Name: _____ IndexNo._____

Class: _____

Date: _____

121/2
MATHEMATICS
Paper 2
Time: 2½hours

))P NOTCH EXAM MERIT TWO (PRE-MOCK) 2016
K..NYA CERTIFICATE OF SECONDARY EDUCATION.

Instructions to Candidates

1. *Write your name, admission number and class at the top of this paper.*
2. *The paper contains **2** sections; Section **A** and Section **B**.*
3. *Answer **ALL** the questions in section A and only five in section B in the spaces provided.*
4. *Non-Programmable silent electronic calculators and KNEC mathematical tables may be used where necessary.*

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

SECTION 1(50 MARKS)
Answer all questions from this section

1. Use logarithms to evaluate correct to 4 significant figures (4 marks)

$$\sqrt{\left(\frac{\log 4}{6.792 \times 0.7343}\right)}$$

2. ...e completing squares method to solve for x (3 marks)

$$3x^2 + 18x + 15 = 0$$

3.a) By rounding each number to the nearest tens, approximate the value of $\frac{2454 \times 396}{66}$

(1mark)

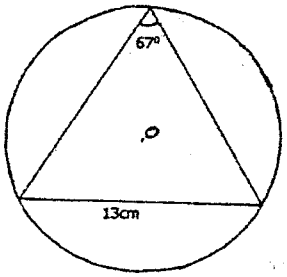
b) Hence, calculate the percentage error arising, from this approximation to 4 significant figures

(2marks)

4. Under an enlargement centre (2, 1) the image of P (1,-1) is P` (4, 5). Determine the scale factor of the enlargement. (3marks)

5. The data below shows marks scored by 8 Form four students in Isabatia district mathematics contest.44. 32. 67. 52, 28, 39, 46, 64.Calculate the mean absolute deviation. (4 marks)

6. A diagram below shows a chord of length 13cm subtends an angle of 67^0 at the circumference of a circle centre O. Find the area of the circle. (3marks)



7. A group of youth borrowed Shs 72,000 from the National Youth Fund and invested the money in two companies A and B. A pays a simple interest of 22.5% while B pays a simple interest of 21%. If from their total investment they obtained a return of 21.5%, how much money did they invest in each company? (4 marks)

8. Given that $\text{Cos}\,\theta = \frac{1}{\sqrt{3}}$, find the value of $\frac{Sin\theta - \tan\theta}{Cos\theta}$ in its simplest form. (Leave your answer in surds.)

(3 marks)

9. A coffee dealer mixes two brands of coffee, ***x*** and ***y***, to obtain 40kg of the mixture worth Ksh. 65 per kg. If brand ***x*** is valued at Ksh. 70 per kg and brand ***y*** at ks.55 per kg. Calculate the ratio, in its simplest form, in which the brands ***x*** and ***y*** are mixed. (2marks)

10. Find, without using mathematical tables the values of x which satisfy the equation

$$\log_2(x^2 - 9) = 3\log_2 2 + 1$$

(3marks)

11.(a) Expand and simplifyup to the first four terms $\left(2-\frac{1}{2}x\right)^6$ (2 marks)

(b) Use the first 3 terms of the expansion in part (a) above to find the approximate value of $(1.97)^6$ to 2 decimal places.(2 marks)

12. Under a transformation whose matrix is $T=\begin{pmatrix} x-2 & -2 \\ x & x \end{pmatrix}$, an objectfigure of area $2.5cm^2$ is mapped onto a figure whose area is $10cm^2$. Find the two possible values of x (3marks)

13. Make x the subject of the formula: $y=\frac{ax}{\left(x^2+b\right)^{\frac{1}{2}}}$ (3marks)

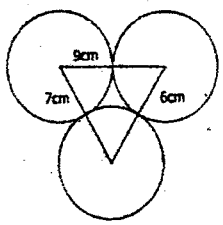
14. A curve has the equation $y = 3Cos(4x + 60^0)$. State:

(a) the amplitude. (1 mark)

(b) the Period . (1 mark)

15. P and Q are two towns on the surface of the earth. Their local times differ by $3\frac{3}{4}$ urs. If the longitude of P is 15^0E, find two possible longitudes of Q. (2 marks)

16. The figure below shows three circles touching each other externally. If the centres of the circles form a triangle with sides of length 9cm, 7cm and 6cm; calculate the radii of the circles. (3marks)



SECTION II (50 MARKS)

Answer only five questions from this section

17. The table below shows income tax rates

Monthly income (Kshs)	Tax Rate (%)
Up to 9680	10
9681 – 18800	15
18801-27920	20

27921-37040	25
37041 and above	30

Kanyari's monthly taxable income is Ksh. 24,200

a) Calculate the tax charged on Ushuru's monthly earnings. (4marks)

b) anyari is entitled to the following tax reliefs:
-personal relief of kshs 1056 per month and
-Insurance relief of 15% of the premium paid.
Calculate the tax Kanyari pays each month if he pays a monthly insurance premium of Ksh. 2,400. (2marks)

c) During a certain month, Kanyarireceived additional earnings which were taxed at 20% each shilling. Given that he paid 36.3% more tax that month, calculate the percentage increase in his earning. (4marks)

18. $A^1B^1C^1D^1$ is the image of ABCD under a shear parallel to x-axis. The point D(2,4) is mapped onto $D^1(1, 4)$ while A(-1, 1) is mapped onto A^1 (1, 1). If the co-ordinates of A,B,C and D are (-1, 1), (0, 1), (3, 4) and (2, 4) respectively:

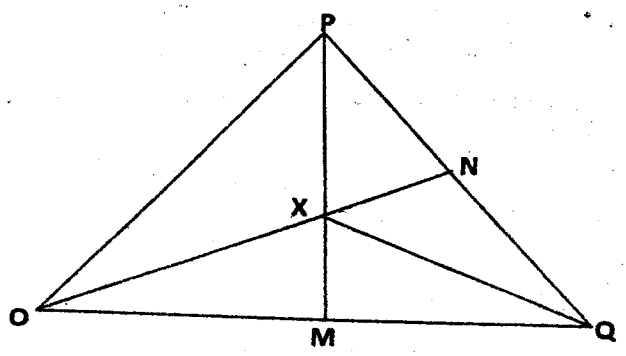
(a) Draw ABCD and $A^1B^1C^1$ and D^1 under the shear on a grid and state the co-ordinates of B^1 and C^1. (3 marks)

(b) State the invariant line. (1 mark)

(c) $A^1 B^1 C^1$ and D^1 undergoes a stretch parallel to y-axis with the stretch factor -2 and the invariant line y =3. On the same grid, draw $A^{11}B^{11}C^{11}D^{11}$ the image of $A^1 B^1 C^1 D^1$ under the stretch. (2 marks)

(d) Describe completely the transformation that maps $A^{11}B^{11}C^{11}D^{11}$ onto ABCD. (4 marks)

19. The diagram below shows a triangle **OPQ** in which **M** and **N** are points on **OQ** and **PQ** respectively such that **OM** = ⅗ **OQ** and **PN** = ¼ **PQ**. Lines**PM** and **ON** meet at **X**.



a) Given that **OP** = **p** and **OQ** = **q** express in term of **p** and **q** the vectors

(i) **PQ.**
(1mark)

(ii) **PM.**
(2marks)

(iii) **ON.**
(2marks)

b) You are further given that **OX** = k**ON** and **PX** = h**PM.**

(i) Express **OX** in terms of **p**and **q** in two different ways. (2marks)

(ii) Find the value of h and K. (2marks)

(iii) Find the ratio **PX:XM.** (1mark)

20. Construct a triangle PQT such that PQ = 10 cm QR = 9 cm and RP = 8 cm. (2marks)

i) Construct the locus of the point X such that QX = XR and mark with the letter X the point where this locus meets QR. (2marks)

ii) Construct the locus of the point Y such that PY= 6cm and mark with the letter Y, the point where the locus meets PR. (2marks)

iv) By Shading the unwanted regions show the area bounded by the three loci defined by the letter T such that QT ≥ TR , PT ≤ 6 cm and angle PRT ≥ angle QRT. Label the region required by the letter T. (4marks)

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

a. Calculate the value of x. (2marks)

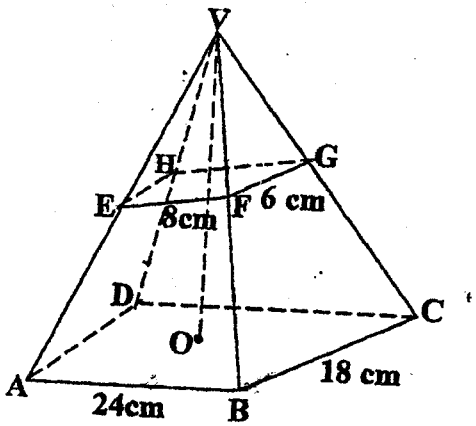
b. Find the common ratio of the series. (2marks)

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

d. Given that the 5^{th} and 7^{th} terms of the geometric progression in (a) above form the 1^{st} two consecutive terms of an arithmetic progression, calculate the sum of the 1^{st} 20 terms of the arithmetic progression. (3marks)

22. The figure below is a rectangular base pyramid with the base ABCD and vertex V.

VC=VB=VA=VD =39 cm, AB=24 cm, BC = 18 cm, EF = 8cm and FG = 6cm



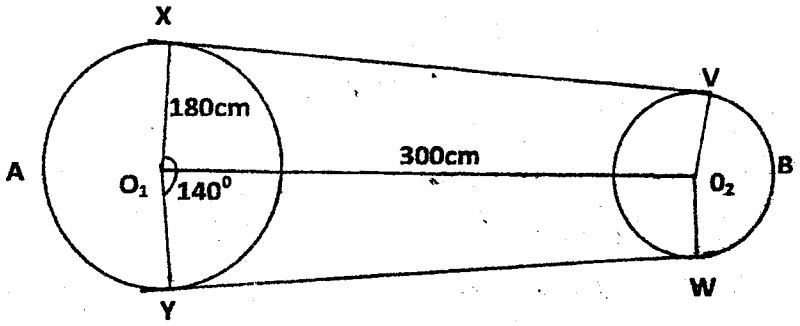
(a) Calculate the height VO of the Pyramid. (2marks)

(b) The Pyramid is cut along a plane EFGH parallel to ABCD as shown.

(i) Calculate the angle between VHE and VBC (3marks)

(ii) Calculate the angle between ABGH and ABCD (5marks)

23. The figure below shows a pulley system where a conveyor belt is tied round two wheels. The radius of the larger wheel is 180cm and the distance between the centres of the wheels is 300cm and angle XOY = 140^0.



Determine;

(a) the length ofthe tangent XV (3marks)

(b) length of the arc VBW (3marks)

(c) the length of the arc XAY (2marks)

(d) Total length of conveyor belt. (2marks)

24. Three towns are located on the earth's surface at the co-ordinates P (15^0N, 45^0E), Q (30^0S, 45^0E) and R (15^0N, 90^0E). A plane A flies from P to Q in 6 hours 40 minutes using the shortest route between the two towns. Another plane B takes off from town P at the same time as A and flies to town R along the parallel of latitude.

(a) Calculate the shortest distance between towns P and Q in km. (3marks)

(b) Find the distance in km travelled by plane B between P and R to the nearest km.

(4marks)

(c) If the two planes fly at the same speed determine to the nearest minute, which lane reaches its destination earlier and by how long. (Take $\pi = \frac{22}{7}$ and radius of earth R = 6370km)

(4marks)