

NAME \_\_\_\_\_ ADM. NO. \_\_\_\_\_ CL. \_\_\_\_\_

MATHEMATICS  
TRIALS PAPER 121/1  
September 2022  
Time: 2 ½ Hours



**ALLIANCE HIGH SCHOOL**  
*Kenya Certificate of Secondary Education (K.C.S.E)*

**INSTRUCTIONS TO CANDIDATES**

1. Write your name and Admission number in the space provided at the top of this page.
2. The paper contains **TWO** sections; section I and section II
3. Answer **ALL** the questions in Section I and Only Five questions in Section II
4. Show all the steps in your calculations; giving your answers at each stage in the spaces provided 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 maybe used.

**For Examiners use only**

**Section 1**

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 14 printed pages*

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

SECTION 1 (50 marks) Answer ALL the questions in the spaces provided.

1. Evaluate correct to 4 significant figures;

(3mks)

$$\frac{4 \times 6 + \frac{1}{25} \div 0.05 + \frac{1}{5}}{(-3) \div (-6) + (23) - 6 \text{ of } 3}$$

2. Given that  $\tan 65^\circ = 3 + \sqrt{5}$ , determine without using mathematical tables nor calculator,  $\tan 25^\circ$ , leaving your answer in the form  $a + b\sqrt{c}$ , where a, b, and c are rational numbers.

(3mks)

3. Use mathematical tables to find y, correct to four significant figures.

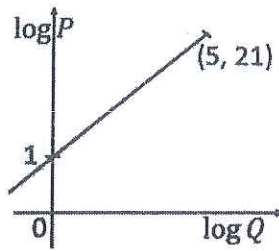
(4mks)

$$\frac{1}{y} = \frac{1}{24.3} + \frac{1}{13.1}$$

4. The three sides of a right angled are  $(x - 1)$ ,  $(2x + 8)$  and the hypotenuse  $(3x + 1)$ , find the area of the triangle.

(3mks)

5. The figure below shows the graph of  $\log P$  against  $\log Q$ .



Given that  $P = aQ^n$ , find the values of  $a$  and  $n$ .

(3mks)

6. A salesman is paid a salary of Sh. 10,000 per month. He is also paid a commission on sales above Sh. 100,000. If in one month he sold goods worth Sh. 500,000 and his total earnings amounted to Sh. 56,000. Calculate the rate of commission.

(3mks)

7. Solve the following equation, giving your answer correct to 4 decimal places. (3mks)

$$8^x + 5 + 2^{3x} = 35$$

8. Express in surd form and simplify by rationalizing the denominator;

(3mks)

$$\frac{1 + \cos 30^\circ}{1 - \sin 60^\circ}$$

9. Solve;  $4 \leq 3x - 2 < 9 + x$

Hence list all the integral values that satisfy the inequality.

(3mks)

10. Simplify the expression;

$$\frac{6b - 3ab - 2a + a^2}{a^2 - 9b^2}$$

(3mks)

11. A construction company employs technicians and artisans. On a certain day 3 technicians and 2 artisans were hired and paid a total of ksh 9000. On another day the firm hired 4 technicians and 1 artisan and paid a total of ksh 9,500. Calculate the cost of hiring 2 technicians and 5 artisans in a day.

(3mks)

12. On the line provided below, by construction, locate a point Q such that the ratio AB: BQ = 5: -2

(3mks)



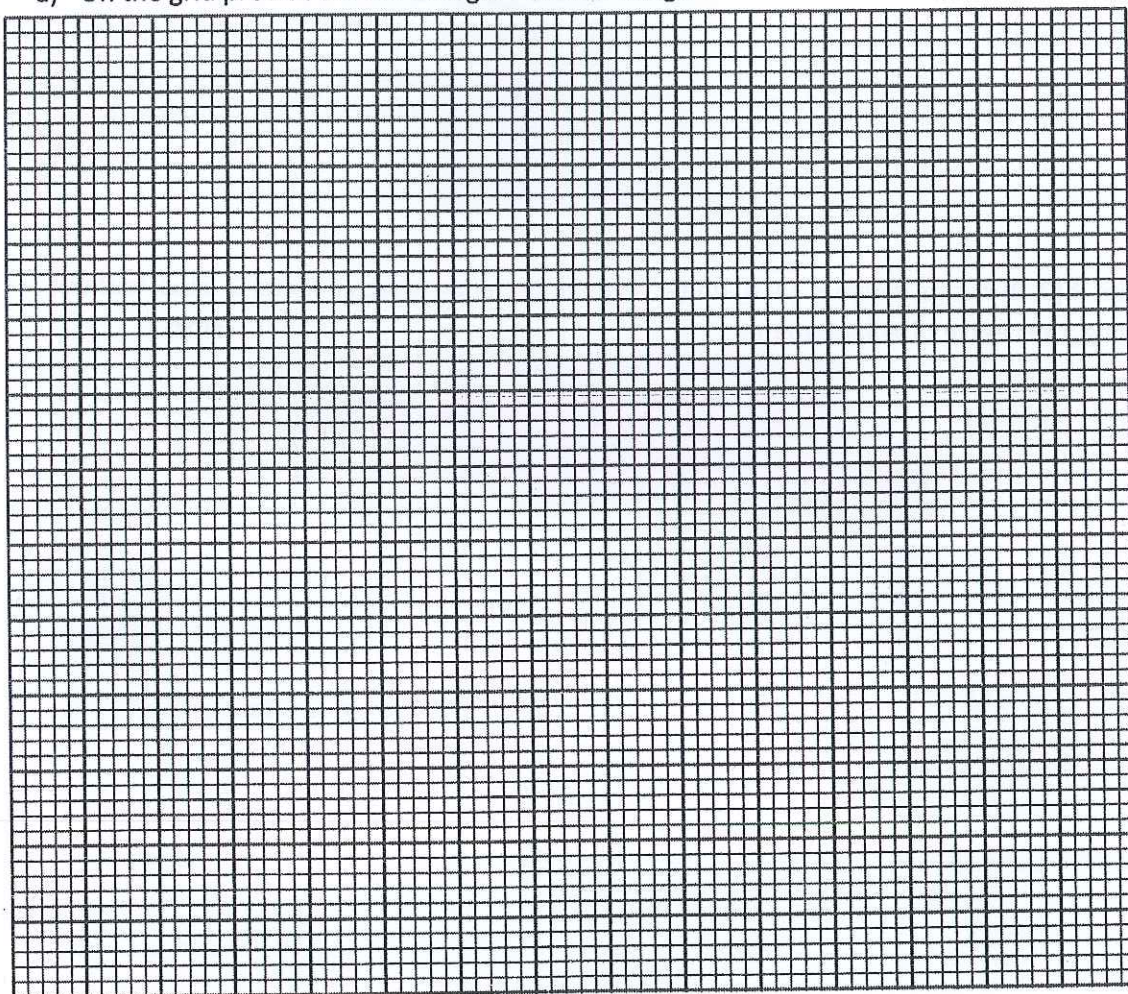
13. Given that  $\log 7 = 0.8451$  and  $\log 6 = 0.7782$ , find  $\log 25.2$

(3mks)

14. A triangle T with vertices A (2,4), B (6,2) and C (4,8) is mapped onto a triangle T<sup>1</sup> with vertices A' (10, 0), B' (8, -4) and C' (14, -2) by a rotation.

a) On the grid provided draw triangle T and its image T<sup>1</sup>

(2mks)



b) Determine the centre and angle of rotation that maps T onto T<sup>1</sup>.

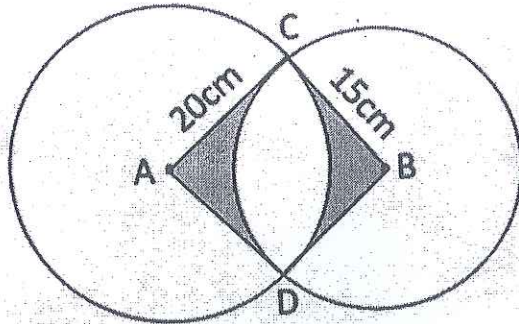
(2mks)

15. Velocity of a particle moving on a straight line is given by  $V = (2t + 10) \text{ ms}^{-1}$ , where  $t$  is the time taken in seconds. Find the distance covered in the 3<sup>rd</sup> second. (3mks)

16. A point R (0, 2) has its image R' (4, 6) under an enlargement with scale factor 3. Find, without drawing, the centre of enlargement. (3mks)

**SECTION II (50 marks) Answer only five questions from this section in the spaces provided.**

17. The diagram below shows two intersecting circles of radii 20cm and 15cm such that their centres A and B are 30cm apart.



Calculate to 2 decimal places;

a) The area of the sector ACD

(3mks)

b) The area of sector BCD

(3mks)

c) The length of the chord CD

(2mks)

d) The area of the quadrilateral ABCD

(1mk)

e) The shaded area

(1mk)

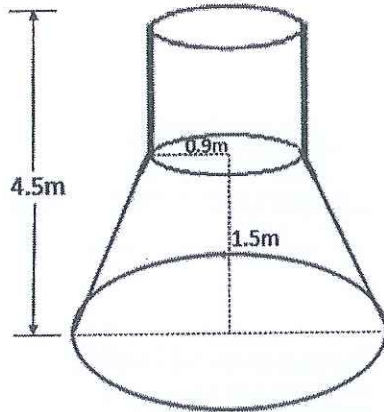
18. A solid S is made up of a frustrum of a cone whose upper part is replaced with cylindrical part. The height of the solid is 4.5m, the common radius of the cylindrical part and the conical part is 0.9m, and the height of the conical part is 1.5m.

Taking  $\pi$  as  $\frac{22}{7}$ ,

- a) Calculate, correct to 1 decimal place,

(i) The volume of solid S.

(4mks)



(ii) The total surface area of solid S

(4mks)

- b) A square based pillar of side 1.6m has the same volume as solid S. Determine the height of the pillar, correct to 1 decimal place.

(2mks)



19. A bus left Mombasa and travelled towards Machakos at an average speed of 60km/h. After  $2\frac{1}{2}$  hours, a car left Mombasa and travelled along the same road at an average speed of 100km/h. If the distance between Mombasa and Machakos is 500km, determine:

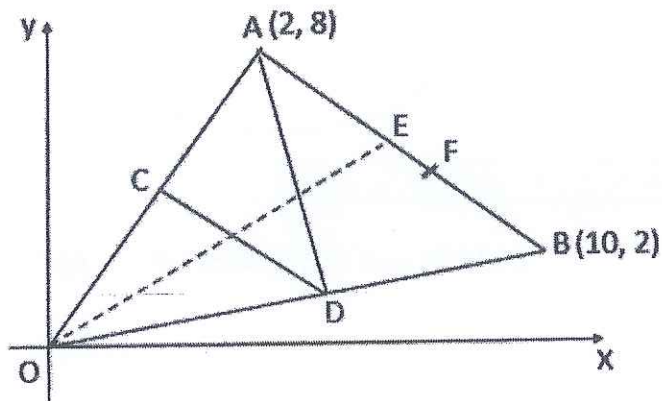
a) (i) The distance of the bus from Machakos when the car took off. (2mks)

(ii) The distance the car travelled to catch up with the bus. (4mks)

b) Immediately the car caught up with bus, the car stopped for 25min. find the new average speed at which the car travelled in order to reach Machakos at the same time as the bus. (4mks)

20. (a) Given that  $a = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ ,  $c = \begin{pmatrix} -2 \\ -5 \end{pmatrix}$  and  $3a - 2b + 4c = \begin{pmatrix} 10 \\ -19 \end{pmatrix}$  find  $b$ . (3mks)

b) In the figure below, OAB is a triangle. A is the point (2, 8) and B the point (10, 2). C, D, and E are the mid-points of OA, OB, and AB respectively, while F is on AB such that  $AF = \frac{2}{3} AB$



i. Find the position vectors of point C (2mks)

ii. Find the length of vector AB (3mks)

iii. If vector  $OA = a$  and vector  $OB = b$ , write  $DF$  in terms of vectors  $a$  and  $b$  (2mks)

21. (a) Using a ruler and a pair of compasses construct a parallelogram ABCD, where  $AB = 8\text{cm}$ ,  $BC = 6\text{cm}$  and angle  $ABC = 120^\circ$ . (3mks)

b) In the diagram draw the diagonal BD and construct the circumcircle to triangle ABD. (3mks)

c) Construct a perpendicular from C to meet AB produced at X. Measure CX. (2mks)

d) Calculate the area of triangle ACD. (2mks)

22. Mr. Pesa bought two types of items from a wholesaler. He bought 5 of type A at Ksh. 1,250 each and 20 of type B at Ksh. 650 each. He is to sell these items at a retail price of Ksh, 1,400 for each item of type A and Ksh. 700 for each of type B.

a) Find the total expenditure of Mr. Pesa. (2mks)

b) Assuming that Mr. Pesa sold all the items, calculate his percentage profit, to 1 decimal place. (3mks)

c) Mr. Pesa learned of a new variety of the same items of type A and type B and decided to return the remaining stock in exchange for the new variety. The remaining stock consisted of one item of type A and 10 of type B. The prices of the new variety were Ksh. 1,500 and Ksh. 800 of type A and B respectively. If Mr. Pesa bought the same number of items as before;

(i) What was the value of the returned goods if a depreciation of 10% is allowed? (3mks)

(ii) Find how much money he was to add in order to get the new variety? (2mks)

23. Triangle ABC has vertices  $A(-2, 0)$ ,  $B(-5, 3)$ , and  $C(1, 3)$ .

a) Find the coordinates of a point O that is equidistant from points A, B, and C (5mks)

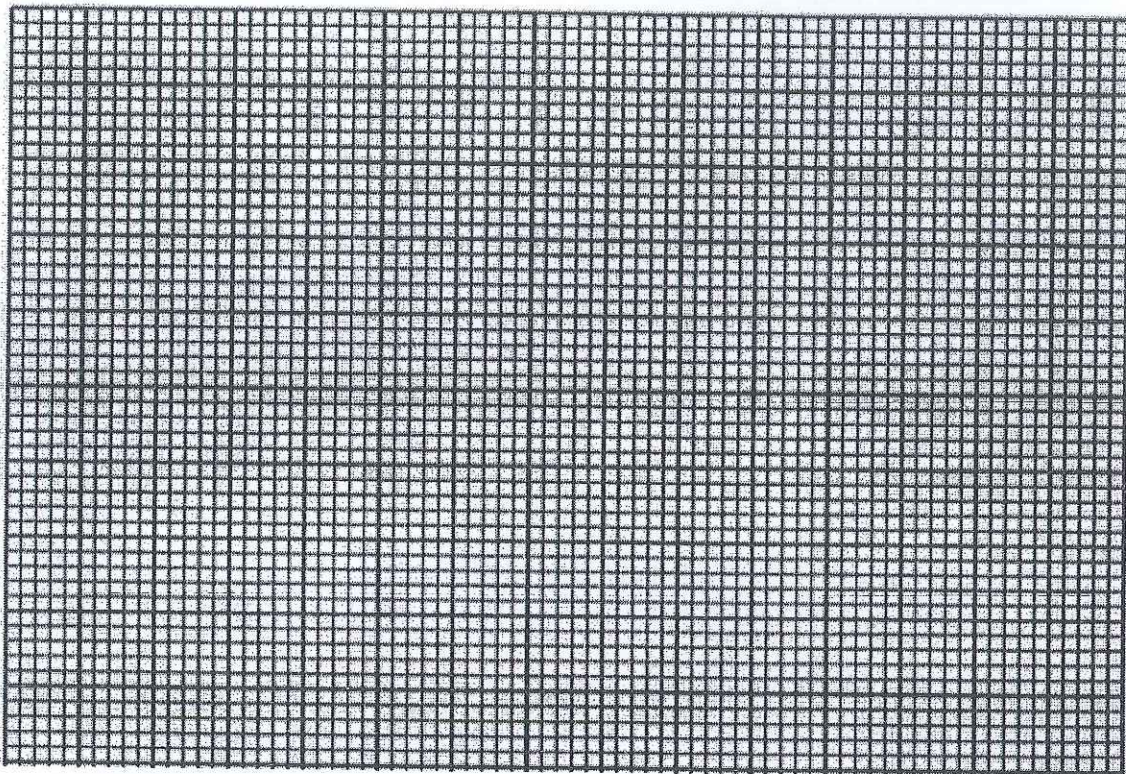
b) If the triangle is circumscribed, find the equation of the circumcircle in the form;  
 $ax^2 + by^2 + cx + dy + k = 0$ , where  $a, b, c, d$ , and  $k$  are constants. (2mks)

c) Determine the equation of the tangent to the circle at point C, in the form of  $y = mx + c$   
(3mks)

24. (a) Complete the table below for the functions  $y = 2\cos x$  and  $y = \sin 2x$ ,  
for  $(-180^\circ \leq x \leq 180^\circ)$  (2mks)

$x$	-180	-150	-120	-90	-60	-30	0	30	60	90	120	150	180
$2x$	-360	-300	-240	-180	-120	-60	0	60	120	180	240	300	360
$2\cos x$	-2	-1.73		0		1.73	2	1.73	1		-1		-2
$\sin 2x$		0.87	0.87	0	-0.87		0	0.87	0.87		-0.87		0

- b) On the grid provided, draw on the same axis the graphs of  $y = 2\cos x$  and  $y = \sin 2x$ ,  
for  $(-180^\circ \leq x \leq 180^\circ)$  (4mks)



- c) Use the graphs in (b) above to determine;
- The amplitude and period of the graph  $y = 2\cos x$  (2mks)
  - The values of  $x$  such that;  $2\cos x - \sin 2x = 0$  (1mk)
  - The difference in the values of  $y$  when  $x = -45^\circ$  (1mk)