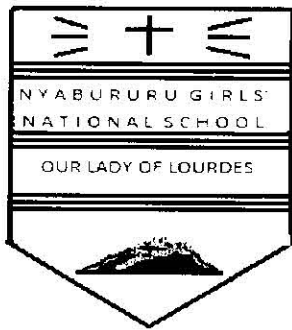


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**MATHEMATICS**

**PAPER 2**

**FEBUARY SERIES 2016**

**TIME: 2½ HOURS**

**Kenya Certificate of Secondary Education**

**February Series examination 2016**

**INSTRUCTIONS TO CANDIDATES:**

1. Write your name, and class in the spaces provided above.
2. Sign and Write the date of examination in the spaces provided above.
3. This paper consists of two Sections; Section I and Section II.
4. Answer all the questions in Section I and any **FIVE** questions from Section II.
5. All answers and working must be written on the question paper in the spaces provided below each question.
7. Non-programmable silent electronic calculators and **KNEC** Mathematical tables may be used unless stated otherwise

**FOR EXAMINER'S USE ONLY:**

**SECTION**

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**

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**SECTION I (50MKS)**

1. Use logarithm table to evaluate  $\sqrt[3]{\frac{74.53 \times 0.00782}{0.009675 \tan 50^\circ 42'}}$  (4mks)

2. Solve for x in the equation  $2\sin^2 x - 1 = \cos^2 2x + \sin 2x$  for  $0^\circ \leq x \leq 360^\circ$  (3 Marks)

3. (a) Expand  $\left(1 + \frac{3}{x}\right)$  upto the fifth term (2 Marks)

(b) Hence use your expansion to evaluate the value of  $(2.5)^5$  to 3 d.p. (2 Marks)

4. A dealer has two types of grades of tea, A and B. Grade A costs Sh. 140 per kg. Grade B costs Sh. 160 per kg. If the dealer mixes A and B in the ratio 3:5 to make a brand of tea which he sells at Sh. 180 per kg, calculate the percentage profit that he makes. (3 marks)

5. By rounding each number to the nearest tens, approximate the value of  $\frac{2454 \times 396}{66}$   
 Hence calculate the percentage error arising from this approximation to 4 significant figures. (2 Marks)

6. Write an equation of a circle that has a diameter whose end points are at (2,7) and (-6, 15) in the form  $x^2+y^2+ax+by+c=0$  where a,b and c are integers (3mks)

7. If  $4x^2 + 32x - 20 + k$  is a perfect square. Find the value of k. (2marks)

8. (a) Find the inverse of the matrix  $\begin{pmatrix} 4 & 3 \\ 3 & 5 \end{pmatrix}$  (1 Mark)

(b) Hence solve the simultaneous equation below using matrix method. (3 Marks)

$$4x + 3y = 6$$

$$5y + 3x - 5 = 0$$

9. The cash price of a fridge is ksh 30,000. Anne bought the fridge on hire purchase by paying a deposit of ksh. 7,500 and 14 monthly instalments of ksh.1875 each. Calculate the monthly rate of interest she was charged. Give your answer to 2 decimal places. (4 marks)

10. Make  $p$  the subject in  $T = \sqrt[3]{\frac{p^2 + n}{m^2}} + R$  (3mks)

11. Solve for  $y$  in the following equation below: (4mks)  
 $\log_x y + \log_y 4 = 2$

12. Calculate the standard deviation of the given data (3marks)  
 3, 7, 2, 1, 8, 9, 13, 6, 4,

13. A point C divides the line AB with coordinates A (3, 4, -5) , B (-1,10,7) externally in the ratio 5 : 3. Find the coordinates of C (3marks)

**SECTION II (50MKS)**

17. A bag contains 5 red, 4 white and 3 blue beads. Two beads are selected at random.

(a) Draw a tree diagram and list the probability space. (3 Marks)

(b) Find the probability that

(i) The last bead selected is red. (2 Marks)

(ii) The beads selected were of the same colour (2 Marks)

(iii) At least one of the selected beads is blue (3 Marks)

18. Mr. Alvin George, a civil servant gets a monthly salary of Shs. 48,000. He lives in a government house where he pays nominal rent of Shs.2500. Besides this he gets an automatic house allowance of Shs.12000 and medical allowance of shs.8000 per month. He gets a family relief of sh.1065 per month. The rates of income tax are shown below

Income tax in K£ per month	rates in shs. Per K£
1-400	10%
401-1200	15%
1201-2400	25%
2401-3600	35%
3601 and above	45%

Calculate:

(a) His taxable income per month in Kenya pounds (2mks)

(b) Net tax per month in Kshs. (6mks)

(c) Net salary (2mks)

14. Simplify the following surds leaving your answer in the form  $a + b\sqrt{c}$

$$\frac{\sqrt{5}}{2\sqrt{2} - \sqrt{5}} + \frac{\sqrt{2}}{2\sqrt{2} + \sqrt{5}}$$

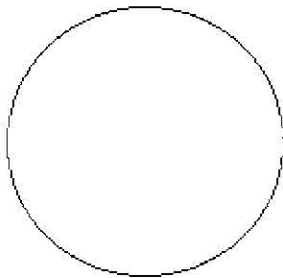
(3mks)

15. Taps A and B can fill a tank in 4 and 9 hours respectively. Both taps are turned on for 2 hours after which tap A is closed. Find how long tap B takes to fill the remaining part of the tank.

(2mks)

16. On the figure below, construct a tangent from the point P to touch the circle at Q. measure its length.

(3mks)



• P



19. The fourth, seventh and sixteenth term of an arithmetic progression are in geometric progression. The sum of the first six terms of the arithmetic progression is 12.

Determine the

(a) First term and the common difference of the arithmetic progression. (6mks)

(b) Common ratio of the geometric progression. (2mks)

(c) Sum of the first six terms of the geometric progression. (2mks)

20. Use a ruler and compass only for all construction in this question.

a) (i) Construct a triangle **ABC** in which **AB** = 8cm **BC** = 7.5 and  $\angle \text{ABC} = 112 \frac{1}{2}^\circ$

(3mks)

b) By shading the unwanted regions show the locus of P within the triangle **ABC** such that

(i)  $\text{AP} \leq \text{BP}$

(ii)  $\text{AP} \geq 3\text{cm}$  mark the required as P.

(3mks)

c) Construct a normal from **C** to meet **AB** produced at **D**.

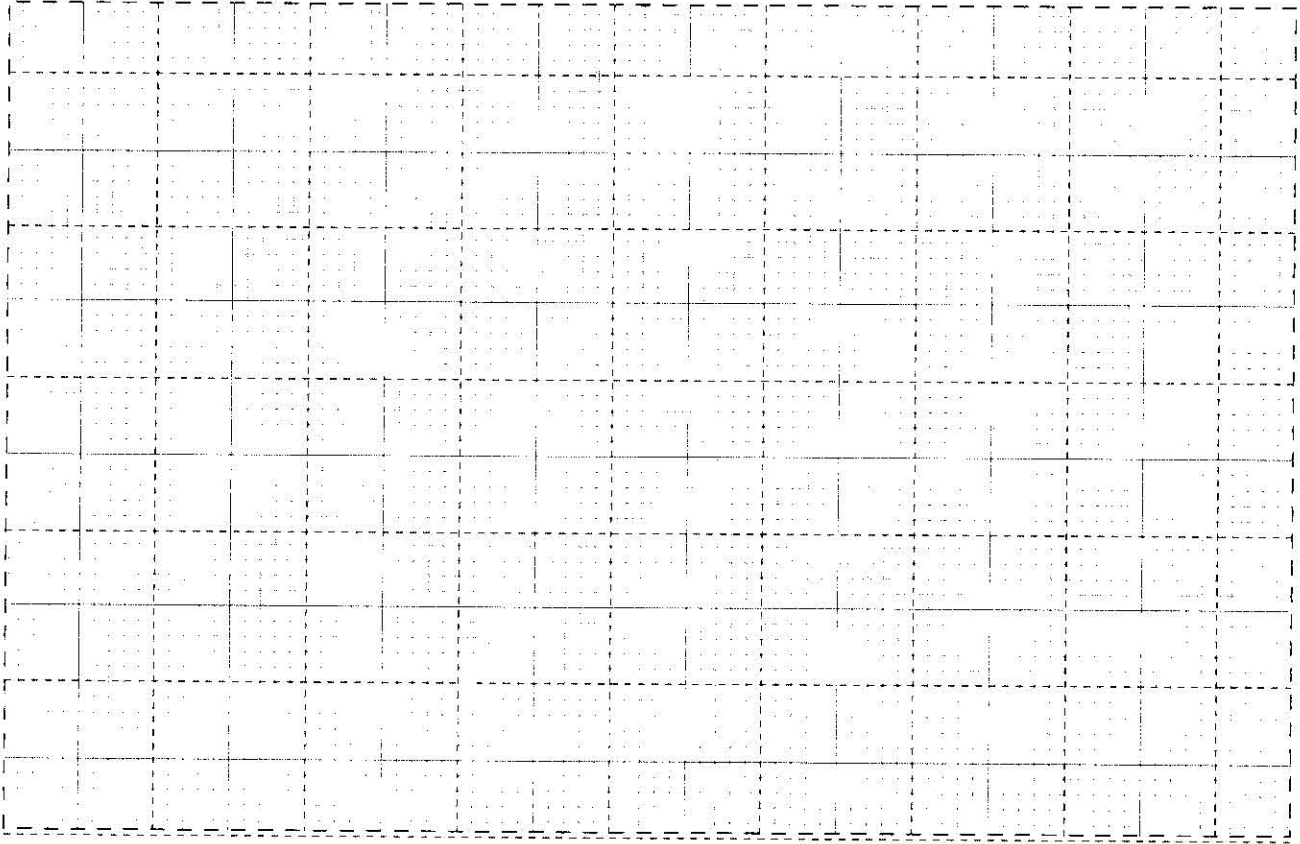
(1mk)

d) Locate the locus of R in the same diagram such that the area of triangle **ARB** is  $\frac{3}{4}$  the area triangle **ABC**.

(2mks)

21. The points A(1,3), B(4,4), C(3,0) are vertices of a triangle.  $A^1B^1C^1$  are the images of ABC under a transformation  $M_1$  a reflection in the line  $y=-x$

- (a) Draw a diagram to show triangles ABC and its image  $A^1B^1C^1$  and the mirror line of this transformation. Write down the co-ordinates of  $A^1B^1$  and  $C^1$  matrix  $M_1$ . (5marks)



- (b)  $A^{11}B^{11}C^{11}$  are images of  $A^1B^1C^1$  under transformation by matrix  $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

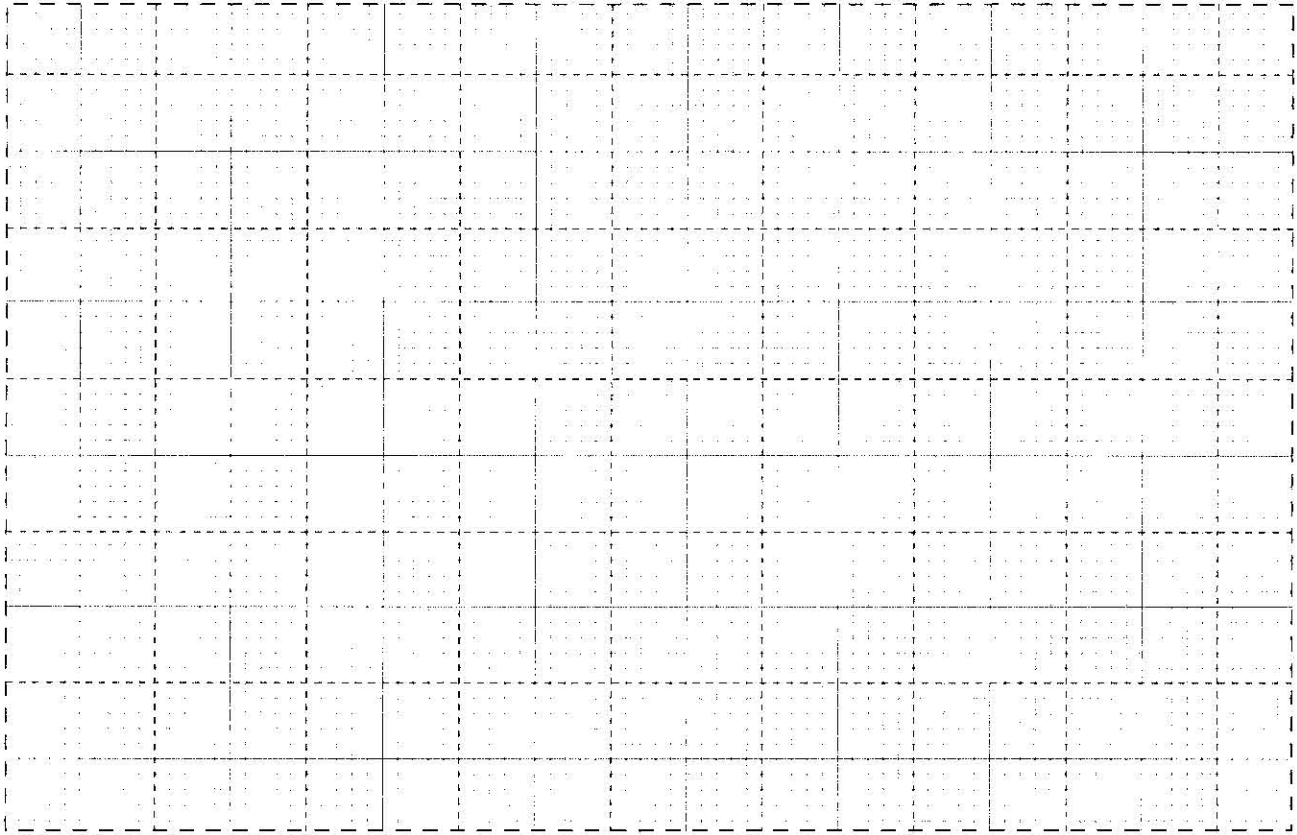
Find the co-ordinates of  $A^{11} B^{11} C^{11}$  and draw it on the same axes (3marks)

- (c) If R is the transformation which maps ABC to  $A^{11} B^{11}C^{11}$  determine the matrix R. (2mks)

22. (a) Complete the table below giving your values correct to 2 decimal places. (2mks)

x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
3cos x	3.00		1.50	0.00		-2.60			-1.50		1.50	2.60	
4sin ½ x		1.04			3.46		4		3.46		2.83		0

(b) Taking 1cm to represent 30° on the horizontal axis and 1cm to represent 1 unit on the vertical axis, draw to the graph of  $y=3\cos x^\circ$  and  $y=4\sin \frac{1}{2} x$  on the same axis on the grid provided. (5mks).



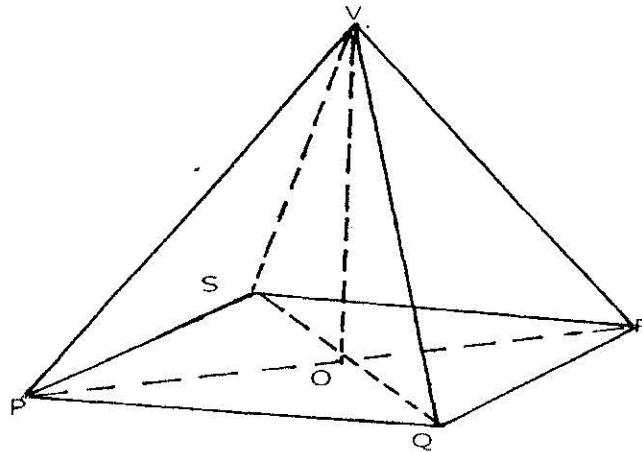
(c) Use the graph to find the values of x for which  $3\cos x - 4\sin \frac{1}{2} x = 0$ . (1mk)

(d) State

(i) The amplitude of the graph  $y=3 \cos x$  (1mk)

(ii) The period of the graph  $y=4 \sin \frac{1}{2} x$  (1mk)

23. The diagram below shows a right pyramid with a horizontal rectangular base and vertex V. The area of the base is  $60\text{cm}^2$  and the volume of the pyramid is  $280\text{cm}^3$ .



(a) Calculate the height of the pyramid. (2mks)

(b) Given that the ratio of the sides  $PQ : QR$  is  $3:5$ , find the length of  
 (i)  $PQ$  (2mks)

(ii)  $QR$  (1mk)

(c) Calculate the angle between the line  $VR$  and plane  $PQRS$ . (3mks)

(d) Calculate the angle between the planes  $VRQ$  and  $PQRS$ . (2 mks)

24. A variable P varies directly as the square of Q and inversely as the square root of R where  $P=8, Q=6$  and  $R=81$ .

(a) Find P in terms of Q and R. (3mks)

(b) Find P when  $Q = 24$  and  $R = 16$ . (2mks)

(c) If Q is increased by 30% and R decreased by 36%, find the percentage change in P. (5mks)

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