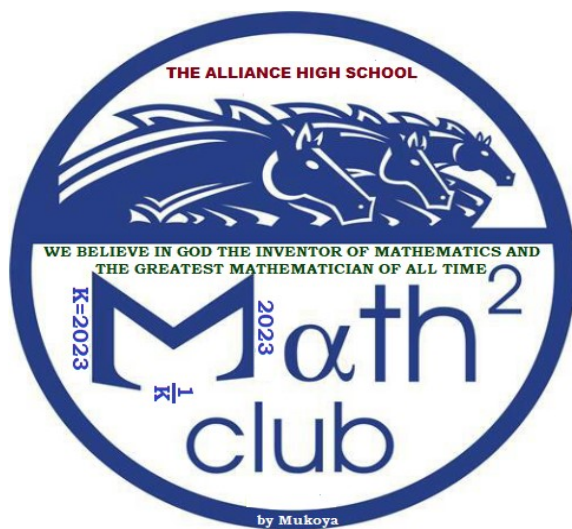


"We believe in God, The Inventor of Mathematics and The Greatest Mathematician of all time"

FORM ONE TEST

10:45 A.M–12:45 P.M SATURDAY 18TH FEBRUARY 2023



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

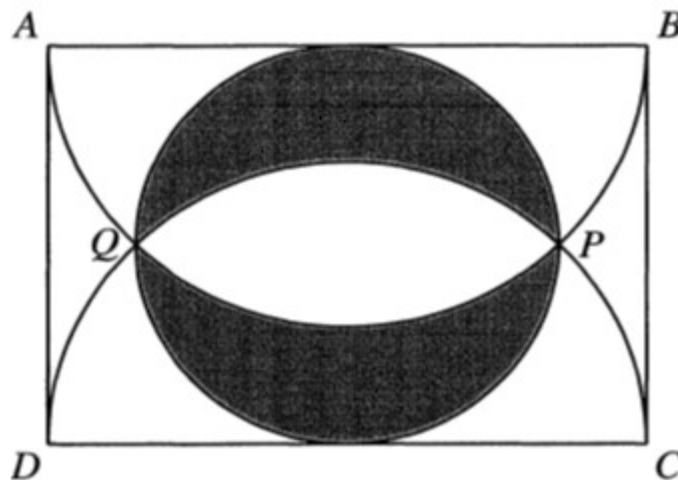
QUESTION	1	2	3	4	5	6	7	8	9	10	11	GRAND TOTAL
MAXIMUM POINTS	10	10	10	10	10	10	10	10	10	10	10	100
PARTICIPANT'S SCORE												

SECTION A

1. Given that Soita has some rabbits which he wishes to count and the outcome is that, when he counts in groups of fives, 4 rabbits remain, when he counts in groups of four, only one rabbit remains, when he counts in groups of three, no rabbit remains, when he counts in groups of sevens, 6 rabbits remain and when he counts in groups of nineteens, 12 rabbits remain. If this was the outcome then determine the least number of rabbits Soita might be having. **[10 POINTS]**
2. Khisa walked half way to school but when he realized he was late he ran the rest of the journey to school. Khisa took 6 minutes to walk to school. If by running he was three times faster than he walked. How long did Khisa take on the way to school? **[10 POINTS]**
3. Obungu was making noise in class and his teacher Akollo gave him a math question to solve as a punishment. Akollo told him to find the sum of the first 2023 odd numbers before he comes back or else, he would be severely punished. Determine the answer to Akollo's question and suggest what might have happened to Obungu. **[10 POINTS]**
4. What is the second digit from the left of the number. **[10 POINTS]**

$$(10^{16} + 1)(10^8 + 1)(10^4 + 1)(10^2 + 1)(10^1 + 1)$$

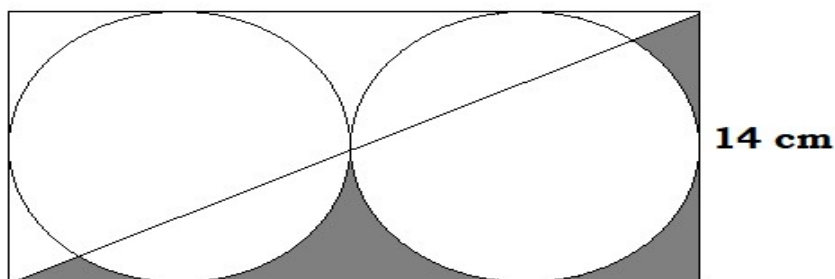
5. Let **ABCD** be a rectangle with **AB = 2023 cm**, consider the circles **C₁** and **C₂** with the diameters **AB** and **CD**. Then let **P**, **Q** be the intersection points of **C₁** and **C₂**. If the circle with the diameter **PQ** is tangent to **AB** and **CD**. Then, determine the exact area of the shaded region.



SECTION B

6. Determine the exact area of the shaded region.

[10 POINTS]



7. In the following sum **O** represents the digit **0**. The letters **A**, **B**, **X** and **Y** each represents a distinct digit. How many possible digits can **A** be?

[10 POINTS]

$$\begin{array}{r} A \ O \ O \ B \ A \ O \ O \ B \\ + \ B \ O \ O \ A \ B \ O \ O \ A \\ \hline X \ X \ O \ X \ Y \ X \ O \ X \ X \end{array}$$

8. Determine the exact value of the sum below.

[10 POINTS]

$$\left(1 - \frac{1}{2}\right) \times \left(1 - \frac{1}{3}\right) \times \left(1 - \frac{1}{4}\right) \times \left(1 - \frac{1}{5}\right) \times \dots \times \left(1 - \frac{1}{2022}\right) \left(1 - \frac{1}{2023}\right)$$

{HINT ... MEANS INFINITY}

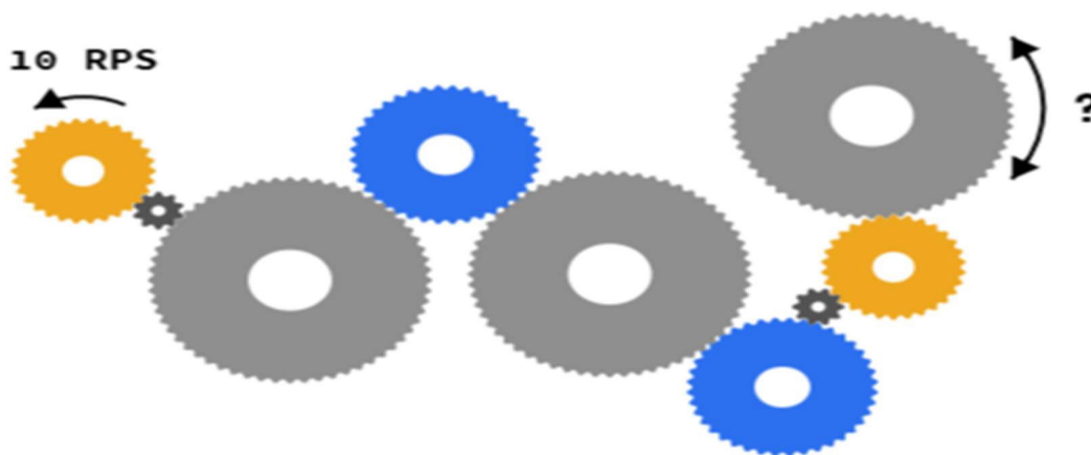
9. If $\frac{139}{22} = a + \frac{1}{b + \frac{1}{c}}$ where **a**, **b** and **c** are positive integers, determine the value of

$$abc(a + b + c).$$

[10 POINTS]

10. In the diagram below, dark grey gears have exactly 10 teeth, yellow gears have exactly 30 teeth and the light grey gears have exactly 60 teeth. We do not know how many teeth the blue gears have. If the gear on the far left rotates exactly 10 times per second. How fast does the light grey gear on the far right rotate?

[10 POINTS]



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11. Derrick writes down in her notebook the list of all positive integers from **1** to **1000** inclusive. Ement then erases all even numbers from the list and replaces them with their halves. How many different numbers are written in Derrick’s notebook once Ement is finished?

[10 POINTS]

Welcome to Alliance High School.

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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| 2. MATILU MUYEKU | VICE CHAIRMAN | 8. CLIVE MAINA -FORM 3 REP 2 |
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| 5. NIMROD NYABERI | ORGANISING SECRETARY | |
| 6. ANDREW CHELIMO | TREASURER | SETER: MUKOYA KHISA(CHAIRMAN) |

– ALL THE BEST IN THIS TEST –

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

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