

121/1
MATHEMATICS
PAPER 1
Time: 2¹/₂ hours
KCSE 2023 TOP PREDICTION MASTER CYCLE 8

Name: Index No:

Stream: Candidate's Signature: Date:.....

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **two** sections: **Section I** and **Section II**.
- (d) Answer **all** the questions in **Section I** and only **five** questions from **Section II**.
- (e) All answers and workings must be written on the question paper in the spaces provided below each question.
- (f) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- (g) Marks may be given for correct working even if the answer is wrong.
- (h) **Non-programmable** silent electronic calculators and KNEC Mathematical tables may be used, except where stated otherwise.
- (i) This paper consists of 14 printed pages
- (j) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- (k) 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	19	19	20	21	22	23	24	Total

GRAND TOTAL

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SECTION I (50 MARKS)

*Answer **all** the questions in this section*

1. Mr. Oralph withdrew some money from a bank. He spent $\frac{3}{8}$ of the money to pay for Grace's school fees and $\frac{2}{5}$ to pay for Namaje's fees. If he remained with Kshs. 12,330, calculate the amount of money he paid for Namaje's school fees. (4 marks)

2. A straight line L passes through the point $(3, -2)$ and is perpendicular to a line whose equation is $2y - 4x = 1$. Find the equation of L in the form $y = mx + c$, where m and c are constants. (3 marks)

3. A Kenyan company received US Dollars 200,000. The money was converted into Kenya shillings in a bank which buys and sells foreign currencies as follows:

	Buying (in Kenya shillings)	Selling (in Kenya shillings)
1 US Dollar	77.24	77.44
1 Sterling Pound	121.93	122.27

- (a) Calculate the amount of money, in Kenya shillings, the company received. (2 marks)

- b) The company exchanged the Kenya shillings calculated in (a) above, into sterling pounds to buy a car from Britain. Calculate the cost of the car to the nearest sterling pound. (2 marks)

4. Tap A fills a tank in 6 hours, tap B fills it in 8 hours and tap C empties it in 10 hours. Starting with an empty tank and all the three taps are opened at the same time, how long will it take to fill the tank? (4 marks)
5. Given that $\sin(90 - x)^\circ = 0.8$, when x is an acute angle, find without using mathematical tables the value of $\tan x$. (2 marks)
6. The length of a rectangle is increased by 20% , while the width is decreased by 10% . Find the percentage change in area. (3 marks)
7. Three bells ring at intervals of 15 minutes, 21 minutes and 30 minutes. The bells will next ring together at 12: 30 pm .Find the time the bells had last rang together. (3 marks)

8. Simplify fully the expression

(3 marks)

$$\frac{6x^2 - 9xy - 6y^2}{8x^2 - 2y^2}$$

9. Solve $4 \leq 3x - 2 < 9 + x$, hence list the integral values that satisfies the inequality.

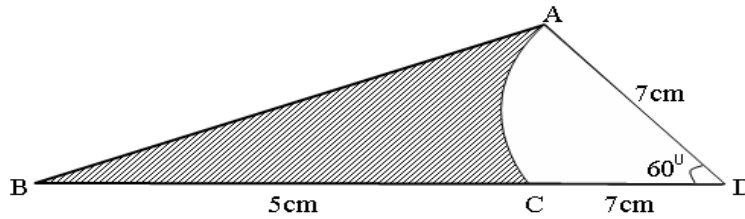
(3 marks)

10. The sum of interior angles of a regular polygon is 1800° . Find the size of each exterior angle. (3 marks)

11. The first three terms of a sequence are given as 10, 14 and 18. Find the sum of the first 10 terms of the sequence.

(2 marks)

12. In the figure below, AC is an arc of a circle centre D. Angle ADC = 60° , AD = DC = 7cm and CB = 5cm.



Calculate

- a) The area of triangle ADB (2 marks)
- b) The area of the shaded region. (2 marks)

13. Use the table of reciprocals, cube roots and square roots to evaluate; leaving your answer in 4 d.p. (4 marks)

$$\frac{3}{\sqrt[3]{6.859}} + \sqrt{0.2468}$$

14. A square brass plate of side 20mm has a mass of 1.05kg. The density of the brass is 8.4g/cm^3 . Calculate the length of the plate in centimeter. (3 marks)

15. The production of wool in grams of 20 sheep on a certain month was recorded as follows ; 22, 26, 15, 19, 22, 16, 27, 22, 20, 18, 28, 30, 22, 20, 15, 16, 22, 20, 17,18.

Determine;

a) The mode (1 mark)

b) Median (2 marks)

16. A transformation whose matrix is given by $\begin{pmatrix} 2x - 1 & -3 \\ 2 & x \end{pmatrix}$ maps a triangle with area 8 cm^2 onto another triangle with area 72 cm^2 , calculate the value of x (3 marks)

SECTION II (50 Marks)

Answer any *five* questions in this section in the spaces provided

17. A straight line L passes through P $(- 2, - 1)$ and Q (x, y) . It has a gradient of $-\frac{2}{3}$.

(a) Find the equation of the line L in the form $ax + by = c$, where a , b and c are integers. (3 marks)

(b) The line L is perpendicular to another line M. If the two lines meet at point P, find the equation of the line M in the form $\frac{x}{a} + \frac{y}{b} = 1$. (4 marks)

c) If the line M is parallel to line N which passes through point $R(-1, 2)$, find the equation of the line N. (3 marks)

18. Using a ruler and a pair of compasses only construct triangle ABC such that angle BAC = 90° , AC = 5 cm and BC = 10 cm. (3 marks)

- (a) Circumscribe a circle on the triangle ABC constructed above (3 marks)
- (b) Measure the radius of the circle (1 mark)
- (c) Find the difference in the area of the circumcircle and the triangle. (3 marks)

19. A and B are two points on latitude 40° N. The two points lie on the longitude 80° W and 100° E respectively. (taking $\pi = \frac{22}{7}$ and R = 6370 km) .

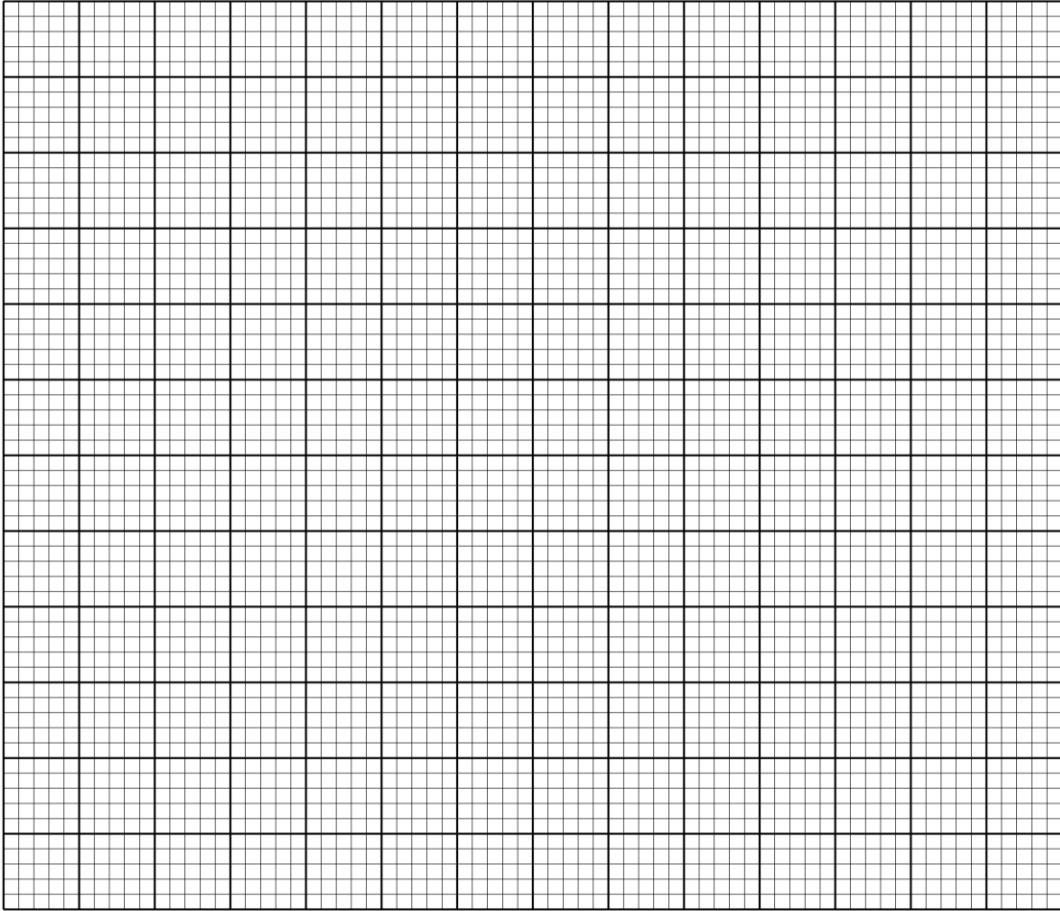
- (a) Calculate;
- (i) The distance from A to B along the parallel of latitude. (3 marks)
- (ii) The distance from A to B along the greater circle. (3 marks)

- (b) Two planes P and Q left A for B at 400 knots and 600 knots respectively. If P flew along the great circle and Q along the parallel of latitude, which one arrived earlier and by how much? Give your answer to the nearest minute. (4 marks)

20. (a) Complete the table below for the equation $y = x^3 + 4x^2 - 5x - 5$ for $-5 \leq x \leq 2$ (2 marks)

x	-5	-4	-3	-2	-1	0	1	2
y		15					-5	

- (b) On the grid provided, draw the graph of $y = x^3 + 4x^2 - 5x - 5$ for $-5 \leq x \leq 2$ (3 marks)



(c) Use your graph to solve the equation $x^3 + 4x^2 - 5x - 5 = 0$

(2 marks)

(d) By drawing a suitable straight line on the graph, solve the equation $x^3 + 4x^2 - 5x - 5 = -4x + 1$

(3 marks)

21. The displacement, S meters of a moving particle after t seconds is given by $S = 2t^3 - 5t^2 + 4t + 3$

Determine:

(a) The velocity of the particle when $t = 4$ seconds (3 marks)

(b) The value of t when the particle is momentarily at rest (3 marks)

(c) The displacement when the particle is momentarily at rest (2 marks)

(d) The acceleration of the particle when $t = 10$ seconds (2 marks)

22. A bus left Bondo at 8:00 a. m. and travelled towards Kisumu at an average speed of 80 km/hr. At 8:30 a.m. a car left Kisumu for Bondo at an average speed of 120 km/hr. Given that the distance between Bondo and Kisumu is 400 km. Calculate:

(a) The time the car arrived in Bondo (2 marks)

(b) The time the two vehicles met. (4 marks)

(c) The distance from Bondo to the meeting point (2 marks)

(d) The distance of the bus from Kisumu when the car arrived in Bondo. (2 marks)

23. A solid consists of a cone and hemisphere. The common diameter of the cone and hemisphere is 16 cm and the height of the cone is 6 cm. Using $\pi=3.142$
Calculate correct to two decimal places:

(a) The surface area of the solid

(3 marks)

(b) The volume of the solid

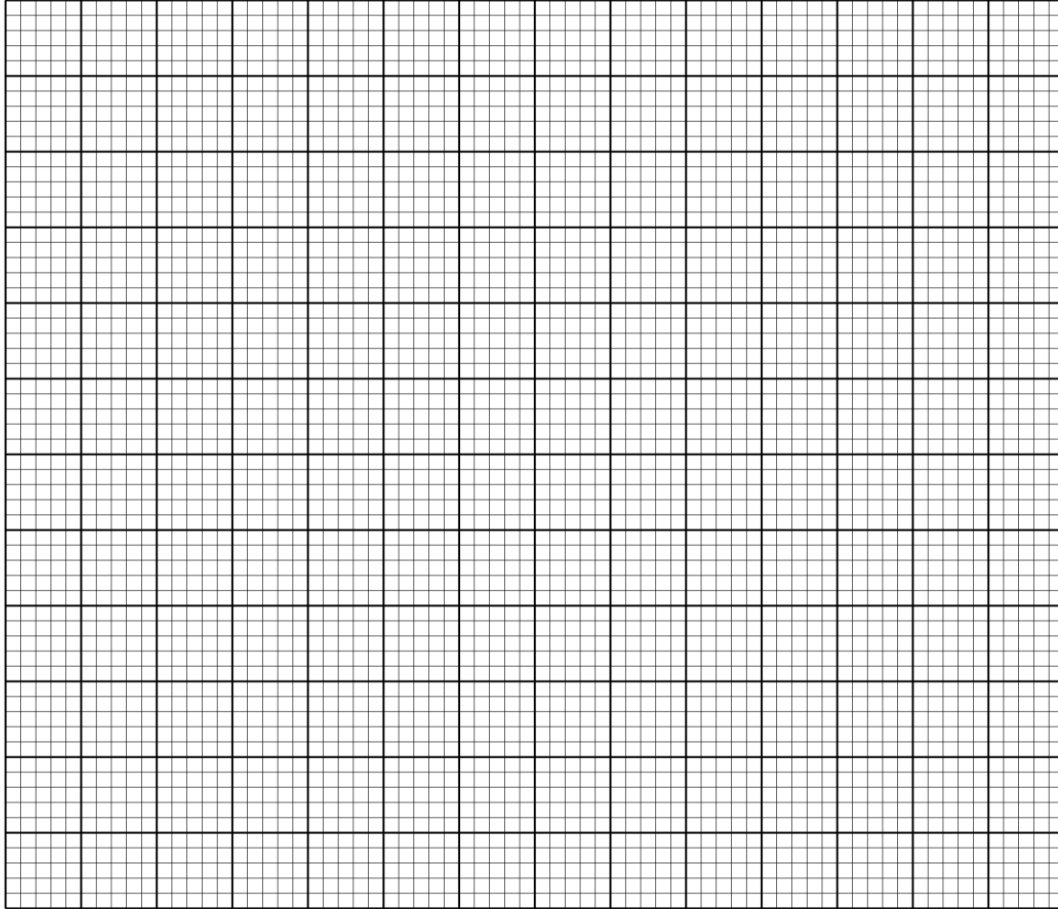
(4 marks)

(c) If the density of the material used to make the solid is 1.5 g/cm^3 , calculate its mass in kilograms
(3 marks)

24. The coordinates of a triangle ABC are $A(1, 1)$, $B(3, 1)$ and $C(1, 3)$.

(a) Plot the triangle ABC on the grid provided.

(1 mark)



(b) Triangle ABC undergoes a translation vector $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$. Obtain $A'B'C'$, the image of ABC under the transformation, write the coordinates of $A'B'C'$.

(3 marks)

(c) $A'B'C'$ undergoes a reflection along the line $x = 0$ to obtain $A''B''C''$. On the same pair of axes, plot $A''B''C''$ and state its coordinates.

(2 marks)

(d) $A''B''C''$ undergoes an enlargement scale factor -1 , centre $(0, 0)$ to obtain $A'''B'''C'''$. Draw triangle $A'''B'''C'''$.

(2 marks)

(e) Describe fully, the transformation that maps triangle $A^{IV}B^{IV}C^{IV}$ with coordinates $A^{IV}(-3, -3)$, $B^{IV}(-3, -5)$ and $C^{IV}(-5, -3)$ onto triangle.

(2 marks)