

NAME:..... INDEX.....

SCHOOL:.....

121 / 2
MATHEMATICS
PAPER 2
JULY / AUGUST 2007
2 1/2 HOURS

BUNGOMA DISTRICT MOCK EXAMINATION Kenya Certificate Of Secondary Education 2007

121 / 2
MATHEMATICS
PAPER 2
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INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the spaces provided at the top of this page.
2. This paper consists of two sections: **Section I and Section II.**
3. Answer **all** questions in **section I** and **any five** questions from **Section II.**
4. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
5. Marks may be given for correct working even if the answer is wrong.
6. 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

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This paper consists of 16 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 the questions in this section.**

1. Given the conditions that $\log a = -1.3748$ and $\log b = -1.5934$, **evaluate** $\log \sqrt{\frac{a}{b}}$. (3marks)

2. **Find** the value of X in which $\det \begin{pmatrix} 1 & 3 \\ -2 & x \end{pmatrix} = \det \begin{pmatrix} x^2 & 4 \\ 1 & 3 \end{pmatrix}$ (3 marks)

3. **Make** x the subject of the formula. $P = \frac{x^{1/2}y}{x^{1/2} - y}$ (3marks)

4. Use reciprocal, square and cube root tables to **evaluate** to 4 significant figures, the expression.

$$\sqrt[3]{\frac{9}{0.03746} + 0.6042^2}$$

(3marks)

5. **Solve** for x in the equation. $3\cos^2 x + \sin x + 1 = 0$ $0 \leq x \leq 360^\circ$ (4 marks)

6. A coffee blender mixes 6 parts of type A with 4 parts of type B. If type A costs sh 72 and type B costs him sh 66 per Kg respectively, at what price should he sell the mixture in order to make 5% profit? Give your answer to the nearest ten cents. (3 marks)

7. Using a ruler and pair of compasses only. **Construct** an equilateral triangle ABC of sides 4cm construct the locus of a point P such that P is always on the same side of BC as A and $\angle BPC=30^\circ$. Shade the region where Q can be found if Q is outside the triangle and angle BQC $> 30^\circ$. (4marks)

8. A right circular cylinder is to be made so that the sum of its radius and its height is 6cm. **Find** the maximum possible volume of the cylinder. (3marks)

9. **Expand** $\left(3x - \frac{1}{3}y\right)^4$ By giving suitable values of x and y in your expansion. **Obtain** the value of $(29.5)^4$ correct 4 d.p (step by step) (4 marks)

10. A point P(2,-3) undergoes transformation represented by the matrix $\begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$. **Find** the co-ordinate of the image of P. (2marks)

11. Water flows at 3m/s through a pipe of radius 3.5cm. **How long** does it take to fill a rectangular tank 9m long, 7m wide and 3m deep? (3marks)

12. A quantity R varies partly as x and partly inversely as y. **Find** the equation connecting R, x and y, when x =1, y =2 and R = 4, When x = 3, y =2 and R=10. (3 marks)

13. **Calculate** the interest on sh 10,000 invested for $1\frac{1}{2}$ years at 12 % p.a. Compounded semi-annually. (3 marks)

14. The radius of a circle is measured to the nearest meters as 7m. **Calculate** the percentage error in the circumference. Leave your answer as a mixed number and take $\pi = \frac{22}{7}$. (3 marks)

15. The first, the fifth and seventh terms of an increasing arithmetic progression are three consecutive terms of a geometrical progression. If the first term of the arithmetic progression is

6. Find

(i) The common difference of the arithmetic progression.

(ii) The common ratio of the geometric progression.

(3 marks)

16. **How long** will it take a car 4 meters long moving at 75 km/h to completely overtake a heavy commercial truck 11m long moving in the opposite direction at 45 km/h if the car is 5m in front of the truck?

(3 marks)

SECTION II (50 Marks)**Answer any five questions from this section.**

17. The intensity I of a lamp was measured for various values of voltage V across it and the result tabulated as shown below.

V(volts)	11.2	14.1	15.8	17.8	20.0	22.4
I (lux)	81.8	301.2	362.3	507.9	691.2	922.0
Log V						
Log (I+200)						

It is believed that V and I conform to the Law in the form $I = KV^n - 200$, where K and n are constants

Draw suitable linear graph and determine the values of K and n hence determine I in terms of V .

(10marks)

18. The following table shows the marks scored in mathematic test by 40 students in Nasalayi secondary school.

Marks	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40
No. of students	3	5	6	8	7	5	4	2

From the table above

(a) Calculate the mean and Median

(5mks)

(b) Draw the cumulative frequency curve

(3mks)

Use the graph to estimate the

(i) Interquartile range

(1mk)

(ii) Probability that a student picked at random scored between 8 and 29 marks. (1mk)

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19. (a) Complete the table below by filling in the blank spaces for the functions. $y=2 \sin (x+30)$ and $y=2 \cos \frac{1}{2} x$ for $0^{\circ} \leq x \leq 210^{\circ}$

x	0	30	60	90	120	150	180	210
$y = 2 \sin (x + 30)$	0.00		2.00		1.00		-1.00	
$y = 2 \cos \frac{1}{2} x$	2.00		1.73				0.00	

- (b) By using completed table in (a) above **draw** the graphs of $y = 2 \sin (x + 30)$ and $y = 2 \cos \frac{1}{2} x$.

Take 2 cm to rep 1 unit on y axis and 2 cm rep 15° on the x- axis.

- (c) Use your graph to **solve**

(i) $2 \sin (x + 30) \geq 2 \cos \frac{1}{2} x$ for $0 \leq x \leq 210^{\circ}$. (1 mark)

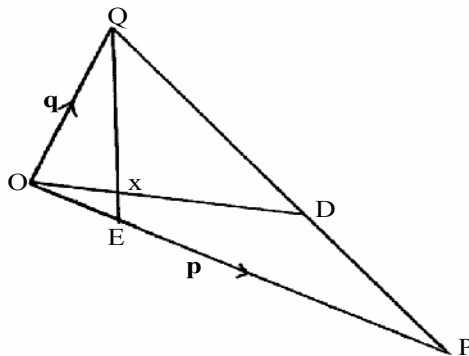
(ii) $2 \sin \frac{1}{2} x = 0.5$ (1 mark)

- (d) State the amplitude and period. (1 mark)

(i) $2 \sin (x + 30)$

(ii) $2 \cos \frac{1}{2} x$ (1 mark)

20. The figure below shows triangle OPQ in which $OP = \mathbf{p}$ and $OQ = \mathbf{q}$. Points D and E are such that $3 PD = PQ$ and $OE = \frac{1}{3} OP$.



- (a) Express in terms of \mathbf{p} and \mathbf{q} vectors

(i) \mathbf{OD}

(1mark)

(ii) \mathbf{QE}

(1mark)

- (b) If $OX = k OD$ and $QX = h QE$ where k and h are constants, express OX in terms of the following in simplified form.

(i) k, \mathbf{p} and \mathbf{q}

(1 mark)

(ii) h, \mathbf{p} and \mathbf{q}

(2 marks)

- (c) Find the value of h and k .

(3 marks)

- (d) If $\mathbf{r} = 3\mathbf{i} - \mathbf{j} + \mathbf{k}$ and $\mathbf{t} = \mathbf{j} + 2\mathbf{k}$. $\mathbf{P} = \mathbf{r} + \mathbf{t}$ find $|\mathbf{P}|$ to 4 s.f.

(2marks)

21. P and Q are two points on latitude 60°S . Their longitudes are 30°E and 90°W respectively.

Find:

(a) The distance between P and Q along the parallel of latitude (Take radius of earth = 6370

km and $\pi = \frac{22}{7}$) [to 1 decimal place.] (2 marks)

(b) The shortest distance along the earth's surface between P and Q [to 1 decimal place]

(3 marks)

(c) A weather forecaster reports that the center of a cyclone at $(30^{\circ}\text{S}, 120^{\circ}\text{W})$ is moving due south at 24 knots. **How long** will it take to reach a point $(45^{\circ}\text{S}, 120^{\circ}\text{W})$? (3marks)

(d) If it is 1400 hrs at Q, **What** will be the time at P?

(2marks)

22. A company makes brands A and B of breakfast cereal both of which are enriched with vitamins P and Q. The necessary information about these cereals is given by the table below.

	Cereal		Minimum Daily Requirement
	A	B	
Vitamin P(units/gram)	1	2	100
Vitamin Q(unit/gram)	5	3	300
Cost/gram	Sh 20	Sh 30	

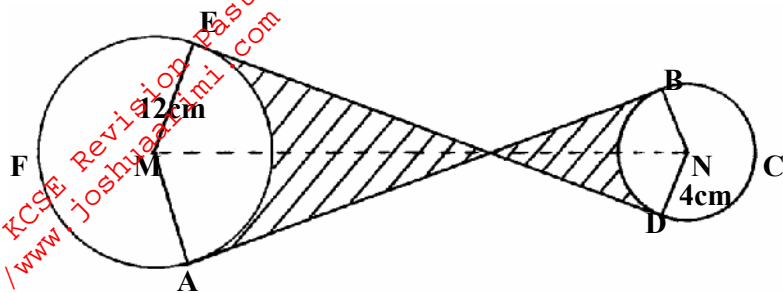
- (a) **Form** all inequality to represent this information. (3 marks)

- (b) **Draw** the inequalities on the graphs showing the region which satisfy the inequalities. (3 marks)

- (c) From your graph **determine** the minimum daily requirements of vitamins P and Q at the lowest cost (2 marks)

- (d) **Determine** the lowest cost. (2 marks)

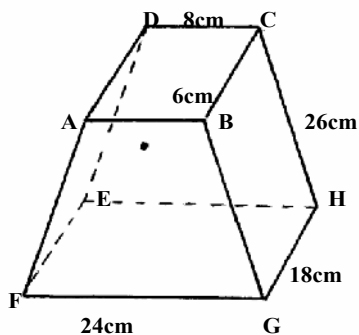
23. The figure below shows a pulley with wheels center M and N, with a rubber belt ABCDEFA stretched round the wheels. The diameters of the wheel are 24cm and 8cm and the centers are 20 cm apart. Point P divides MN in the ratio 3:1]



Find the area of the shaded region

(10 marks)

24. The figure below shows a frustum with a rectangular base which measures 18cm by 24cm and the top measuring 6cm by 8cm. The slant edges are 26 cm long each



- (a) **Draw** the net of the frustum to scale 1:4 (2 marks)

- (b) **Find** the height of the original pyramid. (4marks)

- (c) **Determine** the angle between
 (i) Line B G and EH (2marks)

- (ii) Plane BCHG and the base EFGH (2 marks)