**NAME:……………………………………………….ADM NO:…………… CLASS…………**

**SIGNATURE:……………………..          DATE:……………..**

121/2
MATHEMATICS
2 ½ hours

# KCSE 2023 TOP PREDICTION MASTER CYCLE 4

Kenya certificate of Secondary School-

Mathematics

Paper  2

2 ½ hours

## Instructions to candidates

1.Write your name and index number in the spaces provide above

2.Sign and write the date of examination in the  spaces provided above

3.This paper consists TWO section:Section I and Section II.

4.Answer all the Questions in Section I and Five questions from Section II.

5.All answers and workings must be written on this paper.

For Examiners 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 1  : 50 MKS

1.  Use logarithm tables  only, giving  your answer corrected to three significant figures ; to evaluate                                                                (4mks)

$$\frac{(0.5249)^2 \text{ x } 83.58}{\sqrt[3]{0.3563}}$$

2.  Make K the subject of the formula.                                             (3mks)

$$n = \frac{2x}{g} \sqrt{\frac{H\text{-}K}{3y}}$$

3.  Solve for θ in radians given.                                                   (3mks)
    $2 \cos 2\theta + 1 = 0$   for $0 \le \theta \le 2\pi^C$

4. Atieno was asked to round off $4\frac{7}{15}$ to 3 decimal places but she truncated it instead to 3 decimal places. Calculate.

   Her percentage error resulting from the misunderstanding.                    (3mks)

5. Ketepa tea worth Ksh 40 per kg is mixed with Sasini tea worth Ksh 60 per Kg in the ratio 3:1 . In what ratio should this mixture be mixed with Kericho tea worth Ksh 50 per kg to produce  a mixture worth Kshs 47 per kg.                    (3mks)

6. Calculate the length of a chord which is 3cm from the centre of the circle with radius 5cm. .
                    (3mks)

7. The position vectors of point A and B are **a**= -2i+j-8k and **b**= -3i+2j-2k respectively . Find the magnitude of **AB.**                    (3mks)

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8. Without the use of a calculator or mathematical tables, simplify. (3mks)

$$\frac{\text{Sin } 330^0 + \text{Cos } 120^0}{\text{Tan } 60^0 + \text{Cos } 240^0}$$

9. The cash price of a music system is Ksh 30000. It can be bought under hire purchase terms by paying a deposit of ksh 10,000 and twelve monthly instalment of Ksh 3200 per month. Determine the percentage rate of interest per month. (3mks)

10. Given that the coefficient of $x^3$ in the expansion $(a+\frac{x}{2})^4$ is 1
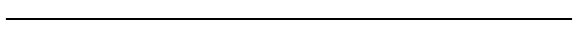
    a) Find the value of a (2mks)

    b) Hence write down the first four terms of $(a+\frac{x}{2})^4$ (2mks)

11. The image of a scalene triangle under the transformation given by the matrix $\begin{bmatrix} x + 1 & 1 \\ 2 & x \end{bmatrix}$ is a straight line. Find the possible value of x (3mks)

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12. Use the mid ordinate  rule to estimate the area bounded by the curve $y+x^2 = 4$ and the line
    $y = 0$ using four strips .                                                    (3mks)

13. State  the centre and radius of the circle  given by the following equation.

    $(x-4)^2 + (y+2)^2 - 4 = 0$                                    (2mks)

14. A ─────────────────────────── B
                  8cm
    Use the line AB above to construct rectangle ABCD with BC = 5cm . A region R moves
    inside the rectangle under the following conditions
    i) It is always nearer to AB than AD

    ii) and always at least 3cm from point B

    Locate R by shading the region.                                    (3mks)

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15. The probability that John misses lunch at school is ¾ . If he misses lunch , the probability that he dozes off during the afternoon lessons  is 4/7 . Otherwise his probability of  dozing off in the afternoon is ½ .

    a)  Illustrate the probabilities using a tree diagram.                 (1mk)

    b)  Calculate the probability that John does not doze off during the afternoon lessons.
                                                      (2mks)

16. The first  4 terms of a G.P are 4,8,16,32

    a)  Find the common ratio                                   (1mk)

    b)  Calculate the sum of the first 8 terms of the G.P            (2mks)

## SECTION II

**Answer only five questions**

17. a) Complete the table below for the function y = 2 Cos 3x                    (2mks)

| x | 0⁰ | 10⁰ | 20⁰ | 30⁰ | 40⁰ | 50⁰ | 60⁰ | 70⁰ | 80⁰ | 90⁰ | 100⁰ | 110⁰ | 120⁰ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cos 3x | 1.000 | - | 0.5000 | | -0.5000 | | -1.0000 | -1.8660 | | | 0.5000 | | 1.0000 |
| y | 2.00 | | 1.00 | | -100 | | -2.00 | -1.73 | | | 1.00 | | 2.00 |

b .i) Using the values in the completed table, draw the graph of y=2 Cos 3x for 0⁰≤ x ≤ 120⁰ on the grid provided.
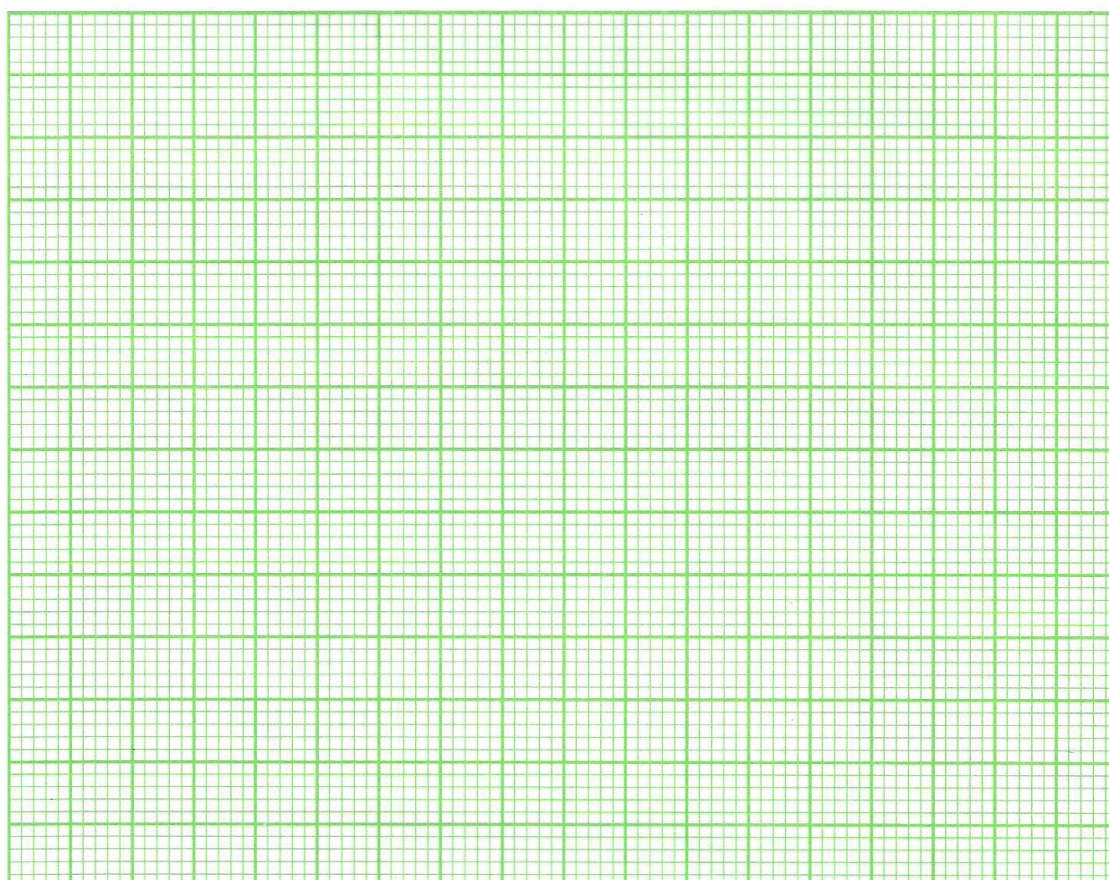
ii) Using the graph, solve the equation. 2 Cos 3x=0                    (3mks)

c) State the amplitude and period of the graph of y= 2 Cos 3x.                    (2mks)

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18. Muma is standing 10 Km from a point P which is due North from her. She walks on a straight on a bearing of $030^0$. By calculation, find

a.) How far will she have walked when she is equidistant from her starting point and P.

(2mks)

b.) What is the bearing of P from this equidistant point. (2mk)

c.) How far will Muma have walked when she is at the shortest distance from the point p.

(2mks)

d.) How far will the point P be from Muma when she walked 20 Km on the same straight path. (4mks)

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19. The height of a number of orange trees in an orchard were measured to the nearest (cm) and recorded in the table below.

| Height (cm) | Frequency |
|-------------|-----------|
| 131 - 140   | 13        |
| 141 – 150   | 23        |
| 151 – 160   | 36        |
| 161 – 170   | 50        |
| 171 – 180   | 35        |
| 181 – 190   | 28        |
| 191 - 200   | 15        |

Using an assumed mean of 165.5, calculate

a) The mean height (3mks)

b) The standard deviation of the distribution (4mks)

c) The quartile deviation (3mks)

20. The points A (5,-1) B (1,-2) and C (x ,y) of a triangle are mapped onto $A^1$ (1,5) $B^1$(2,1) and $C^1$ (4,2) by a matrix $\mathbf{N} = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$. Find

a) Matrix **N** of the transformation. (4mks)

b) Co-ordinates of C (2mks)

c) $A''$ $B''$ $C''$ are the image of $A'$ B'C' under a transformation represented by matrix
$\mathbf{M} = \begin{pmatrix} 2 & -1 \\ 0 & 0 \end{pmatrix}$.
Write down the co-ordinates of $A''$ $B''$ $C''$ (2mks)

d) A transformation **N** followed by **M** can be represented by a single transformation **K**.
Determine K (2mks)

21. A ship left port A ($11^0$ N, $32^0$ W) and sailed due west to another port B. The journey took 160 hours at an average speed of 28 knots. Given that radius of the earth is 6370km and $\pi = {}^{22}/_7$

a) Calculate the distance between A and B
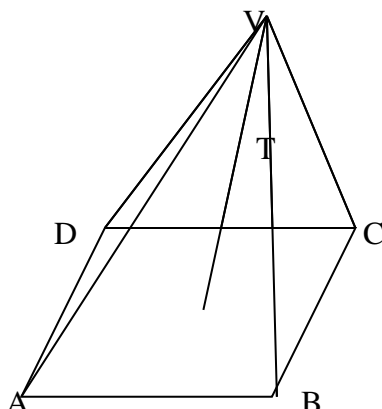i) In nautical miles                                                                                      (2mks)

ii) In km                                                                                                    (2mks)

b) Calculate the average speed of the ship in km/h correct to 2d.p                  (2mks)

c) Calculate to the nearest whole number the longitude of port B and hence state its position
(4mks)

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22.



The right pyramid above (not drawn to scale) has AB = 12 cm and BC = 16 cm. O is the centre of the base with OV = 15 cm.

Calculate, giving your answer to four significant figures.

a) The length of the slant edge                                                    (2mks)

b) The angle between the lines VA and VC                                          (2mks)

c) The angle between the plane ABV and the base ABCD                              (3mks)

d) The pyramid is chopped at point T to form a frustum such T divides OV in the ration 2:1. Find the volume of the frustum.                                            (3mks)

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23. The figure below shows the sketch of the curve $y = x^2 - 2x + 4$ and a straight line PQ which cuts the x-axis and the y-axis at the points (10, 0) (0, 10) respectively.
The line also intersects the curve at P and Q
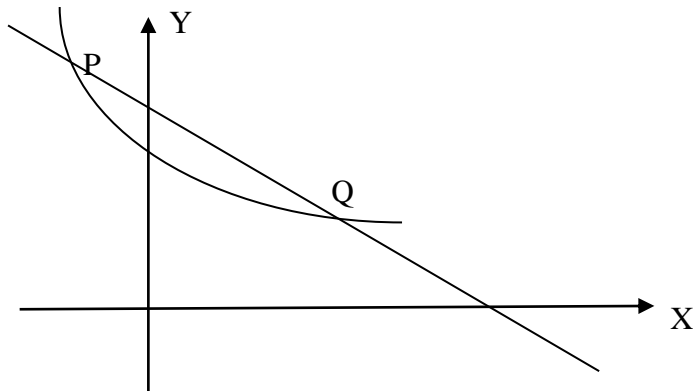


Find.

a   i.) The equation of the straight line in the form $y = mx + c$            (2mks)

ii.) The co-ordinates of P and Q            (4mks)

B Use integration to find the area of the shaded part.            (4mks)

24. Owiti makes two types of dresses, A and B. He takes 3 hours to make one pair of type A and 4 hours to make one pair of type 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 shs 400 to make a pair of type A and shs. 150 to make a pair of type B. His total cost does not exceed shs. 9000. He must make at least 8 pairs of type A and more than 12 pairs of type B.

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

b.) On the grid provided, draw the inequalities and shade the unwanted region. (3mks)
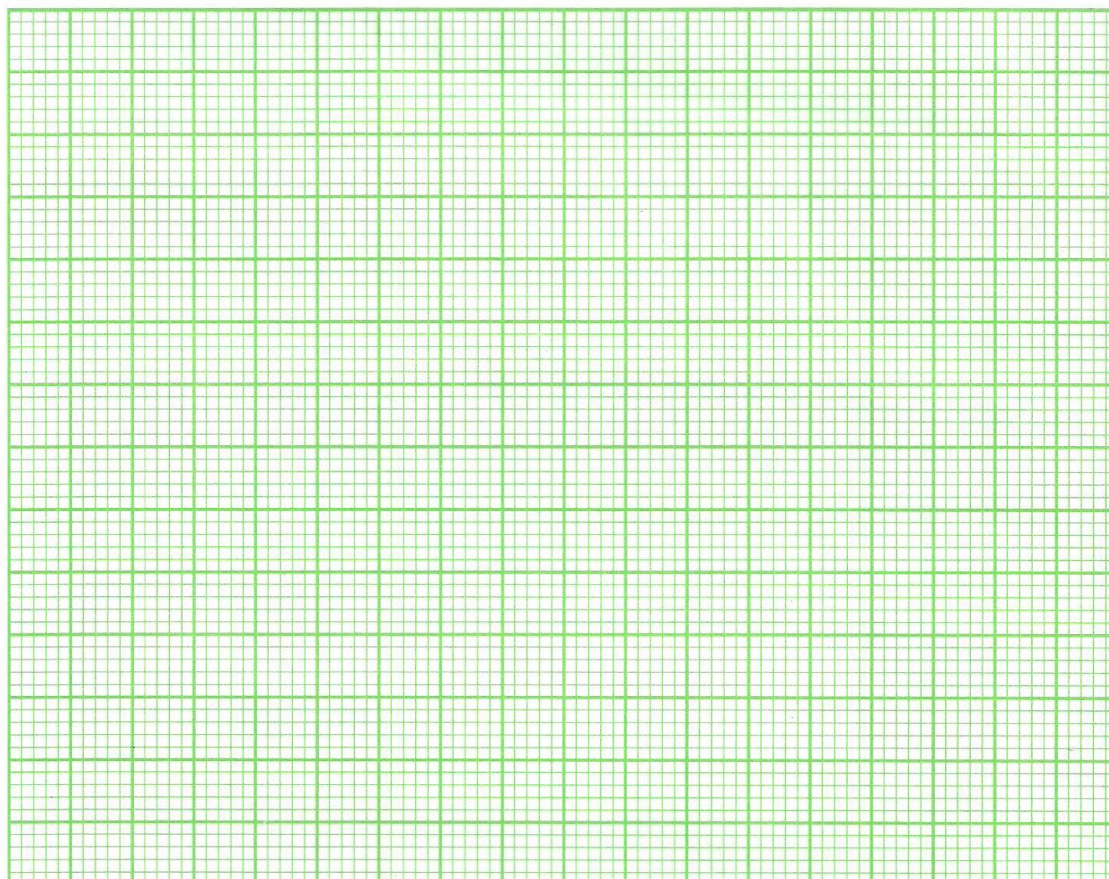
c.) Owiti makes a profit of shs. 40 on each pair of type A and shs. 70 on pair of type B dresses. Use the graph in part (b) above to above determine the maximum possible profit he makes. (3mks)

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