



GENIUS EXAM 2024



Name.....Index No.....

121/2

MATHEMATICS

2½ Hours

KCSE PREDICTION 2024

INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above
3. The paper contains **two** sections: **Section I** and **Section II**.
4. Answer **All** the questions in **section I** and **strictly any five** questions **from Section II**.
5. All answers and working must be written on the question paper in the spaces provided below each question.
6. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and **KNEC** mathematical tables may be used, except unless stated otherwise.
9. This paper consists of **13 printed pages**. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

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



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Grand

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Total





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Section I (50 marks)

1. Use logarithms in all steps to evaluate.

(4marks)

$$\frac{2.532 \times 83.45}{\sqrt{0.4562}}$$

2. The sum of the interior angles of two regular polygons of sides $n-1$ and n are in the ratio of 2:3 Name the polygon with the fewer sides. (3marks)

3. The diameter AB of a circle passes through points A (-4, 1) and B(2, 1). Find the equation of the circle and leave your answer in the form $x^2 + y^2 + ax + by = c$ where a, b and c are constants.(4 marks)

4. Without using mathematical tables and calculators simplify.

(3marks)

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



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5. Expand $(2+x)^5$ up to the terms in x^3 . Hence approximate the value of $(2.03)^5$. (3marks)

6. The sides of a triangular stool were measured as 8 cm, 10cm, and 15cm. Calculate the % error in the perimeter correct to 2d.p. (3marks)

7 Solve for x given that the following is a singular matrix (3mks)

$$\begin{pmatrix} 1 & 2 \\ x & x-3 \end{pmatrix}$$

8. The current price of a vehicle is sh. 500,000. If the vehicle depreciates at rate of 12% p.a find the number of years it will take for its value to fall to sh. 180,000. (3 marks)



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9 Two variables are such that A is partly constant and partly varies as the square root of B. Given that

$A = 27$ when $B = \frac{1}{4}$ and $A = 18$; when $B = 25$, find A when $B = 12\frac{1}{4}$. (3 marks)

10. Determine the amplitude and period of the graph of $y = 6 \sin (\frac{x}{2} - 90^\circ)$. (2marks)

11. A cylindrical container of radius 14 cm and 7cm is filled with water. If the container was a cube, what would be the base area of the cube? (3marks)

12. Solve the following equation. (3marks)
 $1 + \log_5 x = \log_5 12$



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13. A law relating some two variables K and L was found to be $KL^n = C$. Make n the subject of the formula. (3marks)

14. Solve the equation below by completing the square method $3x^2 - 7x + 2 = 0$ (3 marks)

15. Maize and millet costs Sh. 45 and Sh. 56 per kilogram respectively. Calculate the ratio in which they were mixed if a profit of 20% was made by selling the mixture at 66 per kilogram. (4marks)

16. Given that $P = (3i + k)$ and $Q = (2i - k)$, find $|PQ|$ (3mk)



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Section II (Answer five questions only from this section)

17. The position of two towns are A (30°S , 20°W) and B (30°S , 80°E) find

(a) the difference in longitude between the two towns. (1 mark)

(b) (i) the distance between A and B along parallel of latitude in km (take radius of the earth as 6370km and $\pi = \frac{22}{7}$). (3 marks)

(ii) in nm. (2 marks)

(c) Find local time in town B when it is 1.45pm in town A. (4 marks)



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18. Mr. Johnson is a teacher in Kenya .He earns a basic salary of Sh. 19,620 per month. He is paid a house allowance of Sh. 12,000, a medical allowance of Sh. 2,246 and a commuter allowance of Sh. 4,129 .He is deducted Sh. 1,327 towards a Retirement Benefit's Scheme.

Use the tax rates given below to answer the questions below.

Monthly taxable (shp.m)	Rate of tax (%)
0 – 10,164	10
10,165 – 19,740	15
19,741 – 29,316	20
29,317 – 38,892	25
Over 38,892	30

(a) Calculate the monthly taxable income.

(2marks)

(b) Calculate the PAYE he pays to the government if he gets a monthly tax relief of Sh. 1162.

(6marks)

(c) Calculate his net monthly salary

(2marks)

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19. The table below shows the distribution of ages in years of 50 adults who attended a clinic:-

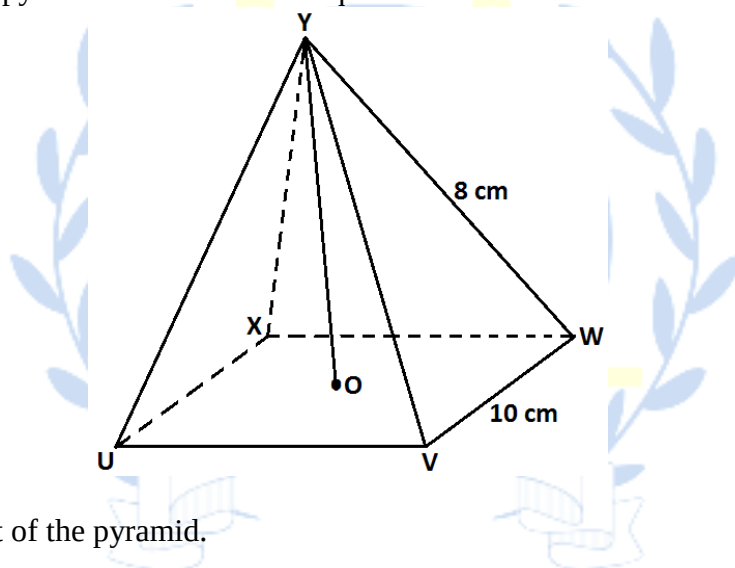
Age	21-30	31-40	41-50	51-60	61-70	71-80
Frequency	15	11	17	4	2	1

- (a) State the medium class (1mk)
- (b) Using a working mean of 45.5, calculate:- (3mks)
- (i) the mean age (3mks)
- (ii) the standard deviation (3mks)

(iii) Calculate the 6th decile.

(3mks)

20. UVWXY is a right pyramid on a horizontal square base of side 10cm. $YU = YV = YW = YX = 8\text{cm}$.



(a) Calculate the height of the pyramid.

(3marks)

(b) The angle between

(i) The slant face YWV and the base UVWX.

(2marks)



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(ii) YV and the base UVWX.

(2marks)

(c) Calculate the angle between the planes UVY and WXY.

(3marks)





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21The probability that three candidates; Anthony, Beatrice and Caleb will pass an examination are

$\frac{3}{4}$, $\frac{2}{3}$ and $\frac{4}{5}$ respectfully. Find the probability that:-

(a) all the three candidates will pass (2mks)

(b) all the three candidates will not pass. (2mks)

(c) only one of them will pass (2mks)

(d) only two of them will pass. (2mks)

(e) at most two of them will pass. (2mks)



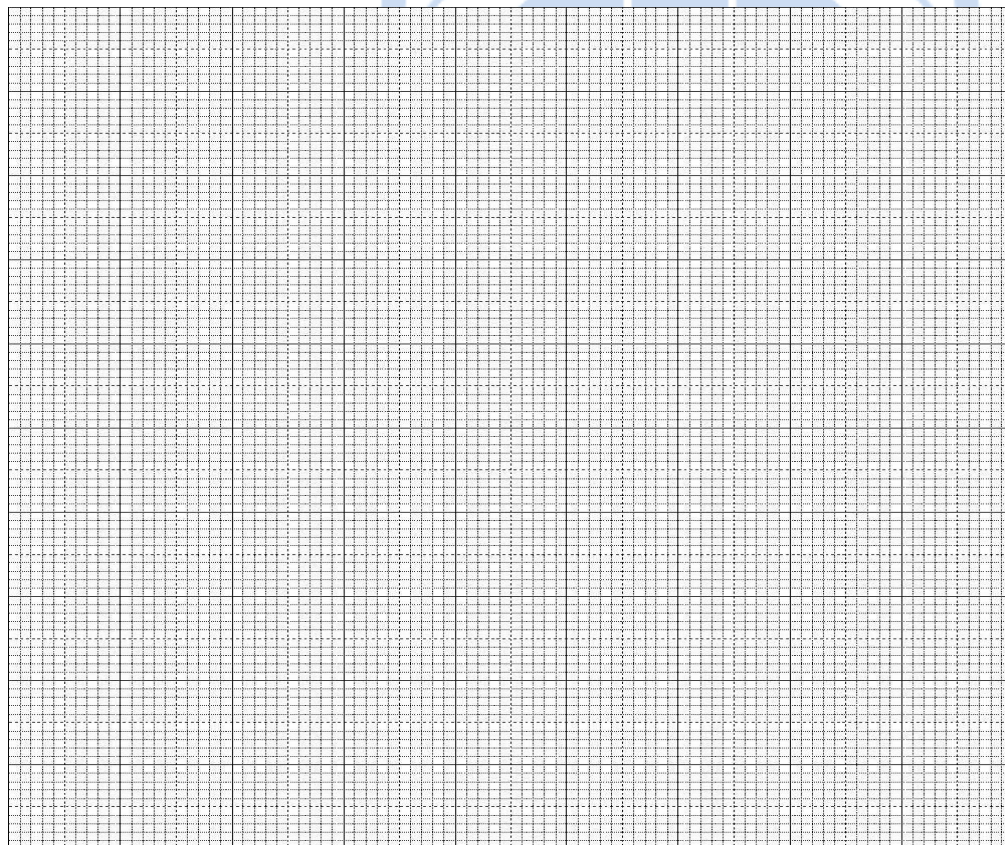
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22. Complete the table below giving your values correct to 2 d.p. (2marks)

x	0°	15°	30°	45°	60°	75°	90°	105°	120°
$3\cos x^{\circ}$	3.00		2.60		1.50		0	-0.78	
$4\sin(2x - 10^{\circ})$		1.37		3.94	3.76		0.69		-3.06

(b) draw the graphs of $y = 3\cos x^{\circ}$ and $y = 4\sin(2x - 10^{\circ})$ on the same set of axis on the grid provided. (4marks)



(c) Use your graph to find values of x for which $3\cos x - 4\sin(2x - 10^{\circ}) = 0$. (2marks)



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(d) State

(i) The amplitude of the graph $y = 3\cos x$.

(1mark)

(ii) The period of the graph $y = 4\sin (2x - 10^0)$.

(1mark)

23. Use a ruler and a pair of compasses only all constructions in this question.

(a) Construct the rectangle ABCD such that $AB = 7.2\text{cm}$ and $BC = 5.6\text{cm}$.

(3mks)



(b) Constructs on the same diagram the locus L_1 of points equidistant from A and B to meet

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with another locus L_2 of points equidistant from AB and BC at M. measure the acute angle formed at M by L_1 and L_2 .

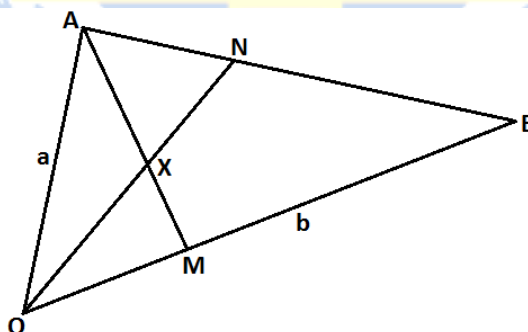
(3mks)

- (c) Construct on the same diagram the locus of point K inside the rectangle such that K is less than 3.5cm from point M. Given that point K is nearer to B than A and also nearer to BA than BC, shade the possible region where K lies. Hence calculate the area of this region.

Correct to one decimal place.

(4mks)

24. In the figure below, M and N are points on **OB** and **BA** respectively such that **OM: MB** = 2:3 and **BN:NA** = 2:1. ON and AM intersect at X



- (a) Given that **OA** = **a** and **OB** = **b**, Express in terms of **a** and **b**

(i) **ON**

(2marks)



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(ii) $\mathbf{AM}$

(1mark)

(b) Given that $\mathbf{OX} = h\mathbf{ON}$ and $\mathbf{AX} = k\mathbf{AM}$ where h and k are scalars

(i) Determine the constants k and h

(5marks)

(ii) The ratio which X divides $\mathbf{AM}$.

(2marks)

