

AIMSRW Quarantine Problem Solving

May 22nd 9:00am-11:30am

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

Each correct answer is worth 2 marks. Each incorrect answer means you lose 1 mark/ Nukora ikibazo urahabwa amanota 2, Nucyica urakurwaho inota.

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 wakoreye, uraba wemeje ko ari wowe wikoreye ikizamini.

Section A: Multiple choice

1. The sum of the first 10 even numbers $2 + 4 + \dots + 20 = 110$. What is the sum of the first 10 numbers divisible by 6. Question: $6 + 12 + \dots + 60 = ?$
A : 330 B : 78 C : 660 D : 600 E : 300
2. Isaac flips/tosses a coin 4 times. What are the chances that he gets exactly 2 heads?
A : $\frac{5}{8}$ B : $\frac{1}{2}$ C : $\frac{3}{8}$ D : $\frac{1}{4}$ E : 0
3. For what value of k is the line passing through $(5, 2k + 3)$ and $(16, 4k - 3)$, parallel to the x-axis?
A : 0 B : 2 C : 1 D : 3 E : 4
4. In Figure 1, rectangle ABCD is made up of six squares. The areas of two of the squares are shown. The perimeter of rectangle ABCD, in centimetres, is
A : 46 B : 44 C : 48 D : 144 E : 288
5. If $3^n = 9^{36}$, what is the value of n ? **A : 18 B : 12 C : 72 D : 6 E : 4**
6. A bag contains red, yellow and green balls. If the ratio of red:yellow:green is 5:4:2 and there are 16 yellow balls, how many balls in total?
A : 16 B : 28 C : 44 D : 18 E : 23
7. How many points (x, y) with x an integer and y an integer are on the line $y = 3x + 4$ and inside the region bounded by $x = 2.5$, $x = 19$, $y = 10$ and $y = 41$?
A : 16 B : 9 C : 17 D : 10 E : 6
8. a , b , and c are positive integers (> 0) such that $a + b + c = 18$ What is the maximum value of $a \times b$?
A : 36 B : 81 C : 72 D : 216 E : None of previous answers
9. How many numbers less than 2021 are divisible by 4 and 6?
A : 84 B : 85 C : 1177 D : 1178 E : 168

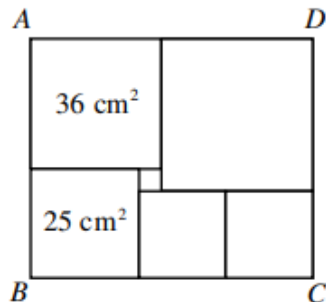


Figure 1

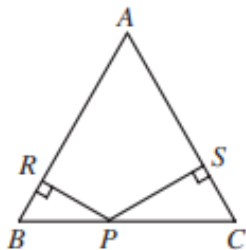


Figure 2

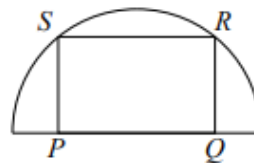


Figure 3

10. There are 3 red balls, 5 yellow balls and 7 green balls in a bag. Isaac chooses 2 balls from the bag. What are the chances that he gets one red and one yellow ball?
- A : $\frac{8}{15}$ B : $\frac{2 \times 8}{15 \times 14}$ C : $\frac{3 \times 5}{15 \times 15}$ D : $\frac{2 \times 3 \times 5}{15}$ E : $\frac{2 \times 3 \times 5}{15 \times 14}$

Section B: Answer only

- Find x such that the mean of 6, 8, x , $3x$, $4x + 2$ and $2x$ is 11.
- (a) Find $f'(x)$ when $f(x) = 3^x$.
(b) Find $f'(x)$ when $f(x) = (x^2 + 1)^{(x+1)}$
- Coach Remy has 5 girls (Let's call them A,B,C,D and E) and 7 boys (Let's call them F,G,H,I,J,K and L). He wants to put 5 players on the volleyball court. He must have 2 girls and 3 boys. In how many ways can he do this?
- Give an example of an integer that has exactly 16 divisors. (include a list of the divisors)
- In Figure 2, Triangle ABC is isosceles with $|AB| = |AC| = 60$. P is a point on BC such that the perpendicular distances from P to AB i.e. $|PR| = 24\text{cm}$ and from P to AC i.e. $|PS| = 36\text{cm}$. What is the area of ABC?
- In Figure 3, rectangle PQRS has side PQ on the diameter of the semicircle with R and S on the semicircle. If the diameter of the semicircle is 20 and the length $|PQ| = 16$ then the length $|PS|$ is?
- Evaluate: $1 + 2 - 3 - 4 + 5 + 6 - 7 - 8 + 9 + 10 - 11 - 12 + 13 + 14 \dots + 2017 + 2018 - 2019 - 2020$
- Consider vectors in \mathbb{R}^3 : $a = (0, 0, 1)$ and $b = (1, -1, 0)$. Find vector c that is perpendicular to both a and b .