

THE MATHEMATICS GURUS KCSE PREDICTOR SERIES ONE.
Kenya Certificate Of Secondary Education (K.C.S.E.) 2022.

121/2

MATHEMATICS

Paper 2



ALT A
FORM FOUR
Oct. 2022–2 $\frac{1}{2}$ hours

Name..... Index Number:.....

Candidate's Signature..... Date.....

Instructions to candidates

- (a) Write your name and admission number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided.
- (c) This paper consists of two sections, Section I and Section II.
- (d) Answer all questions in section I and any two questions from section II.
- (e) **Show all the steps in your calculations** giving the answer at each stage in the spaces provided below each question.
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) **Non-programmable** silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.
- (h) **This paper consists of 18 printed pages.**
- (i) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (j) **Candidates should answer the questions in English.**



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



SECTION I (50 marks)

Answer *all* the questions in this section in the spaces provided.

1. Find x if $(5x - 3)^{\log(5x-3)} = 1.232$ (3 marks)

2. Without using tables or a calculator, simplify the expression below in the form $a\sqrt{2} + b\sqrt{6}$; (3 marks)

$$\frac{\cos 225}{\sin 150^\circ + \tan 600^\circ}$$

3. Madam Juliana Cherera expands $(a + b)^2$ incorrectly as $a^2 + b^2$. Find her percentage error if $a = 8$ and $b = 12$. (3 marks)



4. Given that the coefficient of second last term of the binomial expansion for $\left(\frac{1}{6} + x\right)^n$ is $\frac{3}{2}$, find the n^{th} term of the expansion. (3 marks)

5. If one of the root of a quadratic equation is $\frac{3}{2}$, find the value of C hence other root of the equation; (3 marks)

$$6x^2 - 11x + C = 0$$

6. Make n the subject of the formula; (3 marks)

$$A = \frac{PR(T)^n}{T}$$



7. A cold water tap can fill a bath in 4 minutes while hot tap can fill in 6 minutes. The drain pipe can empty the bath in $4\frac{1}{5}$ minutes. The two taps and the drain pipe are fully open for 3 minutes after which the drain pipe is closed.

(a) What fraction of the bath is filled after the three minutes? (2 marks)


(b) How many seconds are required for the bath to be completely filled? (2 marks)

8. Solve for x in the equation $3 \cos^2 x - 1 = 2 \sin^2 x + 2 \cos x$ for $0^\circ \leq x \leq 360^\circ$ (3 marks)

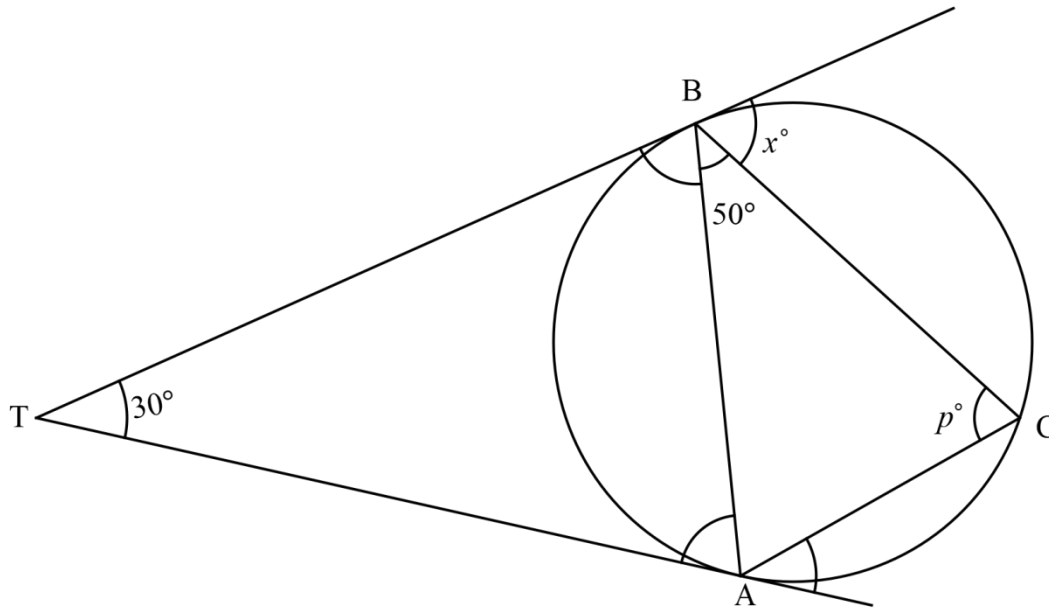
9. An object whose area is 10 cm^2 is transformed by the matrix $\begin{bmatrix} 2 & 1 \\ 4 & 5 \end{bmatrix}$ and the image transformed by matrix $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$. Find the area of the final image. (3 marks)



10. Calculate the area bounded by the function $y = x^2 - 2x$, the x - axis and the lines $x = -1$ and $x = 3$.
(3 marks)

- 
11. New cost of fuel (C) is partly constant and partly varies with the bags of fertilizer (F) after the government subsidy in order to curb future problem on living standard. If the cost of fuel is sh. 5200 when the bags of fertilizer is 15 and if the cost of fuel is sh. 4800 when bags of fertilizer is 10. Find the equation that connecting the relationship between the cost of fuel and the bags of fertilizer.
(3 marks)

12. The figure below show a circle, triangle and chords intersecting externally at T.



Find angle x and p .

(2 marks)

13. The table below shows the income tax for a certain year.

Monthly taxable income(Ksh.)	Tax rate %
1 – 9820	10
9821 – 18940	15
18941 – 28060	20
28061 – 37180	25
Over 37180	30

In that year, Mr. Kilukumi paid a net tax of Ksh. 5820 per month. His total monthly taxable benefits amounted to Ksh. 17220 and was also entitled to a monthly personal relief of Ksh. 1050. Calculate Kilukumi’s his monthly salary. (4 marks)

14. Given that a circle $x^2 + y^2 - 6x + 3y + C = 0$ passes through the point $R(8,1)$ and that P is another point such that RP is the diameter of the circle, find the coordinates of P.(4 marks)

15. Coffee at sh. 80 per kg is mixed with coffee at sh. 120 per kg. In the ratio 2: 3 respectively. In what ratio should this mixture be mixed with coffee at sh. 128 per kg to produce a blend worth sh. 108 per kg. (3 marks)

16. The set of data below shows the height of the maize seedlings in a certain seed bed and recorded as follows;

9, 4, 5, 6, 8, 10, 2, 7


Calculate the standard deviation of the height of the maize seedlings. (3 marks)



SECTION II (50 marks)

Answer only five questions from this section in the spaces provided.

17. (a) A sequence is formed by adding corresponding terms of Geometric progression and Arithmetic progression. The first, second and the third terms of the sequence formed are 28, 68 and 156 respectively. Given that the common ratio of the GP is 3, find the first term of GP and AP and the common difference of the AP. (5 marks)

- 
- (b) The second and third terms of a geometric progression (GP) are 48 and $24(P + 1)$ respectively. Find the value of P and hence the first term given that the sum of the first three terms of the geometric progression (GP) is 152. (5 marks)

18. A bag contains 15 balls, some are Red while others are blue. A ball is taken at random without replacement and the colors recorded. This is done twice. If the probability that the two balls are of blue colors is $\frac{3}{7}$.

(a) How many balls are red. (4 marks)

(b) Calculate the probability that;

(i) The balls are of the same color. (2 marks)

(ii) The balls are of different colors. (2 marks)

(c) Find the probability of obtaining at least red ball. (2 marks)

19. The following distribution shows the masses to the nearest kg of 50 animals in a certain farm.

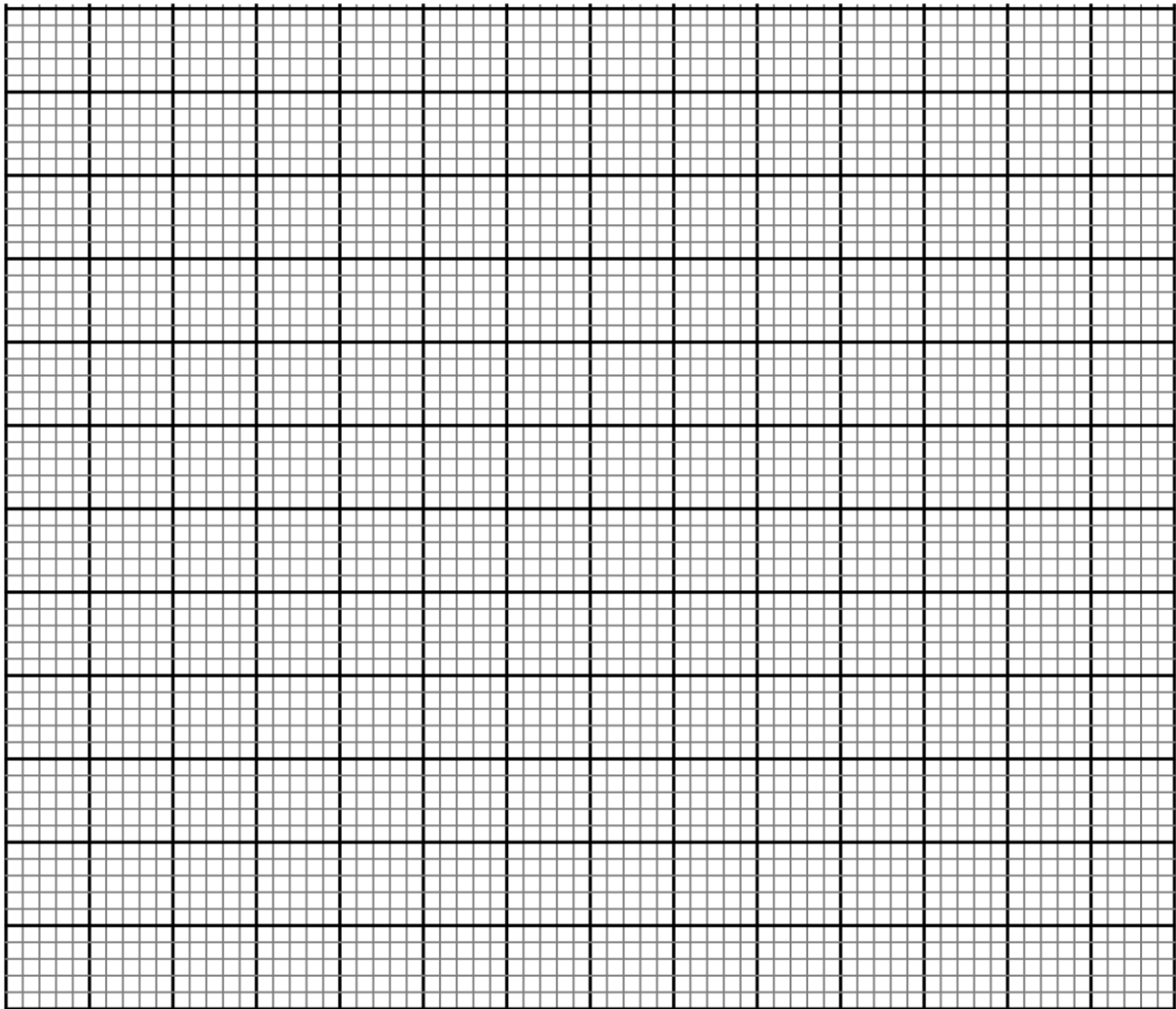
Mass(kg)	$25 \leq x \leq 35$	$35 \leq x \leq 45$	$45 \leq x \leq 55$	$55 \leq x \leq 65$	$65 \leq x \leq 75$	$75 \leq x \leq 85$
Frequency	3	11	18	12	5	x

(a) Find the value of x.

(1 mark)

(b) On the grid provided draw ogive curve for the given information.

(3 marks)



(c) Use the graph to find;

(i) Median mass.

(1 mark)

(ii) Quartile deviation.

(3 marks)

(iii) Percentage of animals whose mass is at least 50 kg.

(2 marks)



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

- (a) Construct a rectangle ABCD in which $AB = 75$ m and $BC = 60$ m. Use a scale of 1 cm representing 10 m. Measure length AC. (4 marks)

(b) On the same diagram, locate;

- (i) Locus P such that $\text{angle } APB = 60^\circ$ (2 marks)

- (ii) Locus Q which is nearer to line CD than line AB. (2 marks)

- (c) Shade the region inside a rectangle in which variable X lies such that $\text{angle } APB \leq 60^\circ$ and $AB > CD$. (2 marks)



21. The position of two points, A and C are A(30°S, 21°W) and C(35°N, 40°E) respectively. Port B is north of A and west of C.

(a) State the position of B. (1 mark)

(b) Find the distance in nautical miles between;

(i) Ports A and B. (2 marks)

(ii) Ports B and C to the nearest nautical miles. (2 marks)

(c) A ship left port C for port B on Thursday 1540 hours at an average speed of 575 km/hr.

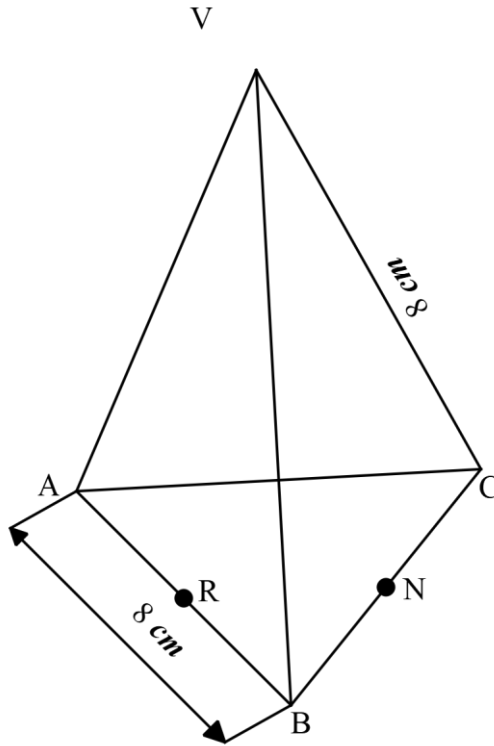
Given that 1 nm = 1.853 km, calculate;

(i) The local time at port B when the ship left port C. (2 marks)

(ii) The day and the time the ship arrived at port B. (3 marks)



22. The figure below shows a regular tetrahedron $VABC$ of sides 8 cm . R and Z are the mid points of AB and BC respectively.



Calculate;

(a) The length VR . (2 marks)

(b) The angle between the planes VAB and the plane ABC . (3 marks)



(c) The perpendicular height of the tetrahedron.

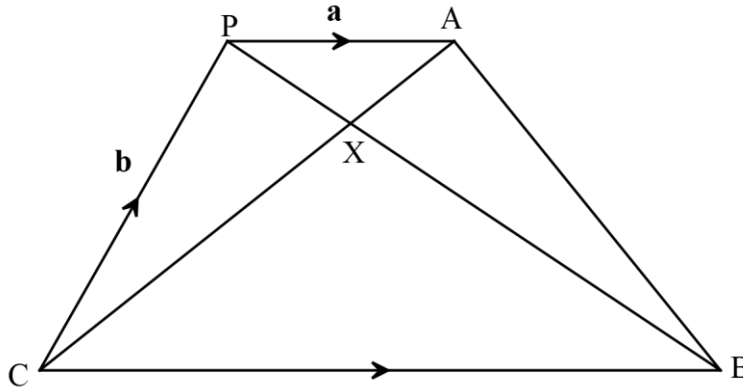
(2 marks)

(d) The angle between the line VC and the plane VAN.

(3 marks)



23. In the figure below, PABC is a trapezium. \vec{PA} parallel to \vec{CB} . Diagonals \vec{PB} and CA intersect at X and $\vec{CB} = 2\vec{PA}$, $\vec{PA} = \mathbf{a}$ and $\vec{CP} = \mathbf{b}$.



(a) Find in terms of \mathbf{a} and \mathbf{b} , the vectors;

(i) \vec{AB} . (1 mark)

(ii) \vec{PB} (1 marks)

(iii) \vec{CA} (1 mark)

(b) Given further $\vec{PX} = k\vec{PB}$ and $\vec{CX} = h\vec{CA}$, where k and h are constants;

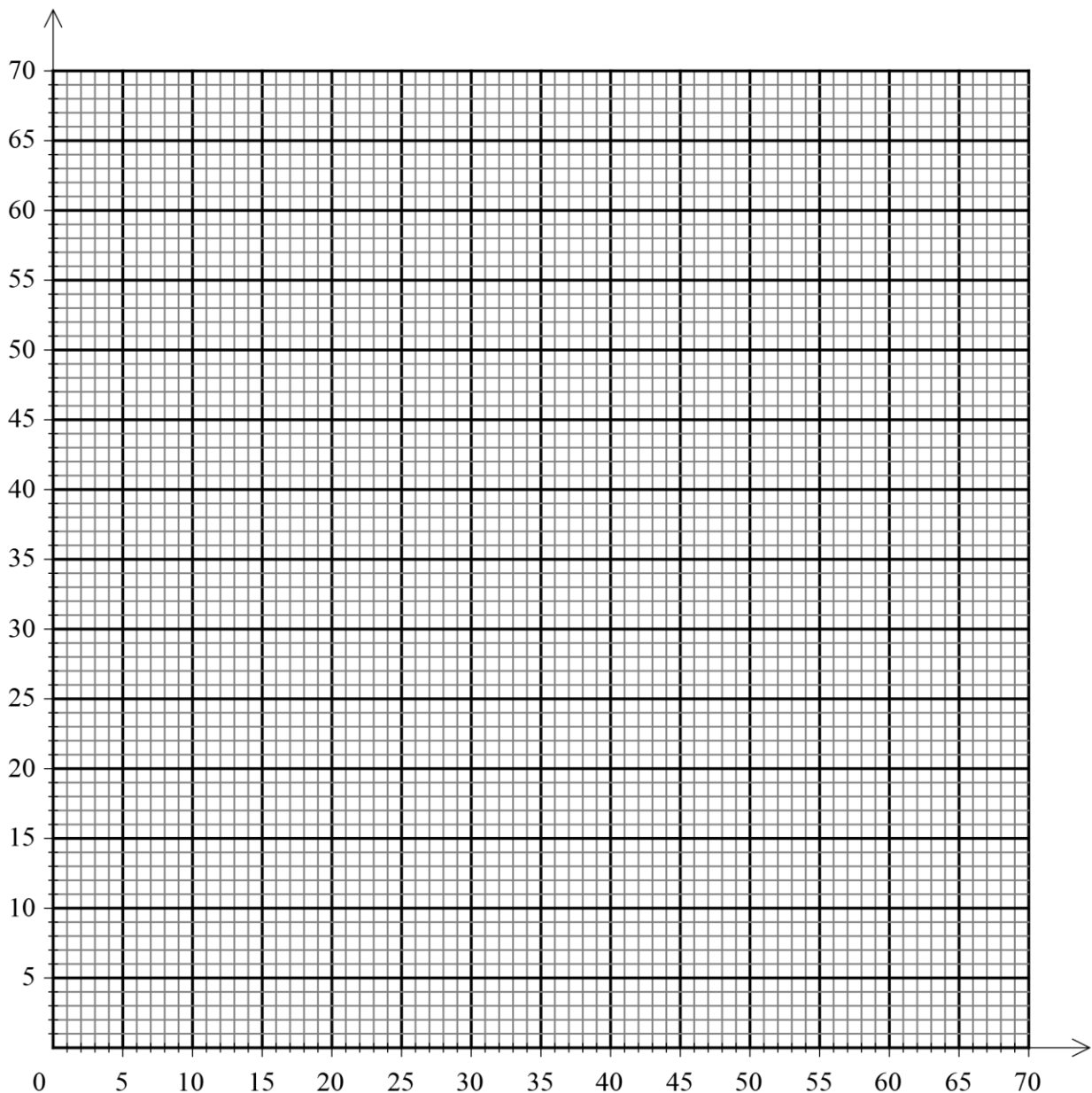
(i) Express PX in two different ways, hence find the value of k and h. (4 marks)

(ii) Show that P, X and B are collinear. (3 marks)

24. Jose Camargo, a Venezuelan man makes two types of vote identification; A and B. He take 3 hours to make one pair of type A and 4 hours to make one pair of B. He works for a maximum of 120 hours to make x pairs of type A and y pairs of type B. It costs him sh. 400 to make a pair of type A and sh. 150 to make a pair of type B. His total cost does not exceed sh. 9000. He must make 8 pairs of type A and more than 12 pairs of type B.

(a) Write down four inequalities representing the information above. (4 marks)

(b) On the grid below, draw the inequalities represented above. (4 marks)



- (c) Jose Carmago makes a profit of sh.40 on each pair of type A and sh.70 on each pair of type b. Use the graph in part (b) above to determine the maximum possible profit he makes. (4 marks)



THIS IS THE LAST PRINTED PAGE.