

NAME OF PARTICIPANT															
(STREAM)	F1	F2	F3	F4	A	B	C	D	M	K	Q	G	R		
CATEGORY					SENIOR						JUNIOR				
SIGNATURE															

TIME: 7,200,000,000,000ns

INSTRUCTIONS TO PARTICIPANTS

1. CALCULATORS AND MATHEMATICAL TABLES **ARE NOT PERMITTED**.
2. THE TEST CONSISTS OF **11** QUESTIONS, **5** IN SECTION **A** AND **6** IN SECTION **B**. YOU ARE REQUIRED TO ANSWER **ONLY 10** QUESTIONS, **5** IN SECTION **A** AND **ANY 5** IN SECTION **B**. EACH QUESTION IS WORTH 10 POINTS.
3. IN EVERY **KTH** NUMBERED QUESTION DIVIDE YOUR ANSWER BY **K**.
4. CRYING IS ALLOWED BUT SILENTLY.
5. ONLY RULE NUMBER ONE CAN BE BROKEN.

FOR OFFICIAL USE ONLY

QUESTION	1	2	3	4	5	6	7	8	9	10	11	GRAND TOTAL
MAXIMUM POINTS	10	10	10	10	10	10	10	10	10	10	10	100
PARTICIPANT'S SCORE												

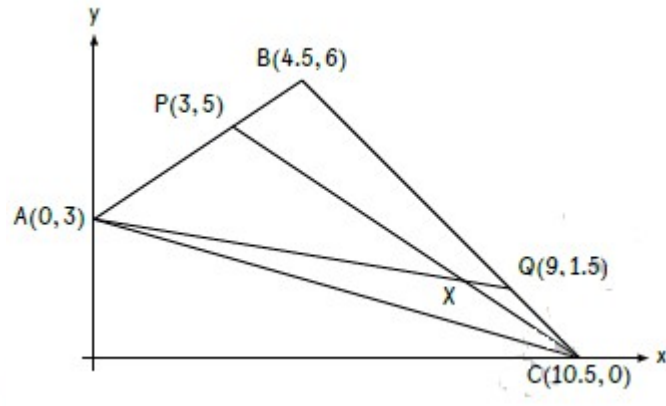
SECTION A

1. Solve for the exact value of x in the equation below.

[10 POINTS]

$$3^{6x+2} - 3^{9x+4} = 2106$$

2. In the diagram below, the vertices of triangle **ABC** are **A (0, 3)**, **B (4.5, 6)** and **C (10.5, 0)**. Points **P (3, 5)** and **Q (9, 1.5)** lie on lines **AB** and **BC** respectively.



a) Find.

[1 POINT]

i. **AQ**

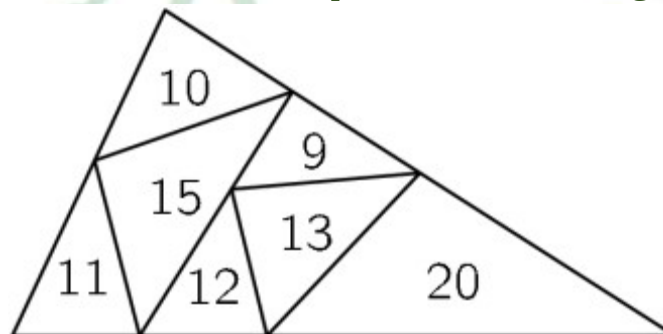
ii. **CP**

b) Lines **AQ** and **CP** intersect at **X** such that **CX = kCP** and **AX = mAQ** where **k** and **m** are scalars.

i. By expressing **OX** in two different ways, determine the values of **k** and **m**. **[7 POINTS]**

ii. Determine the exact coordinates of point **X**. **[2 POINTS]**

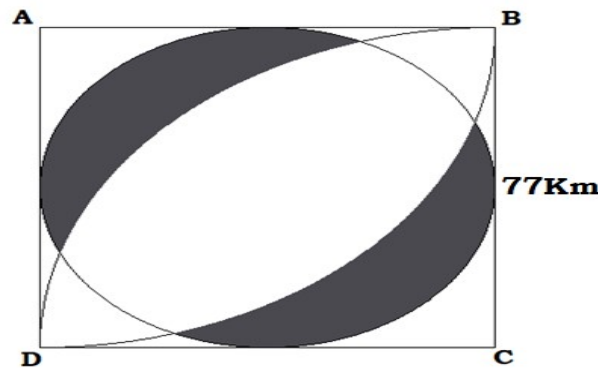
3. A large triangle is divided into smaller triangles as shown. The number inside each small triangle indicates its perimeter. What is the perimeter of the large triangle? **[10 POINTS]**



4. Then given that we have two two-digit numbers whose L.C.M is 136 and their G.C.D is 14. Find the sum of the two numbers. **[10 POINTS]**

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5. The figure below shows Baraka’s farm in Eldamaravine. Determine the exact area of the shaded part which he wishes to give Khisa as a birthday gift without application of calculus but limiting yourself to Geometry and Trigonometry only. **[10 POINTS]**



SECTION B

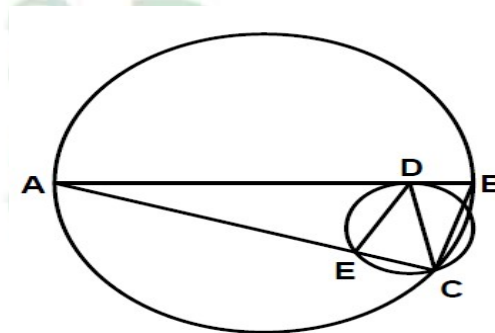
6. Consider the matrix.

[10 POINTS]

$$A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} \quad \text{find } A^{2023}$$

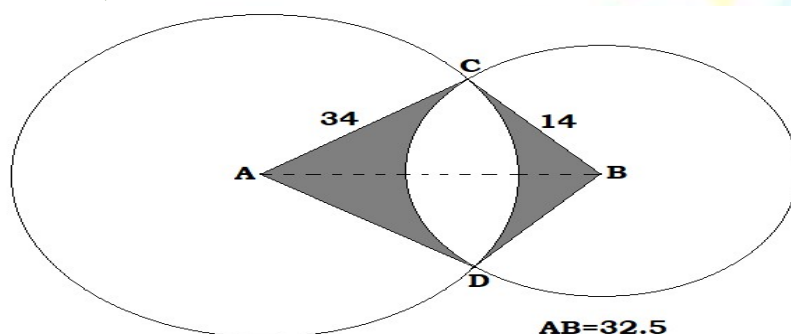
7. In the class 4A in The Great Alliance High School, there are some 53 students. Determine the probability that at least two students were born on the same day. **[10 POINTS]**

8. In the diagram, the two circles meet each other at C . The diameter AB of the bigger circle is tangent to the smaller circle at D . If DE bisects $\angle ADC$ and $\angle BAC = 27^\circ$, find $\angle BCD$



[10 POINTS]

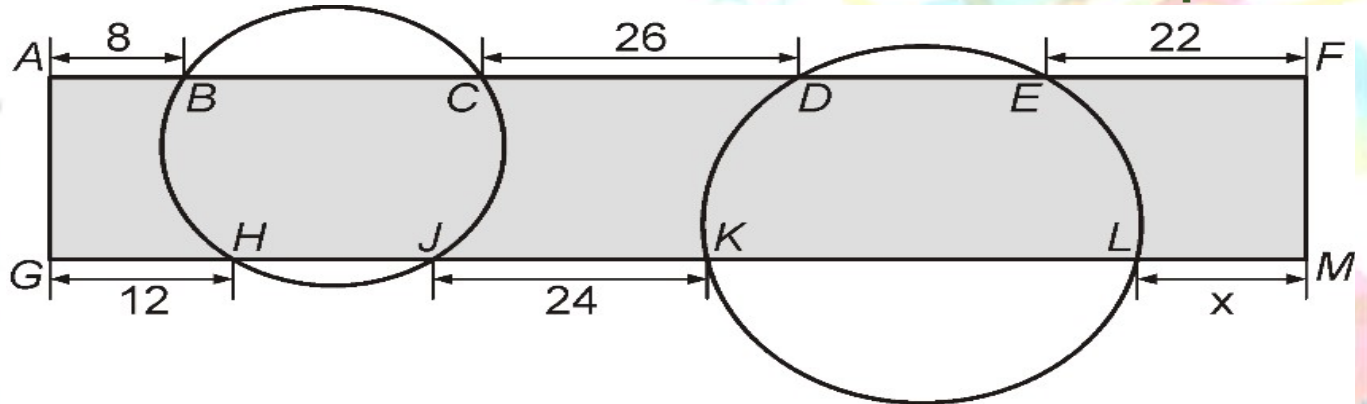
9. In a land selling document, Omutere wanted to sell the shaded region of his piece of land to Mukoya whose shape is as shown in the figure below. Point **A** and **B** are the centers of the circular fields. $BC = 34$, $AC = 14$ and $AB = 32.5$.



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Unfortunately, Mukoya refused to buy the land. Calculate the area of the shaded region and suggest a reason why Mukoya refused to buy the land. **[10 POINTS]**

10. Two circles intersect a rectangle **AFMG** as shown in the diagram. The line segments along the long side of the rectangle that are outside the circles have length **$AB = 8$, $CD = 26$, $EF = 22$, $GH = 12$ and $JK = 24$** . How long is the length x of the line segment **LM** ? **[10 POINTS]**



11. Consider some set K ,
 $K = (1, 2, 3, \dots, 2021, 2022, 2023, \dots, 12345 \dots 202120222023)$
 Determine the number of all subsets. **[10 POINTS]**

The End

WE HOPE AND BELIEVE THAT THIS TEST HAS FILLED YOUR HEART WITH JOY AND LAUGHTER.

MATHEMAGICS CLUB EXECUTIVE COMMITTEE

- | | | |
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– ALL THE BEST IN THIS TEST –

✓ The Executive Committee reserves the right to nullify results of any participant who commits any form of malpractices.