AIMS Rwanda
Junior Maths Challenge Round 2

May 29th 9:00am-11:30am

Time allowed: 2 hours 30 minutes / Ikizamini kigenywe gukorwa: Amasaha abiri n'igice

Your answer sheet should contain the following information: 1. Name / Amazina yawe, 2. Gender / (Gabo/Gore), 3. Date of Birth / Itariki y'amavuko, 4. Whatsapp contact / Numero ya Whatsapp ukoresha, 5. Year in School / Umwaka wigamo, 6. Subject combination / Ibyo wiga, 7. School name / Ishuri wigaho, 8. Teacher name / Izina rya mwalimu wawe, 9. District of the school / Akarere wigamo

The competition is answer only. No rough work should be submitted. / Wirinde kwanduza aho ukorera, andika igisubizo gusa.

You should do this competition on your own, with no help from anyone. By submitting an answer sheet, you are saying that you did not cheat and everything you wrote was from your own brain. Icyitonderwa: Urasabwa gukora iki kizamini wenyine, wirinde gukopera. Mu gutanga urupapuro wakoreyeho, uraba wemeje ko ari wowe wikoreye ikizamini.

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1. Find the highest common factor of 1296 and 816.
2. We define $\mid x \mid$ to be the same as x if x is positive (or zero) and $-x$ if x is negative. For example, $\mid -3 \mid = 3$, $\mid 6 \mid = 6$ and $\mid 0 \mid = 0$. Find all values of x such that $\mid 5x - 2 \mid = 3$.
3. There are 50 students in a class. 30 like mathematics. 40 like Kinyarwanda. 20 like English. What is the maximum possible number of students who like all 3 subjects?
4. What is the area of a triangle with co-ordinates of the corners (0,0), (5,7) and (6,4)?
5. I am thinking of a 4 digit number. The number is the same forwards and backwards. It is also a multiple of 12. The sum of the 4 digits is 6. What is the number?
6. Tap A fills a 12L bucket in 3 minutes. Tap B fills a 12L bucket in 6 minutes. How long does it take to fill the 12L bucket with both taps working together?
7. What is the smallest number with exactly 10 factors?
8. I have 1000 small cubes, each small cube is $1cm \times 1cm \times 1cm$. I make a large cube from my 1000 small cubes. The large cube is $10cm \times 10cm \times 10cm$. I paint the surface of the large cube blue. How many of the 1000 smaller cubes have no paint on them?
9. Which of these is largest? $3^{(3^2)}$ or $2^{(3^3)}$ or $3^{(2^3)}$
10. Remy is randomly given a number from $\{2, 4, 6, 8, 10\}$, Emmanuel is randomly given a number from $\{1, 3, 7, 9, 11\}$. What is the probability that Remy has a larger number than Emmanuel?
11. A unit fraction is a fraction of the form $1/n$ for an integer n (e.g $\frac{1}{2}, \frac{1}{3}$). Write $\frac{11}{12}$ as the sum of 3 unit fractions. $\frac{11}{12} = \frac{1}{a} + \frac{1}{b} + \frac{1}{c}$, what are a, b and c?
12. $f(n) = \frac{n-1}{3}$ <u>if</u> n has a remainder of 1 after division by 3 <u>or</u> $f(n) = n - 1$ otherwise.
    For example $f(3) = 3 - 1 = 2$, $f(5) = 5 - 1 = 4$ and $f(4) = \frac{4-1}{3} = 1$.
    a) Find all values of m such that $f(m) = 2$
    b) Find all values of n such that $f(f(f(f(n)))) = 2$
13. Two identical blue blocks, two identical red blocks and two identical green blocks are placed next to each other in a row. In how many ways can we do this

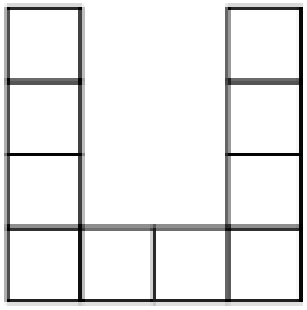

Figure 1

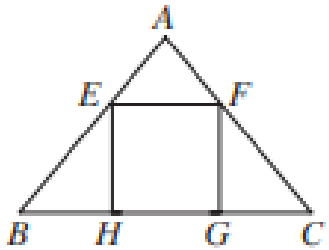

Figure 2

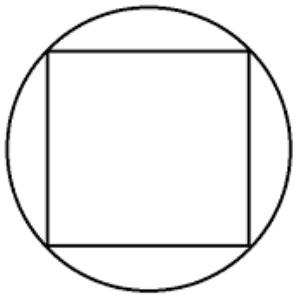

Figure 3

14. In Figure 1, there is 10 identical squares. If the total area of the figure is $160cm^2$, what is the perimeter of the figure?
15. In figure 2, triangle ABC is isosceles with $|AB| = |AC|$ and $|BC| = 30cm$. Square EFGH , which has a side length of $12cm$, is in triangle ABC, as shown. What is the area of triangle AEF?
16. In Figure 3, A square fits perfectly inside a circle. What is ratio of the area of the square to the area of the circle? ?
17. Isaac flips/tosses a coin 4 times. What is the probability that he gets at least 1 heads?
18. How many positive integers less than 2020 are divisible by 8 and 12?
19. What is the last digit of $3^{100} \times 7^{211} \times 2^{20}$?
20. a and b are positive integers such that: $a \times b = 600$. What is the biggest possible value of $a + b$?

Definitions:
digit: a single number. Here is a four digit number: 4354. Here is a five digit number 65382. The last digit of 546 is 6.
factor of a number: The factors of 6 are 1,2,3,6, so 6 has 4 factors. The factors of 12 are 1,2,3,4,6,12, so 12 has 6 factors.