

2023 Gauss Math Tournament Target Round (Div. 3)

June 10, 2023

.....Set 1

1. If the perimeter of a rectangle is 74 and the area is 270, what is the absolute value of the difference between the side lengths?
2. Find the length of the smallest path from $(-9, 8)$ to $(7, 4)$ that touches both coordinate axes.

.....Set 2

3. Calculate the sum of all odd factors of 3332.
4. A positive integer x satisfies the relation $10^2 \leq \log x \leq 10^5$, where $\log x$ denotes the base 10 logarithm. Let S denote the number of possible x . What is the sum of the digits of S ?

.....Set 3

5. Alice and Bob are each secretly given a real number between 0 and 1 uniformly at random. Alice states, "My number is probably smaller than yours." Bob repudiates, saying, "No, my number is probably smaller than yours!" Alice concedes, muttering, "Fine, your number is probably smaller than mine." If Bob and Alice are perfectly logical and act upon all information given to them, what is the probability that Bob's number is actually greater than Alice's?
6. Points $A, B, D, C,$ and E are constructed along the circumference a circle in that order such that $CA = AD = DE = EB$. Suppose that $AD - EC = 9$ and $BD = 12$. Compute BC .

.....Set 4

7. What is the smallest composite number that is not a factor of $200!$, where $200!$ denotes the product of all positive integers less than or equal to 200?
8. In the game of *Minehopper*, a grasshopper jumps along the real number line. In a "jump", the grasshopper travels either two or three units to the right. At each integer position between 0 and 8 exclusive, there is a 50% probability that it is occupied by a mine. There are no mines on positions 0 and 8. If the grasshopper jumps on a mine, it explodes. Your goal is to find a sequence of jumps that will allow the grasshopper to travel from 0 to 8. What is the probability that this is possible?