



MANGU HIGH SCHOOL

121/2
MATHEMATICS
PAPER 2
JULY 2015
TIME: 2½ HOURS

NAME: _____

ADM NO: _____ CLASS: _____

**Kenya Certificate of Secondary Education
Mock Examinations
Mathematics
Paper 2
2½ Hours.**

INSTRUCTIONS TO CANDIDATES

- This paper contains two sections: section I and section II
- Show all the steps in your calculations, giving your answers at each stage in the spaces 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, 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 printed pages**. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

Turn Over

SECTION I (50 MARKS)

Answer all questions in this section the spaces provided.

1. If $\frac{49x^2}{9} + \frac{7}{3}x + \frac{1}{4} + k$ is a perfect square, determine the value of K. (3mks)

2. Make P the subject of the formula in the simplest form (4mks)

$$\frac{1}{H} = \frac{-1}{\pi} \sqrt{Rp + \frac{Gp^2}{2}}$$

3. Solve for x in the equation (3mks)

$$\log_7 \left(\log_5 (\log_2 x) \right) = 0$$

4. Use matrix method to solve the equation (4mks)

$$\log_2 (2x + y) = 4$$

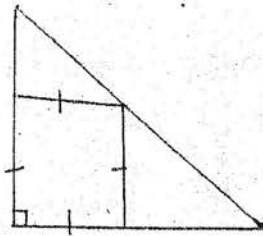
$$\log_{17} (3x + 4y) = 1$$

5. Find the value of the term independent of x in the expansion of (3mks)

$$\frac{1}{(2x^2 - \frac{1}{2}x)^6}$$

6. A coffee trader buys two grades of coffee at sh.80 and sh.100 per packet. Find the ratio at which she should mix them so that by selling the mixture at sh.120, a profits of 25% is realized. (3mks)

7. The sides of the square are 5cm long. Calculate the exact area of the large triangle (2mks)



8. Without using a calculator or mathematical tables rationalize and simplify. (3mks)

$$\frac{2}{2\tan 60^\circ + \sqrt{2}} - \frac{2}{2\sin 45^\circ}$$

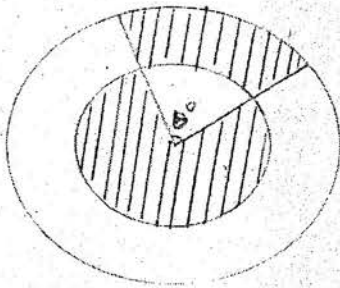
9. The cash price of a TV set is 10% less than the hire purchase price. A customer decided to buy it on hire purchase by paying a down payment of sh.3000 followed by a 12 equal monthly installments of sh.1500 each. Calculate the rate of interest, correct to 4.s.f. (3mks)

10. Find the equation of a circle passing through the points (3,0) and (7,0) and touching the line $x=0$. Leaving the answer the form $ax^2 + by^2 + cx + dy + e=0$ (3mks)

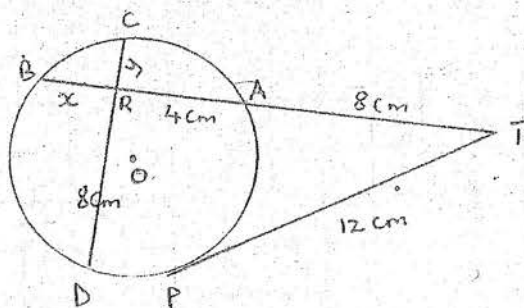
11. (a) The consecutive terms in a G.P are $3^{x+1/2}$, 9^x and 3^4 . Calculate the value of x . (2mks)

- (b) Given that the 5th and 7th terms of the G.P. in (a) above form the first two consecutive terms of an AP. Calculate the sum of the first 10 terms. (2mks)

12. In the figure below, the radius of the larger circle is twice that of the smaller concentric circle and θ is the angle between two radii of the larger circle.



- (a) Find the value of θ for which the two shaded regions have equal areas. (2mks)
- (b) Find the value of θ for which the two shaded regions have equal perimeters. (2mks)
13. Find the percentage area in calculating the perimeter of a triangle whose dimensions are 5cm, 6.3cm and 7.0cm. (3mks)
14. A 5m plank rests on a wall 2m high, so that 1.5m of the plank projects beyond the wall. Calculate to 1 decimal place.
- (i) how high the end of the plank is above the ground. (2mks)
- (ii) the angle the plank makes with the wall (1mk)
15. In the figure below TP is a tangent, calculate the value of x and y. (3mks)



16. Determine the ratio in which $P(11,0)$ divides AB , where A and B are the point $(2,-3)$ and $(17, 2)$ respectively (3mks)

SECTION II (50 MARKS)

Answer any five questions in this section

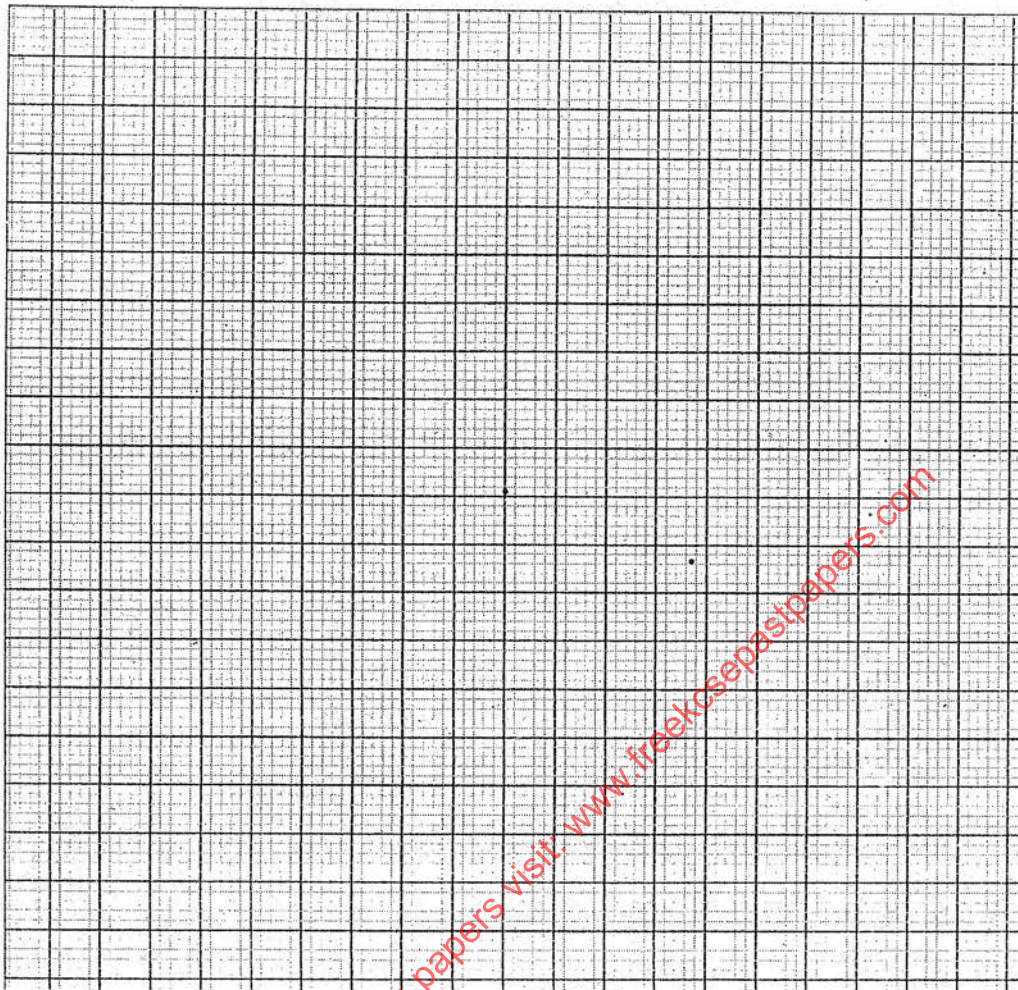
17. The following frequency distribution table shows the heights of students in a school.

Height (cm)	Number of students
146 – 150	3
151 – 155	9
156 – 160	20
161 – 165	14
166 – 170	4

Using assumed mean of 157.5, calculate

- (a) The mean height correct to 3 decimal place (5mks)
- (b) The standard deviation correct to 4 s.f. (5mks)

18. (a) On the same set of axes, draw the graphs of the functions $y = \sin x$ and $y = \sin(x + 60^\circ)$ in the domain $0^\circ \leq x \leq 360^\circ$ (5mks)



- (b) Find the period and amplitude of each function (2mks)
- (c) What transformation maps $y = \sin x$ onto $y = \sin(x + 60^\circ)$? (2mks)
- (d) Use the graphs to solve $\sin x - \sin(x + 60^\circ) = 0$ (1mk)

19. $x = a + b$ and a varies as y and b varies as the square of y . If $x=16$ when $y = 2$ and $x=33$ when $y=3$, find

(i) x when $y=5$ (6mks)

(ii) the change in x if y increases by 10% (4mks)

20. Triangle PQR whose vertices are $P(2,2)$, $Q(4,2)$ and $R(4,6)$ is subject through transformation matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$.

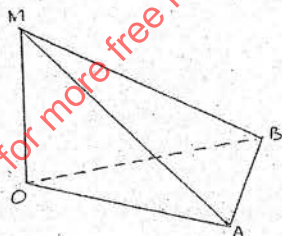
(i) Determine the coordinates of its image and fully describe the transformation (2mks)

(ii) The image of triangle $P'Q'R'$ is rotated through negative quarter turn about the origin. Write down the coordinates of $P''Q''R''$ the image of $P'Q'R'$ (2mks)

(iii) Find $P'''Q'''R'''$ the image of $P''Q''R''$ under a shear, x -axis invariant and scale factor 2. (3mks)

(iv) Find the matrix of transformation that would map $P'''Q'''R'''$ onto PQR (3mks)

21. An electric post OM, 9m high is held vertical by two wires MA and MB, as below.



Points O, A and B on the same horizontal level. Given that triangle OAB is equilateral with sides 8m.

(a) Find

(i) Angle AMB (3mks)

(ii) The angle between planes AMB and OAB

(3mks)

(b) If the four triangular shapes formed were covered with metallic plates, find the size of the material used. (4mks)

22. The positions of airport A and B are $(50^{\circ}\text{N}, 45^{\circ}\text{W})$ and $(50^{\circ}\text{N}, K^{\circ}\text{E})$ respectively. It takes a plane five hours, moving along the latitude, to travel from A to B at average speed of 800 knots. The same plane takes $1\frac{1}{2}$ hours to reach another air port C from B at the same average speed. If C is on the same latitude as B, calculate to the nearest degree.

(a) the value of k (6mks)

(b) the longitude of C (4mks)

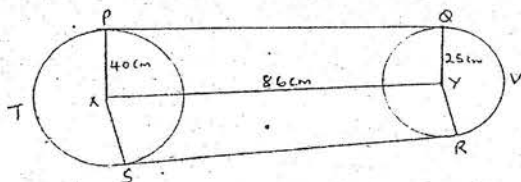
23. (a) A rectangular sheet of metal has sides 16cm and 6cm. A square of sides x cm is cut from each corner of the sheet and the remaining pieces is folded to make an open box.

(i) Find an expression in terms of x , for the volume, V of the box (2mks)

(ii) Find the value of x for which the volume of the box is a maximum and calculate it (3mks)

(b) Sketch the curve $y = (x^2 - 9)(x + 3)$ (5mks)

24. The figure below shows a direct belt driving system consisting of two pulleys of radii 40cm and 25cm. The centres x and y are 86cm apart.



Calculate the total length of the belt to 4.s.f.

(10mks)