

Quiz 1: ECS 342/442/642 Competitive Programming

2 pm to 2 : 45 pm on 10th Jan, 2025

Instructions

- Open Linux, create folder on Desktop titled `quiz-01`
 - If your enrollment number is 20001, the folder should contain files `quiz-11-20001.cpp`, `quiz-12-20001.cpp`, and `quiz-13-20001.cpp` corresponding to the following three questions respectively.
 - Your output should be as specified in the solution of in `test-01` problem on the website.
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Questions

1. (10 pts) **Collatz Conjecture Sequence** Consider an algorithm that takes as input a positive integer n . If n is even, the algorithm divides it by two, and if n is odd, the algorithm multiplies it by three and adds one. The algorithm repeats this, until n is one. For example, the sequence for $n = 3$ is as follows:

$$3 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$$

Define $\psi(n)$ is the number of steps it takes for the algorithm to start at n and end at 1. For example, $\psi(3) = 7$.

Input An integer t followed by collection of t many positive integers. Let sum_ccs be the sum of $\psi(i)$ for every input integer i .

Output Your enrollment number, your name, and sum_ccs .

2. (10 pts) **Largest Prime Factor**

Input An integer t followed by collection of t many positive integers. Let sum_lpf be the sum of largest prime factor of i for every input integer i .

Output Your enrollment number, your name, and sum_lpf .

3. (10 pts) **Coin Piles** You have two coin piles containing a and b coins. On each move, you can either remove one coin from the left pile and two coins from the right pile, or two coins from the left pile and one coin from the right pile. Your task is to efficiently find out if you can empty both the piles.

Input The first input line has an integer t : the number of tests. After this, there are t lines, each of which has two integers a and b : the numbers of coins in the piles.

Output Your enrollment number, your name, and an integer denoting total number of instances out of these t instances when you can empty both the piles.