Name: $\qquad$ Index No: $\qquad$
Candidate's signature $\qquad$
Date $\qquad$

# Muungano KCSE Trial Exam 

## 121/1 <br> MATHEMATICS

PAPER 1
July 2017
$2^{1 ⁄ 2}$ Hours

## INSTRUCTIONS:

1. Write your Name and Index Numberi in the spaces provided at the top of this page.
2. The paper consists of two Sections, $\sqrt{\text { Section }} \mathbf{1}$ and Section $\mathbf{I}$.
3. Answer all questions in Section Dand any five in Section II.
4. All answers and workings mast be written on the question paper on the spaces provided below each question.

## Section 1

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

Section 11

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

This paper consists of 14 printed Pages
Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing

## SECTION 1 (50Mks)

## Answer All questions from this section

1. Without using mathematical tables or calculators, evaluate $\sqrt{\frac{1408 \times 0.594 \times 0.012}{6.05 \times 125}}$ leaving your answer as a simplified fraction
2. A number was increased in the ratio $5: 3$ and the result decreased by $15 \%$. Find the overall percentage change in the number
3. Simplify completely $\frac{3^{n+3}-3^{n+1}}{4 \times 3^{n+2}}$
4. Solve for $\boldsymbol{y}$ in $\log _{2} y=\log _{2} 3+\log _{2} 7+2 \log _{2} y$
(3mks)
5. Five spheres of radius 2 cm are melted and recast into a cone of radius 5 cm . Find the height of the cone
6. Given that $\cos \theta=-\frac{4 \sqrt{2}}{9}$ find without using mathematical tables or calculators the value of $\tan \theta$ if $180^{\circ} \leq \theta \leq 360^{\circ}$
(3mks)
7. Janet was required to increase a number by $20 \%$. By mistake, she decreased it by $20 \%$. By what percentage should it be increased to give the correct value
(3mks)
8. Simplify $\frac{\left(2 a^{3} b^{5}\right)^{4}}{\left(4 a^{4} b^{2}\right)^{2}} \div \frac{\left(\frac{1}{2} a^{3} b^{2}\right)}{(8 a b)^{3}}$
9. A rectangular trough measuring 25 cm long, 8 cm wide by 15 cm deep is filled with water. Find the new depth of water if 1 litre of water is taken out?
(3mks)
10. In what ratio should grade $\boldsymbol{A}$ tea costing Sh .180 per kg be mixed with grade $\boldsymbol{B}$ tea costing Sh . 300 per kg to produce Nganomu Tea which when sold at Kshs 270 a profit of $20 \%$ is realized?
(4mks)
11. ABC is an equilateral of side 6 cm . A circle centre $O$ is drawn such that $A B, A C$, and $B C$ are tangents to the circle. Calculate the exact area of triangle lying outside the circle. (3mks)
12. $X \boldsymbol{Y}$ and $\boldsymbol{W Z}$ are two parallel chords of length 20 cm and 16 cm respectively. They are drawn on the same side of the centre of a circle. If the distance between them is 2 cm , find the radius of the circle.
(3mks)
13. Express $\frac{2 \mathrm{x}^{2}}{\mathrm{x}^{2}-1}+\frac{1}{\mathrm{x}+1}$ as a single fraction and simplify completely (3mks)
14. A translation $\mathbf{T}$ maps $\boldsymbol{A}(4,3)$ onto $\boldsymbol{A}_{\boldsymbol{I}}(-4,2)$. Determine the coordinates of a point $\boldsymbol{B}$ that is mapped onto $(-2,-2)$ under the same transformation
15. A boy observes a bird on top of a post 80 m away at an angle of elevation of $22^{\circ}$. He walks towards the post until the angle of elevation becomes $38^{\circ}$. Find the distance he covered towards the tree (correct to 1 decimal place).
16. 10 men working 9 hours a day can complete a piece of job in 6days. 4 of them start working at 12 hours daily and go on for 5 days. They are then joined by two others but all of them now work for 10 hours daily. How long will it take to complete the remaining job?

## SECTION II (50Marks)

## Answer Any Five questions from this section. ALL questions carry equal marks

17. (a) On the graph paper provided, draw triangle PQR whose vertices are $\mathrm{P}(0,12), \mathrm{Q}(6,0)$ and R(12,18)
(1mk)

(b) (i) Draw the line of symmetry for triangle PQR and state its equation.
(3mks)
(ii) Draw triangle $P^{1} Q^{1} R^{1}$ the image of triangle $P Q R$ under reflection in the line $y=x$ state co-ordinates of $\mathrm{P}^{1}, \mathrm{Q}^{1}$ and $\mathrm{R}^{1}$
(c) The co-ordinates of triangle $\mathrm{P}^{11} \mathrm{Q}^{11} \mathrm{R}^{11}$ which is the image of triangle $\mathrm{P}^{1} \mathrm{Q}^{1} \mathrm{R}^{1}$ are $\mathrm{P}^{11}(-$ $12,6)$, $\mathrm{Q}^{11}(-3,3)$ and $\mathrm{R}^{11}(-24,15)$ under transformation defined by matrix $\mathbf{T}$, draw triangle $\mathrm{P}^{11} \mathrm{Q}^{11} \mathrm{R}^{11}$ hence or otherwise find the transformation matrix T .
18. (a) Complete the following table for the equation $y=x^{2}+2 x-15$

| $x$ | -5 | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{y}=\mathrm{x}^{2}+2 \mathrm{x}-15$ |  |  |  |  |  |  |  |  |  |  |  |

(b) On the grid provided draw the graph $y=x^{2}+3 x+17$ for $-5 \leq x \leq 5$. Take the scale: 2 cm for 1unit on the x -axis and 1 cm for lunit on the y -axis.
(3mks)

(c) Use your graph to solve the equation
(i) $x^{2}+2 x-15=0$
(ii) $x^{2}-18=0$
(3mks)
d) Find the range of values of $x$ for which $y \leq-4$.
19. Complete the following table for the given functions
(2mks)

| $\mathrm{x}^{\mathrm{c}}$ | $0^{\mathrm{c}}$ | $\frac{\pi^{c}}{2}$ | $\pi$ | $\frac{3 \pi^{c}}{2}$ | $2 \pi^{c}$ | $5 / 2 \pi^{c}$ | $3 \pi^{c}$ | $7 / 2 \pi^{c}$ | $4 \pi^{c}$ | $9 / 2 \pi^{c}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\operatorname{Sin} 1 / 2 x^{c}$ |  |  |  |  |  |  |  |  |  |  |
| $3 \sin \left(1 / 2 x+\frac{\pi}{3}\right)^{c}$ |  |  |  |  |  |  |  |  |  |  |

(a) Draw the graph of the functions of $\mathrm{y}=\operatorname{Sin} 1 / 2 x^{c}$ and $\mathrm{y}=3 \sin \left(1 / 2 x+\frac{\pi}{3}\right)^{c}$ on same axes for which $O^{c} \leq x^{c} \leq 9 / 2 \pi^{c}$
(4mks)

(b) What transformation would map the function $\mathrm{y}=\operatorname{Sin} 1 / 2 x^{c}$ on to $\mathrm{y}=3 \sin \left(1 / 2 x^{c}+\frac{\pi^{c}}{3}\right)^{c}$
(1mk)
(c) (i) State the amplitude period and phase angle of the function $\mathrm{y}=3 \sin \left(1 / 2 x+\frac{\pi}{3}\right)^{c}$
(2mks)
(ii) Use your graph to solve the equation $\sin \left(1 / 2 x^{c}+\frac{\pi}{3}\right)^{c}-\frac{1}{3} \sin \frac{1}{2} x^{c}=0$
20. The table below shows the marks scored by 100 students in a mathematics test

| Marks | $0 \leq x<10$ | $10 \leq x<20$ | $20 \leq x<30$ | $30 \leq x<40$ | $40 \leq x<50$ | $50 \leq x<60$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| No of <br> students | 6 | 9 | 12 | 30 | 20 | y |


| Marks | $60 \leq x<70$ | $70 \leq x<80$ |
| :--- | :---: | :---: |
| No of students | 6 | 3 |

(a) Determine the value of y
(b) State the modal class
(c) Calculate the mean
(d) Calculate the median
(e) Calculate the pass-mark if $45 \%$ of the students passed this exam
21. The displacement $\boldsymbol{s}$ metres of a particle moving along a straight line after $\boldsymbol{t}$ seconds is given by:-$\mathrm{S}=4-4 \mathrm{t}+2 \mathrm{t}^{2}+\mathrm{t}^{3}$
a) Find
i) Its speed when $t=1 / 2$
(3mks)
ii) its initial acceleration

## b) Calculate

ii) Its displacement by the time it comes to rest.
22. The positions of two towns $\boldsymbol{A}$ and $\boldsymbol{B}$ on earth's surface are $\left(60^{\circ} \mathrm{N}, 139^{\circ} \mathrm{E}\right)$ and $\left(60^{\circ} \mathrm{N}, 41^{0} \mathrm{~W}\right)$ respectively. Given that the radius of the earth is 6370 km
a) Find the distance between $\boldsymbol{A}$ and $\boldsymbol{B}$ along the parallel of latitude $60^{\circ} \mathrm{N}$
(2mks)
b) Calculate the shortest distance between $\boldsymbol{A}$ and $\boldsymbol{B}$.
(3mks)
c) Another town $\boldsymbol{C}$ is 420 km East of town $\boldsymbol{B}$ and on the same latitude as $\boldsymbol{A}$ and $\boldsymbol{B}$. Find the location of town $\boldsymbol{C}$.
(5mks)
23. A pilot intends to fly from $\boldsymbol{A}$ to $\boldsymbol{D}$ through $\boldsymbol{B}$ and $\boldsymbol{C} ; \boldsymbol{B}$ is 750 km from $\boldsymbol{A}$ and on a bearing of $050^{\circ}$. $\boldsymbol{C}$ is on a bearing of $320^{\circ}$ from $\boldsymbol{B}$ and their distance apart is $600 \mathrm{~km} . \boldsymbol{D}$ is $265^{\circ}$ from $\boldsymbol{C}$ and at a distance of 1050 km .
a) Using the scale 1 cm for 100 km show the flight route.
b) If the pilot now flies directly from $\boldsymbol{D}$ to $\boldsymbol{A}$ in what direction does he fly.
(1mk)
c) The plane flies at $500 \mathrm{~km} / \mathrm{h}$. fitit leaves $\boldsymbol{D}$ at 8.00 am at what time did it arrive at $\boldsymbol{A}$. ( 4 mks )
24. Aggrey, Beatrice and Chebet wanted to start a business. They contributed Sh. 135,000, Sh 216,000 and $\mathrm{Sh} .270,000$ respectively. They agreed to share annually half of the proceeds from the business in the ratio of their contributions.
a) Determine the ratio of their contributions
(1mk)
b) After one year the business yielded Sh. 1,035,000. Find each person's share
(3mks)
c) At the beginning of the second year, Aggrey boosted hishares by the profit he had received for the first year. The other two also increased their shares in the ratio of 5:3 each. Find the new ratio of their shares
d) If they still shares halfof the profit in the ratio of their shares and Aggrey got Sh. 350,000 in a certain year, find the amount of profit made in that year.

