NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ADM NO: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ CLASS: \_\_\_\_\_\_\_\_\_\_

**121/2**

**MATHEMATICS**

**PAPER2**

**TIME: 2½ HOURS**

**Kenya Certificate of Secondary Education**

**.**

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

 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  +  +  + k is a perfect square, determine the value of K.

(3mks)

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

 = 

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

 log7 log5 (log2x) = 0

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

 log2 (2x + y) =4

 log17 (3x + 4y) = 1

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

(2x2 - x)6

1. 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)
2. The sides of the square are 5cm long. Calculate the exact area of the large triangle (2mks)



1. Without using a calculator or mathematical tables rationalize and simplify.

 (3mks)

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1. 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)
2. 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 ax2 + by2 + cx + dy + e=0 (3mks)
3. (a) The consecutive terms in a G.P are 3x+1/2, 9x and34. 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  is the angle between two radii of the larger circle.



1. Find the value of for which the two shaded regions have equal areas. (2mks)
2. Find the value of for which the two shaded regions have equal perimeters. (2mks)
3. Find the percentage area in calculating the perimeter of a triangle whose dimensions are 5cm, 6.3cm and 7.0cm. (3mks)
4. 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.
5. how high the end of the plank is above the ground. (2mks)
6. the angle the plank makes with the wall (1mk)
7. In the figure below TP is a tangent, calculate the value of x and y.

 (3mks)



1. 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*

1. 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

1. The man height correct to 3 decimal place (5mks)
2. The standard deviation correct to 4 s.f. (5mks)
3. (a) On the same set of axes, draw the graphs of the functions y=sin x

 and y=sin(x + 60o) in the domain 0o ≤ x ≤ 360o  (5mks)



(b) Find the period and amplitude of each function (2mks)

(c) What transformation maps y=sinx onto y=sin(x +60o)? (2mks)

(d) Use the graphs to solve sinx - sin (x +60o) = 0 (1mk)

1. 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
2. x when y =5 (6mks)
3. the change in x if y increases by 10% (4mks)
4. Triangle PQR whose vertices are P (2, 2), Q (4, 2) and R (4, 6) is subject through transformation matrix .
5. Determine the coordinates of its image and fully describe the

transformation (2mks)

1. 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)

1. Find P’’’Q’’’R’’’ the image of P’’Q’’R’’ under a shear, x-axis invariant

and scale factor 2. (3mks)

1. Find the matrix of transformation that would map P’’Q’’R’’ onto PQ

(3mks)

1. 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.

1. *Find*
2. Angle AMB (3mks)
3. The angle between planes AMB and OAB (3mks)
4. If the four triangular shapes formed were covered with metallic plates, find the size of the material used. (4mks)
5. The positions of airport A and B are (50oN, 45ow) and (50oN, KoE) respectively. It takes a plane five hours, moving along the latitude, to travel from A to B at average speed of 800knots. The same plane takes 1½ 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.
6. the value of k (6mks)
7. the longitude of C (4mks)
8. (a) A rectangular sheet of metal has sides 16cm and 6cm. A square of

sides xcm is cut from each corner of the sheet and the remaining pieces is folded to make an open box.

1. Find an expression in terms of x, for the volume, V of the box

 (2 mks)

1. Find the value of x for which the volume of the box is a

 maximum and calculate it (3mks)

(b) Sketch the curve y=(x2 - 9) ( x + 3) (5mks)

1. 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)