

KCSE 2022 PREDICTIONS

5 STAR EXAMS SERIES 001/1/2022

121/2 – MATHEMATICS ALT A – PAPER 2

TIME: 2 Hours

Name: …… Adm No: ……

Index No: …… Sign: …… Date: ……

Instructions to candidates

1. Write your name, admission number and class in the spaces provided above.
2. The paper contains two sections: **Section I** and **Section II**.
3. Answer **ALL** the questions in **Section I** and **ANY FIVE** questions from **Section II**.
4. All working and answers must be written on the question paper in the spaces provided below each question.
5. Marks may be awarded for correct working even if the answer is wrong.
6. Negligent and slovenly work will be penalized.
7. Non-programmable silent electronic calculators and mathematical tables are allowed for use.
8. ***This booklet contains 14 printed pages. Please confirm that all the pages exist and are properly printed before starting the exam.***

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 %

TURN OVER

SECTION 1: (50 MARKS)

Answer ALL the Questions in this section in the spaces provided.

1. Evaluate using logarithms. (4 mark)

$$\sqrt[4]{\frac{723.9 \times \log 8.765}{3400 + 23.4}}$$

2. Given the expression 9.7 ÷ 3.7, find to four significant figures the percentage error in its quotient. (3 marks)

3. Make V the subject of the formula T = $\frac{1}{2}m\sqrt{u^2 + v^2}$ (3 marks)

4. Simplify $\frac{3\sqrt{2}}{\sqrt{5}-\sqrt{2}}$, leaving the answer in the form a + b $\sqrt{c}$, where a, b and c are rational number (3 marks)

5. A circle whose equation is $(x-1)^2 + (y-k)\ 10$ passes through point (2.5). Find the coordinates of the possible center of the circle (3 marks)

6. The cost of maize flour and millet flour is Kshs 44 and Kshs 56 respectively. Calculate the ratio in which they were mixed if a profit of 20% was made by selling the mixture at Kshs. 54. (3marks)

7. Triangle ABC has coordinates A (2, 0) B (2, 4) and C (4, 4). It is mapped onto A^{11}(0, -2), B^{11}(-4, -10) and C^{11} (-4, -12) by two successive transformation M = $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ followed by T = $\begin{pmatrix} 0 & -1 \\ -4 & 0 \end{pmatrix}$. Find M. (4 marks)

8. Solve the following linear inequalities and list the integral values of x. (3 marks)

$\frac{1}{3}x + 7 \geq -2x$

$0.5x + 4 > 1.5x$

9. The cash price of a music system is kshs. 30,000. It can be bought under hire purchase terms by paying a deposit of kshs. 10,000 and twelve monthly installments of Kshs. 3,200 per month. Determine the percentage rate of interest per month. (3 marks)

10. Evaluate $\int_0^1 (3x^2 - 6x + 3)dx$ (3 marks)

11. Expand and simplify the binomial $(2+3x)^7$ upto the forth term (1 mark)

(b) Use your expression to estimate $(0.97)^7$ correct to two decimal places (2 marks)

12. Solve for x in $\log(2x+4)-\log(x-1)=3\log 2$. (3 marks)

13. The marks scored by a student in a test of 11 subjects were as follows.

Subject	**Marks**
English	40
Kiswahili	90
Mathematics	50
Biology	40
Physics	70
Chemistry	60
History	20
Geography	10
CRE	60
Computer	70
French	80

Determine the quartile deviation of the student's scores. (3 marks)

14. The equation $3x^2 - 8px + 12 = 0$ has real roots. Find the value of P. (3 marks)

15. Points P, Q and R are on the circumference of a circle. If PQ =PR =13cm and QR =10cm, find the radius of the circle. (3 marks)

16. The points A, B and C lie on a straight line. The position vector of A and C are 2i + 3j + 9k and 5i – 3j + ck respectively. B divides AC internally in the ratio 2:1. Find the magnitude of B from the origin (3mks)

SECTION II (50 MARKS)

(Answer any FIVE questions in this section)

17. Mr. Gachengo basic salary in June was Ksh. 17,000. He was also paid a house allowance of Kshs. 6,000 a commuter allowance of Kshs. 2,500 and a medical allowance of Kshs. 1,800. In July of that year, Mr. Gachengo's basic salary was raised by 2%.

a) Calculate Mr. Gachengo's

i) Basic pay for July (2mks)

ii) Total taxable income in July of that year (2mks)

b) In that year, the income tax rates were as shown in the table below

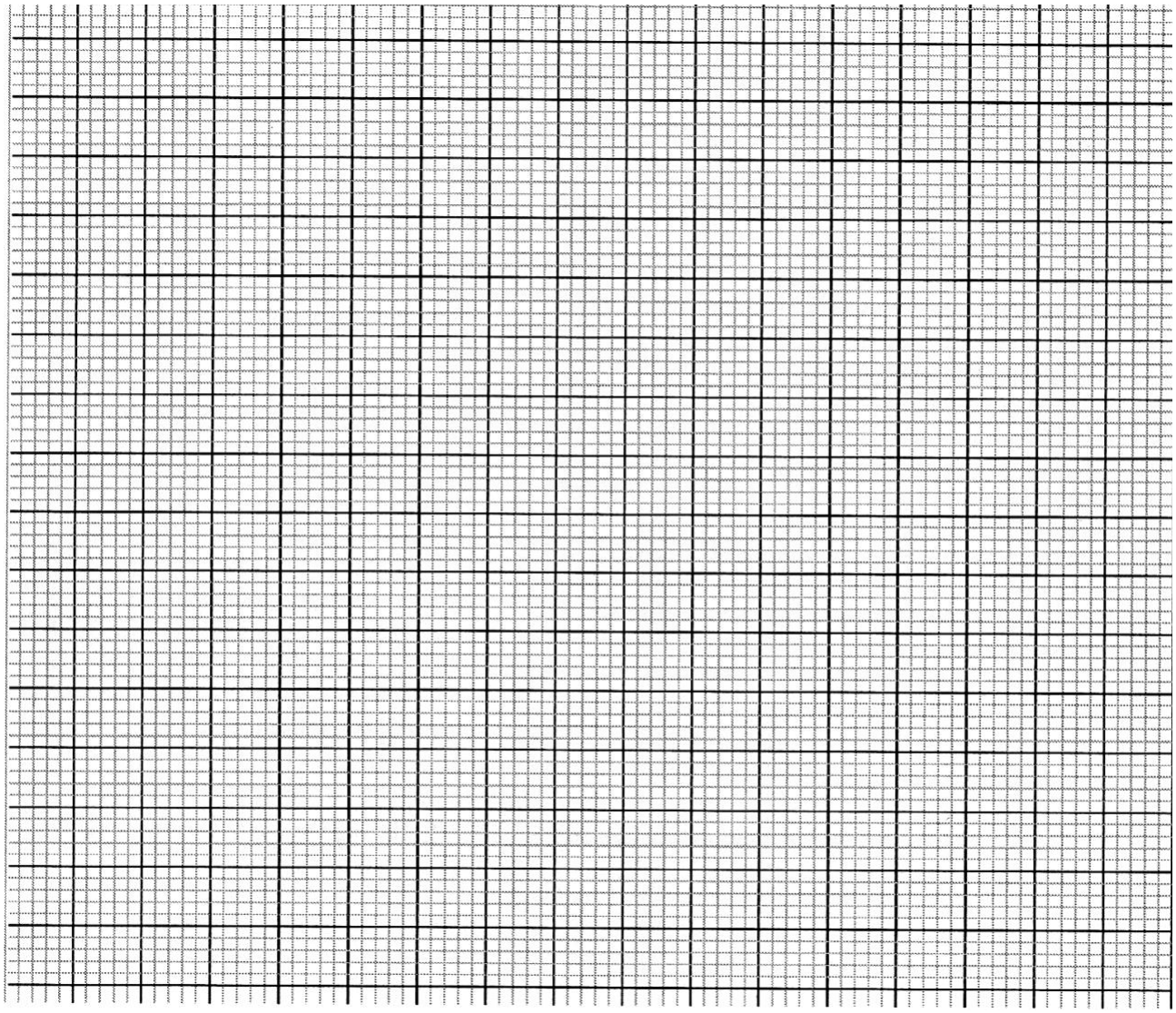
Income taxable income (Ksh)	Percentage rate of tax per shillings
Up to 9680	10
From 9681 – 18800	15
From 18801 – 27920	20
From 27921 – 37040	25
From 37041 and above	30

Given that the monthly personal relief was Kshs. 1056. Calculate the net tax paid by Mr. Gateri for July (6mks)

18. (a) Complete the table given below by filling the blank spaces. (2 marks)

X	0^o	15^o	30^o	45^o	60^o	75^o	90^o	105^o	120^o	135^o	150^o	165^o	180^o
$2\sin(2x+30)^o$	1.00	1.73	2.00	1.73		0	-1.00	-1.73				0	1.00
$4\cos 2x$	4.00		2.00	0	-2.00		-4.00	-3.46		0	2.00		4.00

(b) On the grid provided draw on the same axes, the graph of $y = 4\cos 2x$ and $y = 2\sin\left(2x + 30^0\right)$ for $0^0 \le x \le 180^0$. On x- axis, 1cm rep 15^0 and y- axis 1cm rep 1 unit (5 marks)



(c) From your graph(i) State the amplitude of $y = 4\cos 2x$ (1 mark)

(ii) Find the period of $y = 2\sin\left(2x + 30^0\right)$ (1 marks)

iii) Use your graph to solve $4\cos 2x - 2\sin\left(2x + 30^0\right) = 0$ (1 mark)

19. **a)** Taps X and Y can fill a tank in 3hrs and 5hrs respectively, while tap Z can empty the same tank in 4 hours.If tap Z is closed, how long will it take taps X and Y to fill the tank ? (5marks)

b) Calculate the time it will take to fill the tank when the three taps X, Y and X are left open and running ? (5 marks)

20. Using a ruler and a pair of compass only;

a) Construct a triangle PQR such that PR=7.5cm, PQ=3.0cm and <QPR=60° (3 marks)

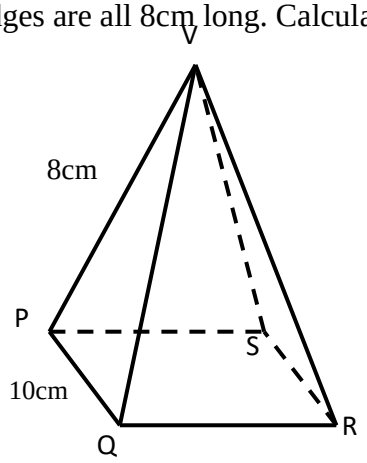
b) Construct the locus T of points which are equidistant from a point L and passes through the vertices P, Q and R. (2 marks)

c) Locate the locus S on T such that it is equidistant from sides PQ and QR of the triangle (2 marks)

d) Locate the locus of points G enclosed by PQ and QS such that QG <2cm. (2marks)

e) Measure SL. (1 mark)

21. The volume of the solid to four significant figures. PQRSV is a right pyramid on a horizontal square base of side 10cm.The slant edges are all 8cm long. Calculate



(a) The height of the pyramid (2 Marks)

(b) The angle between

(i) Line VP and the base PQRS (2 Marks)

(ii) Line VP and line RS (2Marks)

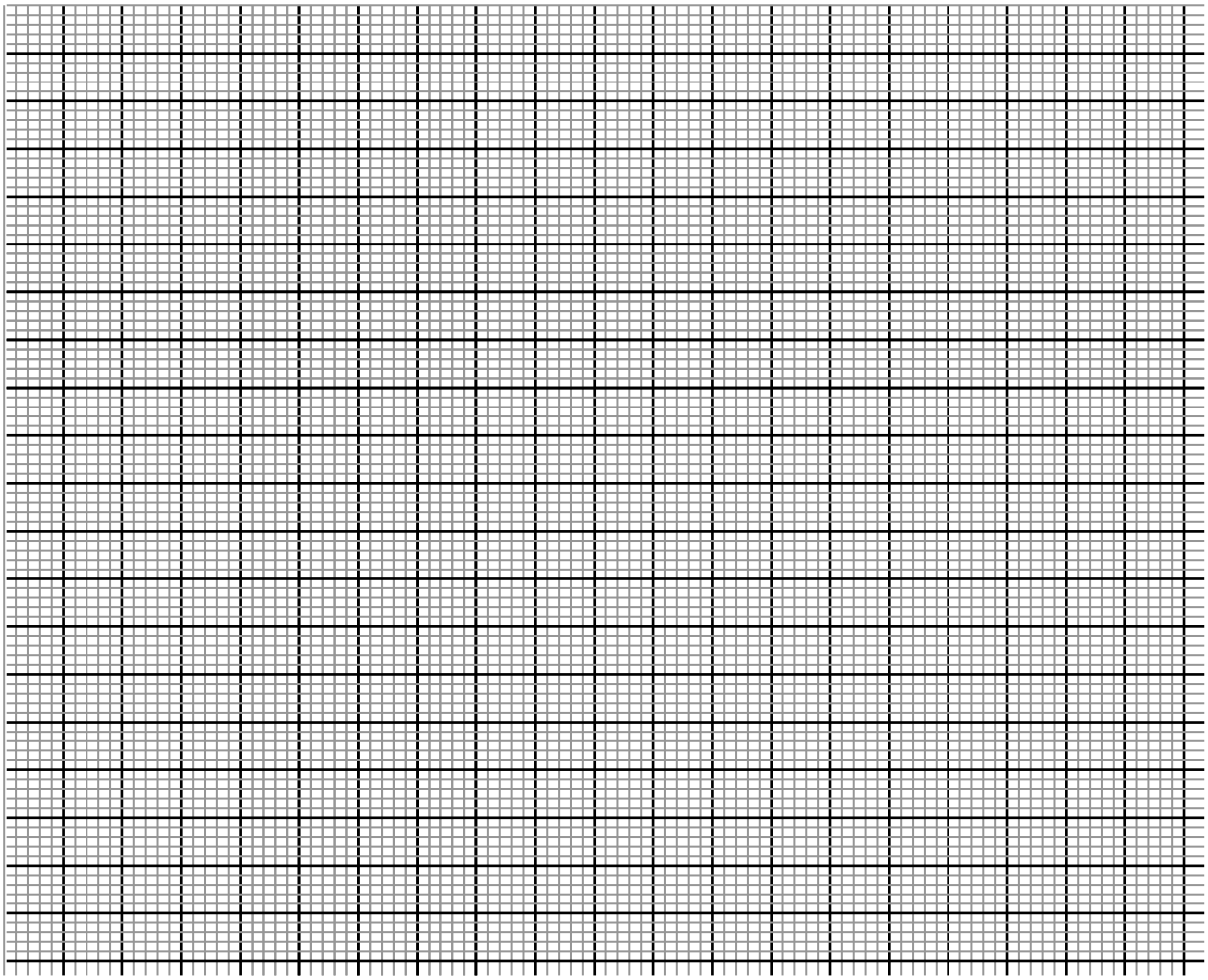
(iii) Planes VPQ and the base PQRS (2 Marks)

(a) Volume of the pyramid (2 Marks)

22. Triangle ABC is such that A(-5, 1), B(-1, 1) and C(-3, 4). Triangle A′B′C′.is the image of ΔABC under transformation $T = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

a) Determine the co-ordinates of Δ A′B′C′. (2 marks)

b) On the grid provided draw ΔABC and Δ A′B′C′. (2 marks)



c) Describe the transformation T fully. (1 mark)

d) Δ A″B″C″ is a reflection of the Δ A′B′C′ on the line y = -x. Construct Δ A″B″C″. State the co-ordinates (3 marks)

e) Determine a single matrix that maps Δ A″B″C″ onto ΔABC. (2 marks)

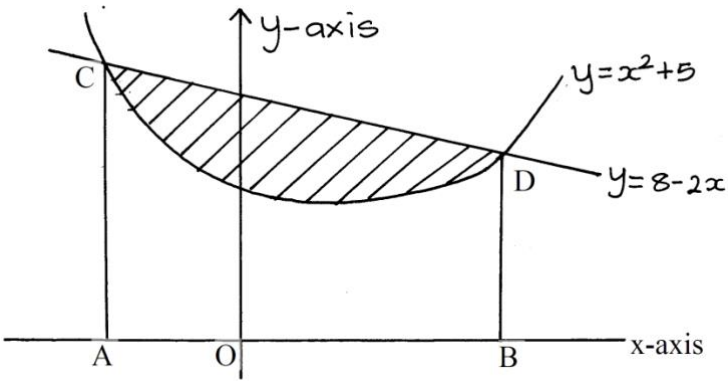
23. A plane leaves an airport P (10^0S, 62^0E) and flies due north at 800km/h.
    (a) Find its position after 2 hours (3 Marks)

    (b) The plane turns and flies at the same speed due west. It reaches longitude Q, 12^0W.
        (i) Find the distance it has traveled in nautical miles. (3 Marks)

        (ii) Find the time it has taken (Take $\pi = \frac{22}{7}$, the radius of the earth to be 6370km and 1 nautical mile to be 1.853km) (2 Marks)

    (c) If the local time at P was 1300 hours when it reached Q, find the local time at Q when it landed at Q (2 Marks)

24. The diagram below, not drawn to scale shows part of the curve $y = x^2 + 5$ and the line y = 8-2x. The line intersects the curve at points C and D. Lines AC and BD are parallel to the y-axis.



(a) Determine the coordinates of C and D. (4 marks)

(b) Use integration to calculate the area bounded by the curve and the x-axis between the points C and D. (3 marks)

(c) Calculate the area enclosed by the lines CD, CA, BD and the x-axis. (2 marks)

d) Calculate the area of the shaded region. (1 mark)