

Name:.....

Index No:

School:.....

Candidate's Sign:.....

Date:

121/2
MATHEMATICS
PAPER 2
JULY / AUGUST 2011
TIME: 2 ½ HOURS

SOTIK DISTRICT JOINT EVALUATION TEST

Kenya Certificate of Secondary Education (K.C.S.E)

**Mathematics
Paper 2**

INSTRUCTIONS TO CANDIDATES:

- Write your **name** and **index number** in the spaces provided above.
- **Sign** and **write** the date in the space provided above.
- This paper contains **two** sections: **Section I** and **Section II**.
- Answer **all** the questions in **Section I** and any **five** questions from **Section II**.
- All working and answers **must** be written on the question paper in the spaces provided below each question.
- Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
- Marks may be given for correct working even if the answer is wrong.
- Non-programmable silent electronic calculators and KNEC mathematical tables may be used

For Examiners' Use Only.

Section I

Questions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Marks																	

Section II

Questions	17	18	19	20	21	22	23	24	Total
Marks									

**GRAND
TOTAL**

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

SECTION I (50 MARKS)

Answer all the questions in this section in the spaces provided.

1. Use logarithms in all steps to evaluate:

$$\frac{2.53^2 \times 83.45}{\sqrt{0.4562}}$$

(4mks)

2. Evaluate:

$$\frac{\frac{1}{2} \text{ of } 3\frac{1}{2} + 1\frac{1}{2}(2\frac{1}{2} - \frac{2}{3})}{\frac{3}{4} \text{ of } 2\frac{1}{2} \div \frac{1}{2}}$$

(3mks)

3. The table below is part of tax table for monthly income for the year 2010.

Monthly taxable income in Ksh.	Tax rate % in each sh.
Under Ksh. 9681	10%
From Ksh. 9681 but under 18801	15%
From Ksh. 18801 but under Kshs.27921	20%

In the year 2010, the tax on Koech's monthly income was Ksh.1916. Calculate Koech's monthly income.

(3mks)

4. (a) Expand and simplify the expression
 $(10+2/x)^5$

(1mk)

- (b) Use the expression in (a) above to find the value of 14^5 .

(2mks)

5. Make C the subject of the formula.

$$T = x\sqrt{c^2 + d^2}$$

(3mks)

6. A variable **P** varies as the square of **Q** and inversely as square root of **R**. Find the percentage change in **P** when **Q** is increased by 5% and **R** reduced by 19%. (3mks)

7. The distance between Sotik and Nakuru is 130km. car x starts from Sotik at 8.00 a.m and travels at 40km/hr towards Nakuru. A second car y starts traveling from Nakuru at 8.15 a.m towards Sotik at an average speed of 35km/hr. At what time will the two cars meet? (3mks)

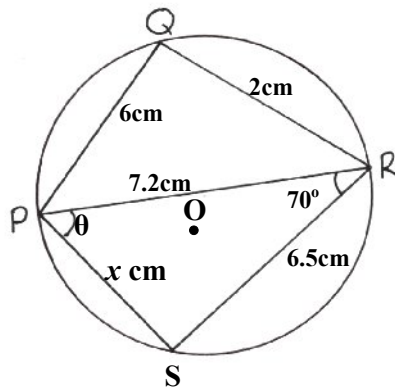
8. Use matrix method to solve simultaneous equations.

$$3x + 7y = 11$$

$$x - y + 4 = 0$$

(3mks)

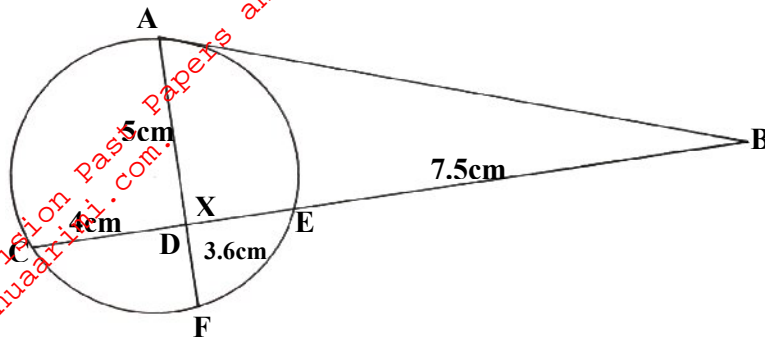
9. PQRS is a cyclic quadrilateral in which PQ=6cm, QR=2cm, RS=6.5cm, PR=7.2cm and angle PRS=70°.



Determine values of x.

(3mks)

10. In the figure below, AB is a tangent, meeting chord CDE at B. $DE = x$ cm.



Determine:

- (a) the value of x

(1mk)

- (b) the length of AB

(2mks)

11. Without using mathematical tables and calculators simplify:

$$\frac{2}{3-\sqrt{7}} - \frac{2}{3+\sqrt{7}}$$

(3mks)

12. Find the values of θ in $2 \sin 3\theta = -1.0893$ for $0^\circ \leq \theta \leq 180^\circ$

(3mks)

13. Find the equation of the tangent to the circle $x^2+y^2-8x+2y+7=0$ at the point (3, 2). Give your answer in the form $y=ax+b$. (3mks)

14. Aman accumulated sh.71,105 after investing sh.50,000 at a rate of 18% p.a. Compounded quarterly. Find the time taken in years to accumulate this amount. (3mks)

15. The masses of 100 objects measured to the nearest kg are given in the following table. Draw a histogram to illustrate the data. (3mks)

Mass (kg)	1 - 5	6 - 10	11 - 20	21 - 25	26 - 40
No. f objects	7	16	38	33	6

16. Draw an equilateral triangle of side 80m to represent Mr. Laal's farm. Laal wants to plant some flowers in the field. The flowers must be at most 60m from A and nearer to B than to C. If no flower is to be more than 40m from BC, show by shading the exact region where the flowers may be planted. (4mks)

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SECTION B (50 MARKS)

Answer any five questions in this section in the spaces provided.

17. The n^{th} term of a series is given by $3n+4$.

(a) Write down the first four terms of the series.

(2mks)

(b) Find the sum of the first twenty terms of the series.

(3mks)

(c) Find the 30th term.

(2mks)

(d) Show that the sum of the first n terms of the sequence is given by $S_n=3/2n^2+11/2n$. Hence or otherwise, find the largest integral value of n such that $S_n \geq 130$.

(3mks)

18. In a square PQRS, A is the mid-point of \overrightarrow{PQ} and B is the mid-point of \overrightarrow{QR} , while C is a point on \overrightarrow{BP} such that $2\overrightarrow{BC} = 3\overrightarrow{CP}$. The co-ordinates of P, Q and S are (4,4), (14,4) and (4,14) respectively. Find:

(a) (i) the column vectors of \overrightarrow{PQ} and \overrightarrow{PS} . (4mks)

(ii) co-ordinates of R (2mks)

(b) Show that A, C, S are collinear. (4mks)

19. The points X and Y are both on latitude 39°N . The longitude of X is 73°W and the longitude of Y is 18°W . Two ships P and Q leave X at the same time and travel to Y along the line of latitude. The ships P and Q travel at constant speeds of 25km/hr and 20km/h respectively. Taking the radius of the earth to be 6371km and $\pi = \frac{22}{7}$; Calculate:-

(a) The distance Q still has to travel when P reaches Y. (5mks)

(b) At the same time a third ship R leaves Y traveling due west at an average speed of 15km/hr . Calculate the longitude of the point at which R meets P. (5mks)

20. A supermarket is stocked with plates which come from two suppliers A and B. They are bought in the ratio of 3:5 respectively, 10% of plates from A are defective and 6% of the plates from B are defective.

(a) A plate is chosen by a buyer at random. Find the probability that;

(i) it is from A (2mks)

(ii) it is from B and it is defective. (2mks)

(iii) it is defective (2mks)

(b) Two plates are chosen at random. Find the probability that:

(i) both are defective (2mks)

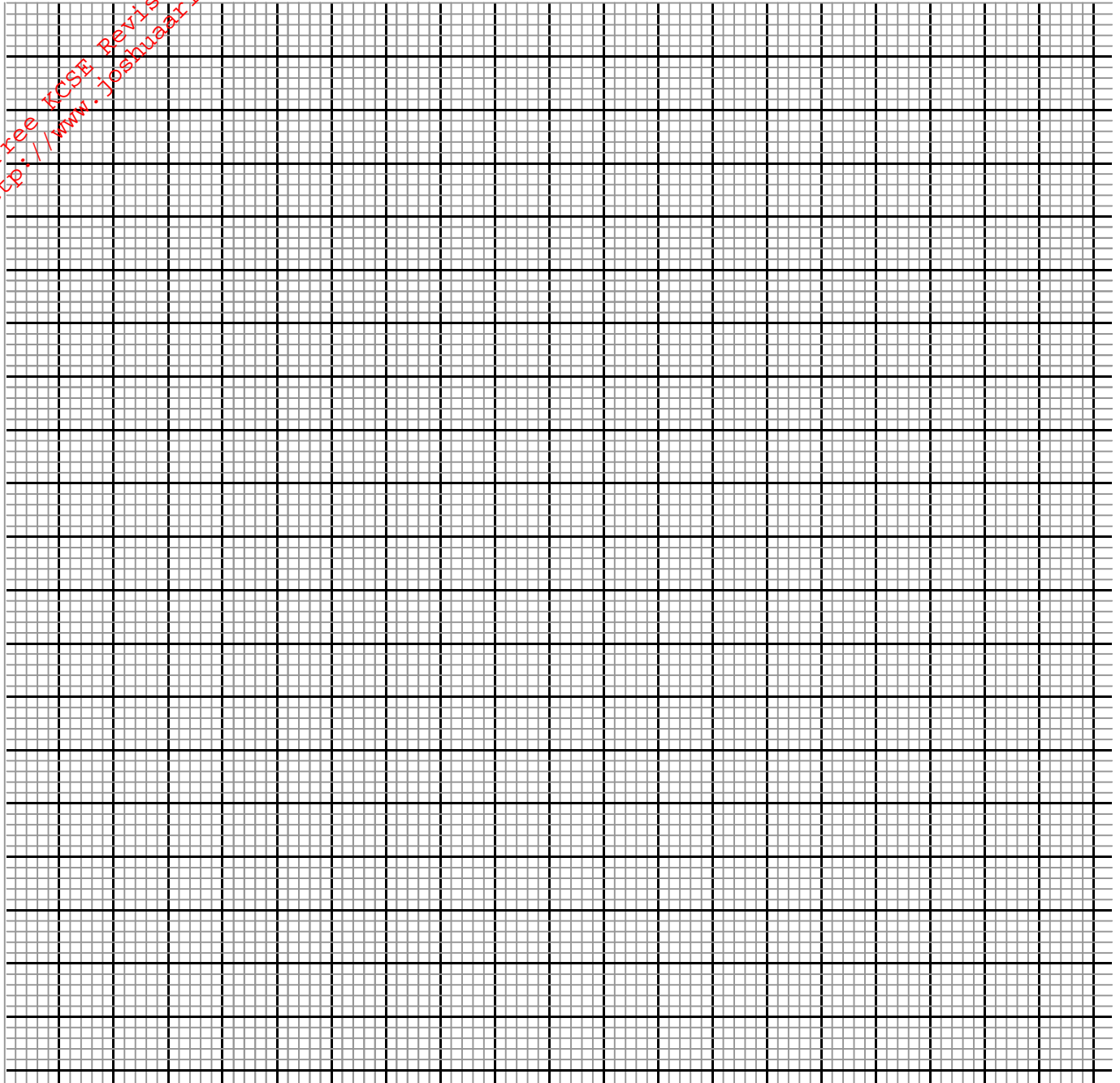
(ii) at least one is not defective. (2mks)

21. (a) Copy and complete the table below for the function $y=4+5x-x^2$ for $-2 \leq x \leq 7$.

x	-2	-1	0	1	2	3	4	5	6	7
y										

(2mks)

(b) Draw the graph of the function $y = 4 + 5x - x^2$ for $-2 \leq x \leq 7$, in the grid provided. (3mks)



(c) Use your graph to solve

(i) $x^2 = + 3x - 4$

(2mks)

(ii) $x^2 - 4 = 5x$

(1mk)

(d) Write down the equation of the line of symmetry.

(1mk)

(e) State the co-ordinates of the maxima point of the graph $y = 4 + 5x - x^2$.

(1mk)

22. A company wishes to buy two types of squash packing machines; electric and manual. A manual machine requires 4 attendants whereas an electric one requires 2. An electric machine fills 300 packets per hour; a manual one can fill 200 packets per hour. At least 3,000 packets need to be filled per hour and the number of attendants should not exceed 40.
- (a) Write down inequalities to describe these conditions and graph them. (6mks)

(b) If for every hour it is used, an electric machine brings a profit of sh.200 and a manual one sh.500, determine the number of machines of each type that should be installed in order to maximize profit per hour. (3mks)

(c) Find the maximum profit. (1mk)

23. Matrix P is given by $\begin{pmatrix} 4 & 7 \\ 5 & 8 \end{pmatrix}$ (2mks)
a) Find P^{-1}

b) Two institutions, Masomo High School and Tumaini High School, purchased beans at sh. b per bag and maize at sh. m per bag. Masomo purchased 8 bags of beans and 14 bags of maize for sh. 47,600. Tumaini purchased 10 bags of beans and 16 bags of maize for sh. 57,400.

i) Form matrix equation to represent the information above (1mk)

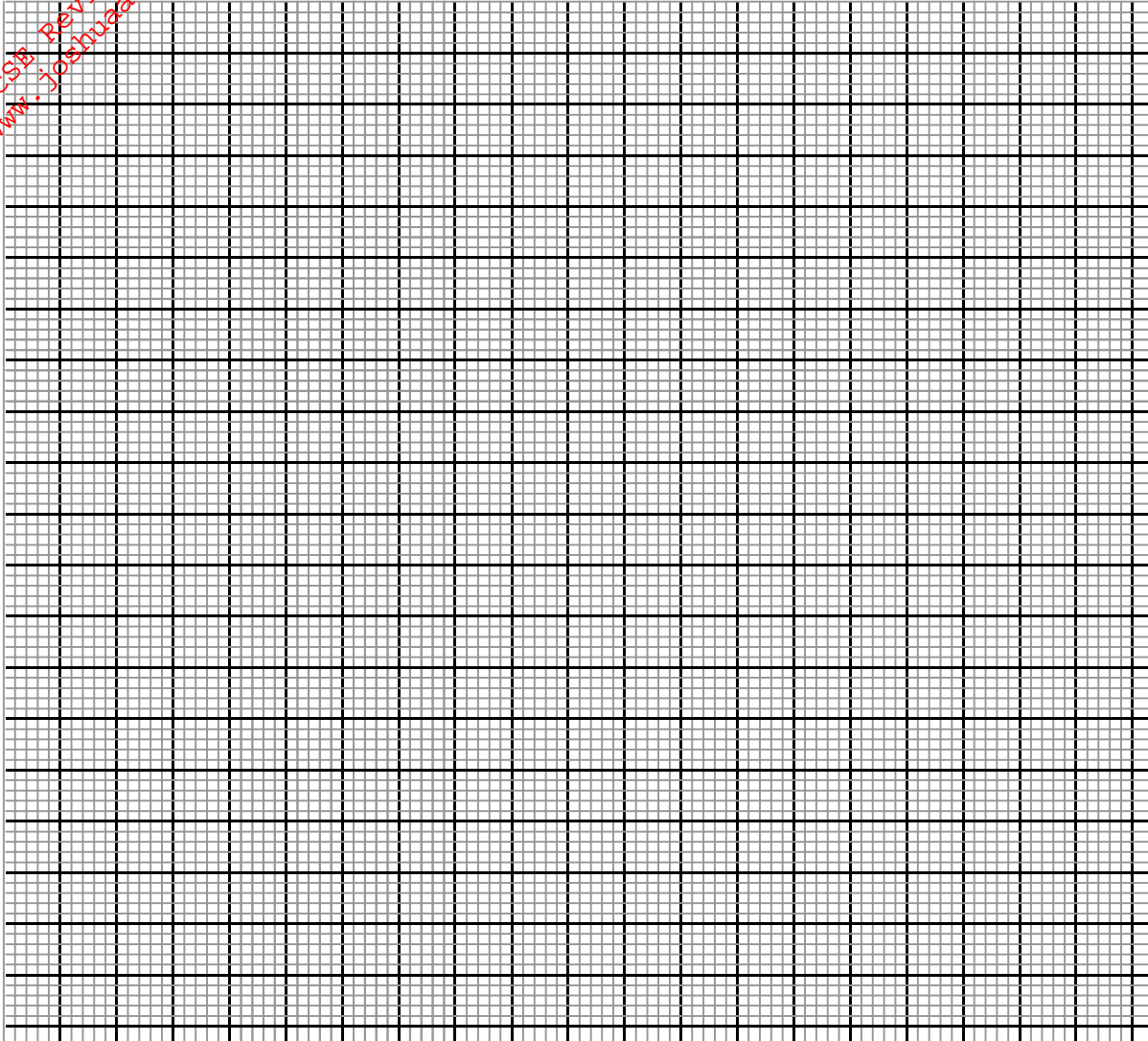
ii) Use the matrix P^{-1} to find the prices of one bag of each item. (4mks)

c) The price of beans later went up by 5% and that of maize remained constant. Masomo bought the same quantity of beans but spent the same total amount of money as before on the two items. State the new ratio of beans of maize. (3mks)

24. In a certain mathematical relationship, the values of A and B are found to obey the relationship $B=CA+KA^2$ where C and K are constants.
Below is a table of values of A and B.

A	1	2	3	4	5	6
B	3.2	6.75	10.8	15.1	20	25.2

- (a) By drawing a suitable straight line graph, determine the values of C and K. (8mks)



- (b) Hence write the relationship between A and B. (1mk)

- (c) Determine the value of B when A=7 (1mk)