NAME: ……. **INDEX NO: …….**

SCHOOL: ……..…… **DATE : ……..**

STUDENT'S SIGNATURE:…….

MATHEMATICS

FORM THREE 2020

PAPER ONE

121/1

TIME ALLOWED: 2 ½ HOURS

Instructions to Candidates

1. ***The paper contains two sections. Section I and Section II. Answer ALL Questions in Section I and only Five Questions from Section II.***
2. ***All Answers and working must be written on the Question Paper in the spaces provided below each question.***
3. ***Show all steps in your calculations, giving your answers at each stage in the spaces below each question.***
4. ***Non-Programmable Silent Calculators and KNEC Mathematical Tables may be used except where stated otherwise.***

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**

GRAND TOTAL

SECTION I (50 Marks)

Answer ALL Questions in this Section

1. Evaluate without using tables or calculator.

$$\sqrt{\frac{0.0625 \times 2.}{0.25 \times 0.08 \times}}\sqrt{\frac{0.0625 \times 2.}{0.25 \times 0.08 \times}}$$

(3 Marks)

2. Simplify $\frac{x+4}{\quad} - \frac{5x+x+4}{x^2 \quad} - \frac{5x+}{x^2}$.

(3 Marks)

3. Evaluate without using log tables. (3 Marks)

$$\frac{\log_{10} 343 - \log_{10}}{\log_{10} {}^{7}/_{\square}}$$

4. Solve the following inequalities and represent the solution on a single number line.

$-2x + 3 < 5$

$4 - 4 - {}^{3}/_{2}\,x \geq -8 {}^{3}/_{2}\,x \geq -8$

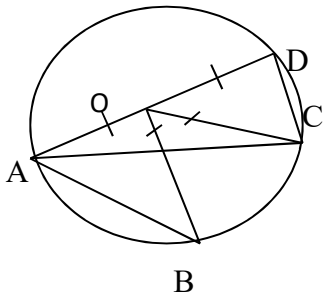
(3 Marks)

5. The scale of a map is 1 : 200. Calculate the actual area of a triangular field whose sides are 6cm, 8cm and 10cm on the map. (4 Marks)

6. 24 mean each working 10 hours a day take 4 days to complete a piece of work. How many more days will it take 15 men each working 8 hours a day to complete the same piece of work. (3 Marks)

7. Find the value of ^{xx} in $(1/2)^x \times (1/8)^{1-x} = 32.(1/2)^x \times (1/8)^{1-x} = 32.$
(3 Marks)

8. The figure below shows a circle ABCD, centre O. BO is perpendicular to the diameter AOD and ∠COD = 42°.



Calculate:

a) ∠CAD (2 Marks)

b) ∠BAC (2 Marks)

9. Given that $\sin x = {}^{2}/_{3}, \sin x = {}^{2}/_{3}$, find without using tables.

$tan\ x tan\ x$

(2 Marks)

10. A three digits number is such that twice the hundreds digit is more than the tens digit by 2. The units digit is thrice the hundreds digit. When the digits are reversed, the number is increased by 594. Find the number. (4 Marks)

11. If $2m + 3n : 5m - n = 3 : 2, 2m + 3n : 5m - n = 3 : 2,$ calculate the ratio m : n.

(3 Marks)

12. A dealer sells a car battery to a customer at a profit of 22%. The customer sells it to a friend for Sh.4800, at a profit of 8%. Find: -

a) How much it cost the dealer to buy the battery. (2 Marks)

b) How much it cost the dealer to buy the battery. (2 Marks)

13. Given vectors $\underset{\sim}{PQ} = \begin{pmatrix} \\ \end{pmatrix}$ $\underset{\sim}{PQ} = \begin{pmatrix} \\ \end{pmatrix}$ and $\underset{\sim}{RS} = \begin{pmatrix} 6 \\ a- \end{pmatrix}$ $\underset{\sim}{RS} = \begin{pmatrix} 6 \\ a- \end{pmatrix}$ are parallel, find the value of a, hence calculate $\left|\underset{\sim}{RS}\right|\left|\underset{\sim}{RS}\right|$.

(3 Marks)

14. Find the greatest common factor of $x^3y^2x^3y^2$ and $4xy^44xy^4$. Hence factorise completely the expression $x^3y^2 - 4xy^4x^3y^2 - 4xy^4$.

(3 Marks)

15. Express 2.4545……. in the form $^{p}/_{q}{}^{p}/_{q}$ where pp and qq are integers and $q \neq 0.q \neq 0.$ (3 Marks)

16. Given that $a = 2.5a = 2.5$ and $b = 6.15b = 6.15$, find the percentage error in $b - a.$ $b - a.$ (3 Marks)

SECTION II (50 Marks)

Answer any FIVE Questions in this Section.

17. Towns A and B are 580km apart. A matatu started from town A and travelled towards town B at an average speed of 90km/h at 7.30 a.m. One and a half hours later a car travelled from town B towards town A at an average speed of 120km/h.

a)

i) At what time did the two vehicles meet? (2 Marks)

ii) How far from B did the two vehicles meet? (2 Marks)

b) If the matatu took a total of 30 minutes to drop and pick travellers along the way, calculate the time it arrived at town B. (2 Marks)

c) A rally driver starts from B towards A at 10.00 a.m. at an average speed of 180km/h.

i) At what time did the rally driver overtake the car? (2 Marks)

ii) How far from A did the rally driver overtake the car? (2 Marks)

18. The figure below shows marks obtained by 60 students in a test.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of pupils	2	2	3	8	23	13	6	2	1

a) Calculate the mean mark. (3 Marks)

b) Calculate the median. (3 Marks)

c) State the modal class. (1 Mark)

d) Represent the information on a histogram. (3 Marks)

19. The figure shows the cross-section of a cylindrical tank containing some oil and lying horizontally. The tank is 4m long.

O is the centre of the circle, radius 14m. $\angle AOB=120°$.

Calculate:

i) The length of chord AB. (2 Marks)

ii) The area of segment ABC. (3 Marks)

iii) The volume of oil in the tank. (2 Marks)

iv) The area of the tank in contact with the oil. (3 Marks)

20. Given that , complete the following table and use it to answer the questions that follow.

(2 marks)

	-6	-5	-4	-3	-2	-1	0	1	2	3

a) Using a scale of 1cm to represent 1 unit on both axes plot the graph of .

. (3

(3 Marks)

b) On the same grid draw the line . (3 Marks)

(3 Marks)

c) Use your graph to estimate the roots of the equation. (2 Marks)

d) Give the least value of for the curve . (1 Mark)

(1 Mark)

e) Give the range of values of for which is less than or equal to 2.

(1 Mark)

21. The vertices of a triangle are at) and Under a rotation R, the images of A and B are and rotation R, the images of A and B are and respectively.

i) Draw the two triangles on the Cartesian plane. (2 Marks)

ii) Find the centre and angle of rotation (2 marks)

iii) State the coordinates of the image of C. (1 mark)

iv) Triangle is reflected in the line to get $A^2B^2C^2$. Draw triangle $A^2B^2C^2$. State the triangle $A^2B^2C^2$. State the coordinates of $A^2B^2C^2$. (2 marks)

v) is the image of $A^2B^2C^2$ under an enlargement centre (0, -5) and scale factor = 2. Draw and state its coordinates. (3 marks)

22. Three straight lines L_1, L_2 and L_3 are such that;

L_1 cuts the y-axis at and has a gradient of 2.

L_2 is perpendicular to L_1 at the point where L_1 cuts the x-axis.

L_3 is parallel to L_2 and passes through the point (1, 2).

a) Find the equations in the form of

i) L_1 (2 Marks)

ii) L_2 (2 Marks)

iii) L_3 (2 Marks)

b) Determine the coordinates of the point at which L_3 is perpendicular to L_1. (3 Marks)

23. Use a ruler and a pair of compasses only to construct a triangle ABC with AB = 3.8 cm, BC = 4.2 cm and $\angle ABC=75°$. (2 marks)

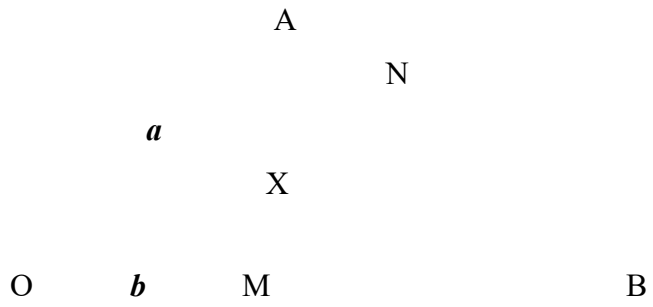
a) Measure AC. (1 Mark)

b) Drop a perpendicular from B to meet AC at N. Measure BN and AN. (2 Marks)

c) Calculate the area of . (2 Marks)
Marks)

d) Construct a perpendicular bisector of AB and BC to meet at O. Use OA as the radius to draw a circle.
Find the area of the circle. (3 Marks)

24. In the figure below AN = ¼ AB and OM = $^{2}/_{3}$ OB. **OA = a** and **OB = b**. The lines AM and ON intersect at point .



a) Express in terms of and .

i) **ON**

ii) **AM**

b) If **AX** = k**AM** and **OX** = h**ON**

i) Write two expressions for **OX** in terms of and .

ii) Hence write OX in terms of and .