# KCSE 2023 TOP PREDICTION MASTER CYCLE 2

NAME: …… INDEX NO : ……..

**121/1**

**MATHEMATICS**

**PAPER 1**

**TIME: 2½ HOURS**

INSTRUCTIONS TO CANDIDATES

i. Write your name and Index number in the spaces provided above.
ii. This paper consists of two sections: Section I and Section II.
**iii.** Answer all questions in **Section I** and only Five questions from **Section II.**
iv. Show all the steps in your calculations giving your answer at each stage in the spaces provided below each question.
v. Non-programmable silent electronic calculators and KNEC mathematical tables may be used.

**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

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**SECTION I ( 50 MKS)**

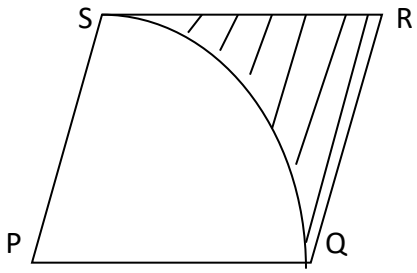
**Attempt all questions.**

1. Use tables of reciprocal only to evaluate $\frac{1}{0.325}$ hence evaluate : $3\sqrt{\frac{0.000125}{0.325}}$ (3mks)

2. Two boys and a girl shared some money. The elder got **4/9** of it, the younger boy got **2/5** of the remainder and the girl got the rest. Find the percentage share of the younger boy to the girls share. (3mks)

3. Annette has some money in two denominations only. Fifty shillings notes and twenty shilling coins. She has three times as many fifty shilling notes as twenty shilling coins. If altogether she has sh. 3,400, find the number of fifty shilling notes and 20 shilling coin. (3mks)

4. The figure below shows a rhombus PQRS with PQ= 9cm and ‹SPQ=$60^0$ . SXQ is a circular arc, centre P.




Calculate the area of the shaded region correct to two decimal places (Take Pie= 22⁄7) (4mks)

5. Solve the equation $2x^2 + 3x=5$ by completing the square method (3mks)

6. Simplify the expression $\frac{3x^2 - 4xy^2 + y}{9x^2 - y^2}$ (3mks)

7. Solve the equation **$8x^2 + 2x - 3 = 0$** hence solve the equation **$8\text{Cos}^2y + 2\text{Cos}y - 3 = 0$**
For the range $0^0 < y < 180^0$ (4mks)

8. Show that the points P(3,4), Q(4,3) and R(1,6) are collinear. (3mks)

9. Solve the inequalities $x \leq 2x + 7 \leq \frac{1}{3}x + 14$ hence represent the solution on a number line. (3mks)

10. The mean of five numbers is 20. The mean of the first three numbers is 16. The fifth number is greater than the fourth by 8. Find the fifth number. (3mks)

11. The volume of two similar solid spheres are $4752cm^3$ and $1408cm^3$. If the surface area of the small sphere is $352cm^2$, find the surface area of the larger sphere. (3mks)

12. Solve for x in the equation $\frac{1}{2}\log_2 81 + \log_2(x - x/3) = 1$ (3mks)

13. A farmer has a piece of land measuring 840m by 396m. He divides it into square plots of equal size. Find the maximum area of one plot. (3mks)

14. a) find the inverse of the matrix $\begin{pmatrix} 4 & 3 \\ 3 & 5 \end{pmatrix}$ (1mk)

b) Hence solve the simultaneous equation using the matrix method (2mks)

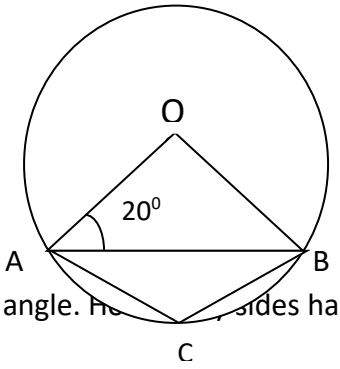
4x + 3y =6

3x + 5y +5

15. In the figure below O is the centre of the circle and <OAB=$20^0$. Find;

a) <AOB (1mk)

b) <ACB (2mks)




16. Each interior angle of a regular polygon is $120^0$ larger than the exterior angle. How many sides has the polygon? (3mks)

## SECTION II (50MKS)

## Choose any fie questions

17. Three business partners, Bela Joan and Trinity contributed Kshs 112,000, Ksh,128,000 and ksh,210,000 respectively to start a business. They agreed to share their profit as follows:

30% to be shared equally

30% to be shared in the ratio of their contributions

40% to be retained for running the business.

If at the end of the year, the business realized a profit of ksh 1.35 Million. Calculate:

a) The amount of money retained for the running of the business at the end of the year. (1mk)

b) The difference between the amounts received by Trinity and Bela (6mks)

c) Express Joan's share as a percentage of the total amount of money shared between the three partners. (3mks)

18. Complete the table below for the function $y=x^3 + 6x^2 + 8x$ for $-5 \leq x \leq 1$ (3mks)

| X | -5 | -4 | -3 | -2 | -1 | 0 | 1 |
|---|---|---|---|---|---|---|---|
| $X^3$ | -125 | -64 | | | -1 | 0 | 8 |
| $6X^2$ | | | 54 | | 6 | 0 | |
| 8X | -40 | | -24 | -16 | | 0 | 8 |
| Y | | 0 | 3 | | | 0 | 15 |

a) Draw the graph of the function $y=x^3 + 6x^2 + 8x$ for $-5 \leq x \leq 1$ (3mks)
(use a scale of 1cm to represent 1 unit on the x-axis . 1cm to represent 5 units on the y-axis)

b) Hence use your graph to estimate the roots of the equation
$X^3 + 5x^2 + 4x = -x^2 - 3x - 1$ (4mks)

19. Three islands P,Q,R and S are on an ocean such that island Q is 400Km on a bearing of $030^0$ from island P. island R is 520Km and a bearing of $120^0$ from island Q. A port S is sighted 750Km due South of island Q.

a) Taking a scale of 1cm to represent 100Km, give a scale drawing showing the relative positions of P,Q,R and S. (4mks)

Use the scale drawing to:

b) Find the bearing of:

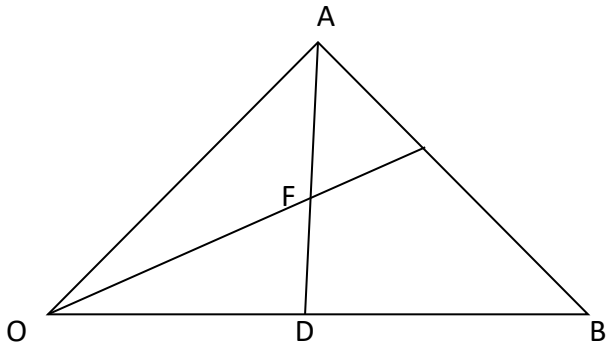
i. Island R from island P (1mk)

ii. Port S from island R (1mk)

c) Find the distance between island P and R (2mks)

d) A warship T is such that it is equidistant from the islands P,S and R. by construction locate the position of T. (2mks)

20. In the figure below, E is the midpoint of AB, OD:DB=@:3 and f is the point of intersection of OE and AD.




Given OA= a and OB= B

a) Express in terms of a and b

i. AD (1mk)

ii. OE 2(mks)

b) Given that AF= sAD and OF= tOE find the values of s and t (5mks)

c) Show that E,F and O are collinear (2mks)

21. A bag contains 5 red, 4 white and 3 blue beads . two beads are selected at random one after another.

a) Draw a tree diagram and show the probability space. (2mks)

b) From the tree diagram, find the probability that;

i. The last bead selected is red (3mks)

ii. The beads selected were of the same colour (2mks)

iii. At least one of the selected beads is blue. 3(mks)

22. The table below shows how income tax was charged on income earned in a certain year.

| Taxable income per year(Kenyan pounds | Rate shilling per K£ |
|---|---|
| 1-3630 | 2 |
| 3631- 7260 | 3 |
| 7261 -10890 | 4 |
| 10891 - 14520 | 5 |

Mr. Gideon is an employee of a certain company and earns a salary of ksh.15,200 per month. He is housed by the company and pas a nominal rent of Ksh. 1050 per month. He is married and is entitled to a family relief of ksh. 450 per month.

i. Calculate his taxable income in K£ p.a (2mks)

ii. Calculate his gross tax per month. (4mks)

iii. Calculate his net tax per month (2mks)

iv. Calculate his net salary per month (2mks)

23. The table below shows the distribution of mathematics marks of form 4 candindates in Mavoko Secondary school.

| Marks | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 |
|---|---|---|---|---|---|---|---|---|---|
| F | 4 | 7 | 12 | 9 | 15 | 23 | 21 | 5 | 4 |

Use the above date to calculate:

a) Mean using assumed mean of 65 (3mks)

b) Median (3mks)

c) Standard deviation (4mks)

24. Coast bus left Nairobi at 8.00am and travelled towards Mombasa at an average speed of 80Km/hr. At 8.30am, Lamu bus left Mombasa towards Nairobi at an average speed of 120 km per hour. Given that the distance between Nairobi and Mombasa is 400Km.: determine:

    i. The time Lamu bus arrived in Nairobi. (2mks)

    ii. The time the two buses met. (4mks)

    iii. The distance from Nairobi to the point where the two buses met. (2mks)

    iv. How far coast bus is from Mombasa when Lamu bus arrives in Nairobi (3mks)