

Name.....

Index No...../.....

School.....

Candidates Signature.....

Date

121/2
MATHEMATICS
Paper 2
July/August 2009
2 ½ Hours

BORABU INTER - SECONDARY SCHOOL
JOINT EVALUATION TEST - 2009
Kenya Certificate of Secondary Education (K.C.S.E)

121/2
MATHEMATICS
Paper 2
July/August 2009
2 ½ Hours

Instructions to candidates

1. Write your name and index number in the spaces provided above.
2. The paper contains two sections: **Section I** and **Section II**.
3. Answer **All** the questions in **section I** and **strictly any five** questions **from Section II**.
4. All answers and working must be written on the question paper in the spaces provided below each question.
5. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
6. Marks may be given for correct working even if the answer is wrong.
7. Non-programmable silent electronic calculators and KNEC mathematical tables may be used, except unless stated otherwise.

For official 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

*This paper consists of 16 printed pages.
Candidates should check the question paper to ensure that all the pages
are printed as indicated and no questions are missing*

SECTION I (50 MARKS)

Answer all questions in this section.

1. Use logarithms tables only to evaluate

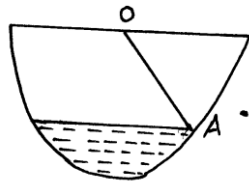
$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}} \quad (3\text{mks})$$

2. A plane figure of area 50cm^2 is transformed by the matrix $\begin{pmatrix} 1 & 3 \\ 2 & -7 \end{pmatrix}$ and then followed by the matrix $\begin{pmatrix} 3 & -1 \\ 0 & 4 \end{pmatrix}$. Find the area of the final image. (2mks)

3. If $\frac{5}{\sqrt{7}+3} - \frac{10}{\sqrt{7}-3} = \frac{a\sqrt{7}}{b} + \frac{c}{b}$, find the values of a, b and c. (3mks)

4. Find the turning points of the curve $y = 5 + 24x - 9x^2 - 2x^3$ and investigate whether maxima or minima. (4mks)

5. The figure below shows a vertical section of a hemispherical pot centre O. the radius OA of the pot is 20cm. If the pot contains water to a depth of 8cm, calculate the diameter of the water surface. (3mks)



6. A teacher intends to buy a computer which costs Ksh 48,000. He borrows the money from a bank. The loan has to be repaid at the end of 3rd year. The bank charges an interest at the rate of 18% p.a. compounded half – yearly. Calculate the total amount payable to the bank at the end of the period. (3mks)

7. Make x the subject of the formula

$$W = Y - (R + X^2)^{\frac{1}{2}}. \quad (3\text{mks})$$

8. Find the value of K if the expression $4x^2 - 12x + 2k + 8$ is a perfect square. (3mks)

9. Find the inverse of the matrix $\begin{pmatrix} 1 & -2 \\ 2 & 3 \end{pmatrix}$ hence solve the following simultaneous equations:

$$\begin{aligned} x - 2y &= 6 \\ 2x + 3y &= 5 \end{aligned} \quad (3\text{mks})$$

10. Y varies partly as X and partly inversely as X. when $X = 4$, $Y = 17$ and when $X = 6$, $Y = 13$. Find Y when $X = 10$. (4mks)
11. Two solid spherical balls with centers P and Q touch each other externally. The balls lie inside and in contact with a hemispherical bowl of centre R. Given that $PQ = 13\text{cm}$, $QR = 16\text{cm}$ and $PR = 19\text{cm}$, calculate the radii of the bowl and of the two spherical balls (4mks)
12. The sides of a triangle were measured and recorded as 8cm; 10cm and 15cm. Calculate the % error in the perimeter correct to 2 decimal places. (3mks)

13. Solve the equation $\log_{10}(6x + 2) - 1 = \log_{10}(x - 3)$ (3mks)

14. (a) Write down and simplify the first four terms of the expression $\left(2 + \frac{1}{4}x\right)^{10}$ in ascending Powers of x. (1mk)

(b) Hence find the value of $(2.025)^{10}$ correct to the nearest whole number. (2mks)

15. The second, fourth and eighth term of an A.P are in geometrical progression, and the sum of the third and fifth term is 20. find the first term and the common difference. (3mks)

16. If $\underline{a} = 3i + j + 2k$ and $\underline{b} = -2i + 2j + k$, find the value of the modulus of $2\underline{a} + \underline{b}$ (3mks)

SECTION II (50 MARKS)

Answer only five questions in this section.

17. The table below shows taxation rates for income earned in a certain year.

Monthly taxable income in Ksh.	Tax rate Ksh per £
1 - 10164	2
10165 - 19760	3
19761 - 29316	4
29317 - 38892	5
Over 38892	6

Before getting a tax relief of sh 1162 per month, Mwangi's total gross monthly tax was Kshs. 7803

- (a) What was his annual net tax that year (2mks)

- (b) Calculate his annual taxable income in K£ (6mks)

- (c) If the ratio of Mwangi's basic salary to the allowances is 7:3, calculate his basic monthly salary in Ksh (2mks)

18. The table below shows marks scored by a hundred students in a physics test.

Marks	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Number of students	4	6	10	14	x	24	14	6

(a) Determine the value of x (1mk)

(b) Calculate:

(i) The mean mark using appropriate working mean (3mks)

(ii) Standard deviation (3mks)

(iii) The median mark (3mks)

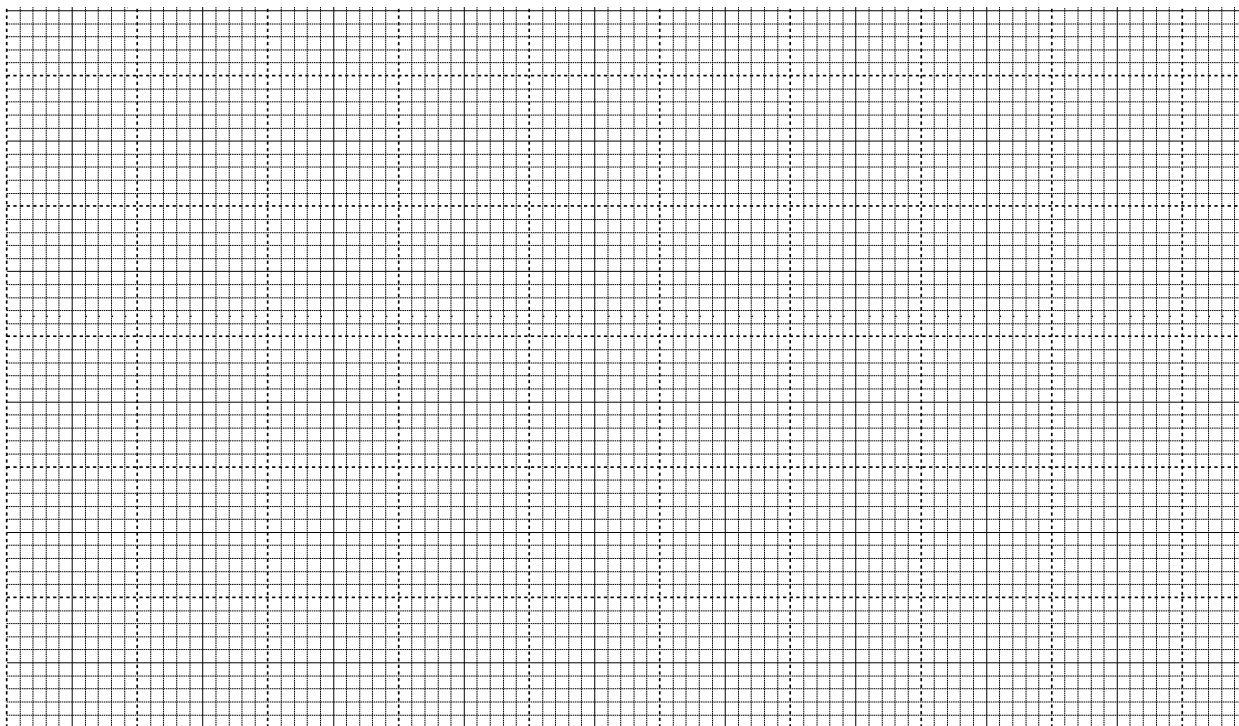
19. A firm produces gas cylinders and sewing machines. It has undertaken to supply once a week at least 100 gas cylinders and 150 sewing machines to one of its depots. The depot has found that it cannot store more than 600 gas cylinders and sewing machines combined. A gas cylinder weighs 20kg and a sewing machine weighs 5kg and the depot cannot store a total weight of more than 6000kg. The depot sends out to shops all the gas cylinders and sewing machines with which it is supplied each week before the next delivery.

If the company sends x gas cylinder and y sewing machines per week

(a) Find:

(i) The inequalities satisfied by x and y (4mks)

(ii) On the grid provided, find the region satisfied by the inequalities. (4mks)



b) If the profit is Sh 900 on a gas cylinder and Sh 300 on a sewing machine, how many of each should be sent to the depot to give the maximum profit. (2mks)

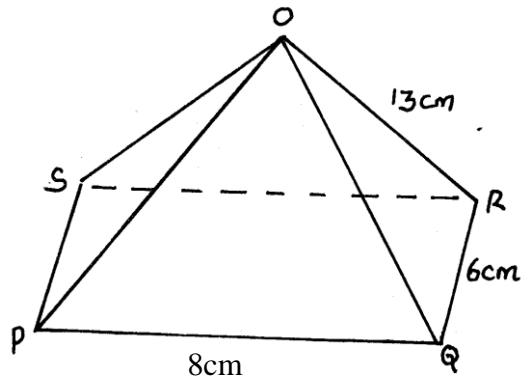
20. In this question, use ruler and a pair of compasses only.

- (a) Construct the triangle PQR such that $PQ = 10\text{cm}$, $QR = 9\text{cm}$ and $RP = 8\text{cm}$. (2mks)
- (b) Construct the locus of point x such that $QX = XR$. Mark with the letter X the point where this locus meets QR. (2mks)
- (c) Construct the locus of point M such that $\angle QRM = \angle MRP$. Mark with the letter X the point where this locus meets PQ .Measure QM. (3mks)
- (d) Construct the locus of point Y such that $PY = 6\text{cm}$. Mark with the letter Y the point where the locus meets PR. (2mks)
- (e) Shade and label T the region in which point T lies given that

$$QT \geq TR,$$

$$\angle PRT \geq \angle QRT \text{ and } PT \leq 6\text{cm}. \quad (1\text{mk})$$

21. OPQRS is a right pyramid on a rectangular base $PQ = 8\text{cm}$, $QR = 6\text{cm}$ $OP = OQ = OR = OS = 13\text{cm}$



Calculate

- (a) The height of the pyramid (2mks)
- (b) The inclination to the horizontal of
- (i) The face OQR (2mks)
- (ii) The edge OQ (2mks)
- (c) Find the angle between
- (i) The edge OQ and SR (2mks)
- (ii) The planes OQR and OPS (2mks)

22. A triangular plot ABC is such that $AB = 36\text{m}$, $BC = 40\text{cm}$ and $AC = 42\text{m}$

(a) Calculate the

(i) Area of the plot in square metres (2mks)

(ii) Acute angle between the edges AB and BC (2mks)

(b) A circular fence passes through vertices A, B and C. A water tap is to be installed inside the plot such that the tap is equidistant from each of the vertices A, B and C. Calculate

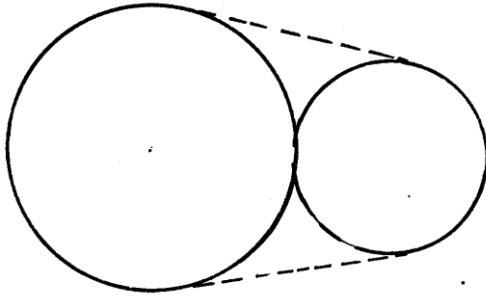
(i) The distance of the tap from vertex A (3mks)

(ii) The area between the circular fence and the triangular plot (3mks)

23. A plane leaves an airport A (38.5°N , 37.05°W) and flies due North to a point B on latitude 52°N
- (a) Find the distance covered by the plane (5mks)

- (b) The plane then flies due East to a point C, 2400km from B. Determine the position of C
- Take the value of π as $\frac{22}{7}$ and radius of the earth as 6370km (5mks)

24. Nyandiri wants to transport two drums of diameters 1.6m and 1.4m. using a pick up truck. To avoid rolling, he ties them together using a strap as shown below.



Given that he needs 48cm of strap for knotting, what is the total length of strap he uses (10mks)

