Beihang University
School of General Engineering

Beijing, November 11th,2020
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Computer Science and Programming
Lab Class 7

Task 1 ***Analysis of mid-term examination solution*** *(45 minutes)*

Task 2 ***Remaining tasks from the previous lab classes–Goldbach conjecture*** *(10 minutes)*

Goldbach's conjecture is one of the oldest and best-known unsolved problems in number theory and all of mathematics. It states: **Every even integer greater than 2 can be expressed as the sum of two primes.**

Please verify Goldbach conjecture for integers smaller than 1000. For any even number n in that interval which obeys the conjecture, please print the two prime numbers summing up to n.

Hint: Find all prime numbers smaller than 1000 at first and store them in a list. Afterwards, iterate all numbers from 1 to 999, and try to express them as a sum of any two elements of the prime number list. You can generate all pairs of prime numbers by using a nested loop. However, note that a function without nested loops would be more efficient.

Task 3 ***Remaining tasks from the previous lab classes–Cantor's table*** *(20 minutes)*

One of the famous proofs of modern mathematics was Georg Cantor's proof that rational Numbers were enumerable. He uses the following table to prove this:

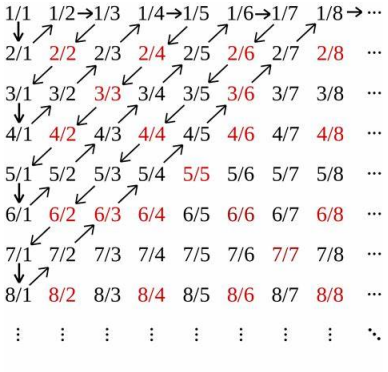

Figure 4: Cantor's table

We number each item in the above table with zigzag order. The first item is 1/1, and the following are 2/1, 1/2, 1/2, 2/2, 3/1, 4/1, ...

Write a python program which receives a integer N and print the Nth item in the table. (Sample input: 7 Sample ouput: 4/1)

Task 4 ***Remaining tasks from the previous lab classes–Class: Pet dog*** *(15 minutes)*

Implement a Python class `Dog`, which satisfies the following additional constraints:

1. There should be an initial function which generates a dog that has not eaten anything and has not been walked for any time.
2. It can be fed by a function `feed()` and the value of `eaten_food` will be added by one.
3. It can be walked by a function `walk()` and the value of `walk_time` will be added by one.
4. Its mood can be checked by a function `check_mood()`. If `eaten_food<3` or `walk_time<1`, the mood is `angry`; otherwise, the mood is `happy`.
5. Everyday, all states (`eaten_food` and `walk_time`) of this dog will be reset to zero.