Name……..Class ……

Index Number ……..…… **Class Number……**

FORM 4
MATHEMATICS PAPER 2
JULY 2018
TIME: 2 ½ HOURS

KAKAMEGA NORTH SUBCOUNTY JOINT EXAMINATIONS
KCSE Trial Exam

Mathematics Paper 2
2 ½ Hours

Instructions to candidates

1) Fill the spaces provided above.
2) The paper consists of two sections**:** ***section I*** and ***section II*****.**
3) Answer **all**the questions in **section I** and any **five** in **section II**
4) Section I has **sixteen** questions and section two has **eight** questions
5) All answers and working must be written on the question paper in the spaces provided below each question.
6) ***Show all the steps in your calculations, giving your answers at each stage in the spaces below each question***
7) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.

For examiner's 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

1. Evaluate without using tables or a calculator (4mks)

$$\sqrt{\frac{(0.000125)^{1/3} \times 0.0049 \times 3.9 \times 10^{3}}{0.325 \times \sqrt{0.0036}}}$$

2. Find the value of the term independent of x in the expansion of (3mks)

$$\left(3x^{2} + \frac{1}{3x}\right)^{6}$$

3. Simplify the following giving your answer in the simplest form possible.

$$\frac{2}{\sqrt{6} + \sqrt{3}\sqrt{7}} - \frac{5}{\sqrt{5}}$$ (3mks)

4. Without using tables or a calculator evaluate (3mks)

$$\frac{\text{Tan } 225 \ - \ \cos 330}{\text{Sin } 210 \ + \ \cos 840}$$

5. Given that a = b + $\sqrt{b^2 + c^2}$ make c the subject of the formular. (3mks)

6. Two matrices A and B are such that

$$A = \begin{pmatrix} K & 4 \\ 3 & 2 \end{pmatrix} \qquad B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

Given that the determinant of AB = 4 find the image of triangle ABC where A = (2,0) , B (3,2) and C (3,4) under stretch, stretch factor K, parallel to the *X* axis. (3mks)

7.a. Find the position vector **OC** of the centre of a circle C, whose equation is

$2x^2 + 2y^2 + 4x - 6y - 26 = 0$ (2mks)

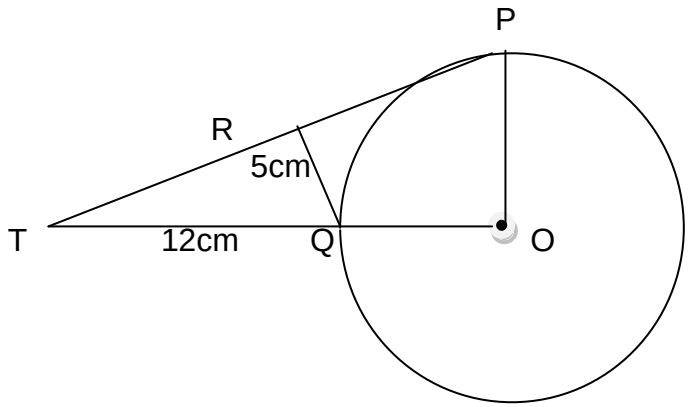
b. If the circle passes through P (3,2), use vector method to find the diameter of the circle. (2mks)

8. The sum of the digits in a three digit number is nine. The tens digit is half the sum of the sum of the other two and the hundreds digit is half the units digit. Find the total value of the number. (3mks)

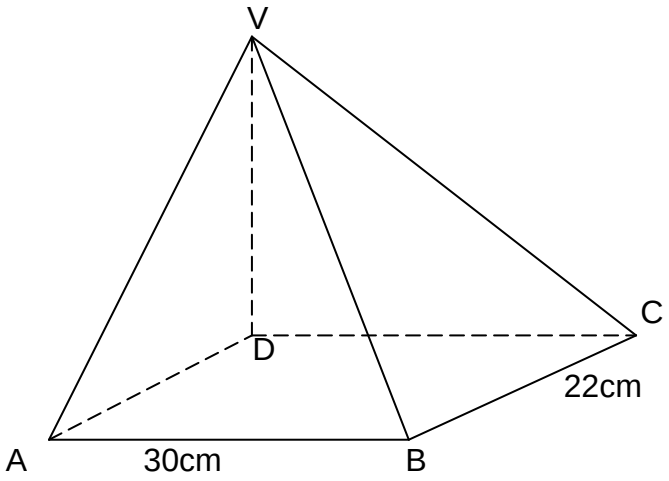
9. Given that y is inversely proportional to x^n and β is the constant of proportionality and that x = 2, when y = 12, and x = 4, when y = 3, find the values of n and β. (4mks)

10. Find the exact area of the region bounded by the curve $y = 9x - x^3$ and the x axis. (4mks)

11. In the figure below, RP and RQ are tangents to the circle centre O, radius r cm. OQ produced meets PR produced at T. QT = 12cm and QR = 5cm
Calculate the radius of the circle. (3mks)



12. The figure below represents a right pyramid with a vertex V and a rectangular base, ABCD. VA = VB = VC = VD = 40 cm.
AB = 30cm and BC = 22cm. X is the mid-point of BC.
Calculate the size of the angle between planes VBC and ABCD (3mks)



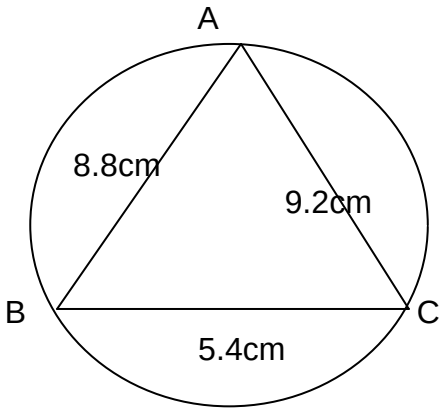
13. Given that $\mathbf{a} = 3\mathbf{i} - 2\mathbf{j} + 3k$ and

$\mathbf{b} = 2\mathbf{i} - 4\mathbf{j} - 3k$

Find $\left| \mathbf{2a} - \mathbf{3b} \right|$ (3mks)

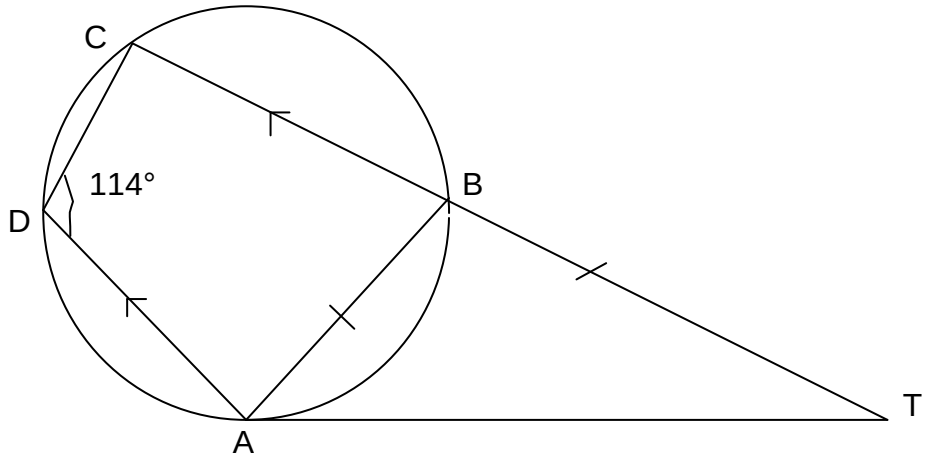
14. If $25x^2 + k + 9$ is a perfect square find x (2mks)

15. The figure below shows a circle centre O touching the vertices A , B , C of triangle AB = 8.8cm , BC = 5.4cm and AC = 9.2cm.



Calculate the radius of the circle to the nearest whole number. (3mks)

16. XAY is a tangent to the circle ABCD. AD is parallel to the straight line CBY . Angle ADC = 114°, and AB = BY



Calculate angles

i. ABC (1mk)

ii. BCA (1mk)

17. The following table shows individual rates of income tax

Income K£ PA	Rate (sh. Per K£)
1 – 4512	2
4513 - 9024	3
9025 – 13536	4
13537 – above	5

Mr. Kariuki lives in a company house for which he pays a nominal rent of Ksh.610 per month. For taxation purpose, his basic salary is increased by 15%. He is insured and pays sh.1200 as premiums per month and claims insurance relief of K£ 36 per annum. He also claims a family relief of sh.660 per month. In addition, he is a member of a co-operative society, to which he remits Ksh.1500 per month, as shares. If Mr. Kariuki's P.A.Y.E is ksh.2400 per month, calculate his net salary in shillings per month. (10mks)

18.a. Using a ruler and a pair of compasses only construct

i. Triangle ABC, such that AB = 9cm, AC = 7cm and $< CAB = 60°$ (2mks)

ii. The locus of P , such that $AP \leq BP$ (2mks)

iii. The locus of Q such that $CQ \leq 3.5cm$

iv. Locus of R such that angle ACR ≤ angle BCR (2mks)

b. Find the area of the region satisfied by both P and Q (2mks)

19. Points D(0° , 24°E) , E(O°, 21°W) , F(60°S, 120°W) , G(60°S, 110°E) are marked in a globe representing the earth with radius = 0.7m.
(Taking π as $\frac{22}{7}$)

a. Find the length of the arc DE. (3mks)

b. If A is the centre of the latitude 60°S, and B is the centre of the latitude O° find

i. the length AB
(3mks)

ii. the area of the major sector AFG (4mks)

20. In a group of 40 people, 10 are healthy and every person of the remaining 30 has either high blood pressure, a high level of cholesterol or both. 15 have high blood pressure and 25 have high level of cholesterol. If a person is selected at random from this group, what is the probability that he/she

a. Has high blood pressure only (4mks)

b. Has high level of cholesterol only (2mks)

c.. Has high blood pressure and high level of cholesterol (2mks)

d. Has either high blood pressure or high level of cholesterol (2mks)

21. Three consecutive terms in a G.P are 3^{2x+1}, 9^{x} and 81 respectively.

a. Calculate the value of x (2mks)

b. Find the common ratio of the series. (2mks)

c. Calculate the sum of the first 10 terms of the series. (3mks)

d. Given that the 5^{th} and 7^{th} terms of the G.P in (a) above form the 1^{st} two consecutive terms of an A.P Calculate the sum of the 1^{st} 20 terms of the A.P. (3mks)

22. Two variables y and x are believed to be related by the equation $y = x + ax^b$. The table below shows the corresponding values of x and y.

X	1	1.5	2	2.5	3	3.5	4
y	7.54	9.33	11.00	12.59	14.12	19.90	27.23

a. By drawing a suitable line graph, estimate the values of a and b. (9mks)

b. Write down the equation connecting y and x. (1mk)

23. The marks obtained by fifty candidates were recorded in the table below.

Marks	0 - 9	10 - 19	20 - 29	30 - 39	40 -49	50 - 59	60 - 69
No. of candidates	6	8	12	9	7	5	3

a. Draw a cumulative frequency graph and use it to estimate. (3mks)

i. Median (1mk)

ii. Quartile deviation (2mks)

iii. The percentage number of candidates failing if the pass mark was 25 marks. (2mks)

iv. The range of marks scored by the middle 30% of the candidates. (2mks)

24. A theatre has a seating capacity of 250 people. The changes are sh.100 for an ordinary seat and sh.160 for a special seat. It costs sh.16,000 to stage a Show and the theatre must make a profit. There are never more that 200 ordinary seats and for a show to take place, at least 50 ordinary seats must be occupied. The number of special seats is always less than twice the number of ordinary seats.

a. Taking x to be the number of ordinary seats and y the number of special seats, write down all the inequalities representing the information above. (4mks)

b. On a graph paper, show the region represented by the above inequalities. (4mks)

c. Determine the number of seats of each type that should be booked in order to maximize profit. (2mks)