
(c) If the bus upon reaching town $\mathbf{X}$ rests for 10 minutes then starts its journey back to $\mathbf{Y}$, calculate how far from $\mathbf{X}$ the bus meets the cyclist.



