



digit =

United International University  
Department of CSE

CSE 1112: Structured Programming Language Lab

Final Examination | Spring 2023 | Set A

Slot: 9:00 am - 11:00 am

Time: 1 Hour 20 Minutes | Full Marks: 25

Class ID:

Name:

**Note: PLEASE READ THE QUESTIONS THOROUGHLY IN ITS ENTIRETY.**  
**Figures on the right-hand side indicate full marks.**

1. Write a program that checks whether a number is a "Superprime" number or not. A "Superprime" number is a number that has the following properties: **13 Marks**

- The number is prime
- The sum of all the digits in that number is also a prime number ✓

For example, the number "223" is a "Superprime" because it is a prime number, and also, the sum of its digits is  $2 + 2 + 3 = 7$ , which is also a prime number. However, the number "149" is not a "Superprime", because although it is a prime number, the sum of its digits ( $1 + 4 + 9 = 14$ ) is not prime. ✓

Write a program that takes two numbers  $a$  and  $b$  as input, and then prints all superprime numbers in the range from  $a$  to  $b$  (including  $a$  and  $b$ ). ✓

For that purpose, you have to write the following functions:

- `int is_prime(int x)`: This function returns 1 (or nonzero/true value) if the integer  $x$  is prime and 0 otherwise
- `int digit_sum(unsigned int x)`: This function takes an integer as input and returns the sum of all the digits.  
**You must write this function by using recursion.**
- `int is_superprime(int x)`: This function takes an integer as input and returns 1 (or nonzero/true value) if it is a superprime and 0 otherwise. **You should make function calls to functions (a) and (b) in this function.**

See the following sample input and output:

Sample Input	Sample Output
100 150	101 113 131 137 139
200 250	223 227 229 241

6

100 101 113 131 137 139 200 223 227 229 241

sum = 0

digit = input % 10

digit = sum \* 10 + digit

sum = digit + sum

is\_prime =

2. Mr Gaben, the legendary programmer, was working on his company's server when he detected that computer viruses exist in his server. However, he does not know which programs running on the server are computer viruses and which ones are legit. If he does not find out which programs are viruses, all of the valuable data on the server will be lost. So Gaben needs your help in finding these viruses. In Gaben's server, each program is represented by a structure, containing the following member variables:

```
struct program {
    char name[60];           // name of the program
    int total_memory;        // total memory in bytes that
                             // program has been assigned by OS
    int used_memory;         // total memory in bytes that
                             // program is using now
};
```

Gaben knows that the programs which are viruses consume the entire memory that is assigned to it (Their used memory is equal to or greater than their total memory), and also, all letters in their name are capital letters.

Now write a program that takes information about all the programs in Gaben's server, and then prints how many programs among them are viruses and their names.

The first line of input contains an integer N indicating the number of programs running on Gaben's server. The next lines contain information about the individual programs. Each group of three lines contains the name, total bytes, and used bytes of a program respectively. The name of a program consists of a single word.

Your program should have the following properties:

1. Your program should represent all the programs in Gaben's server using an array of structures of type `struct program`
2. **You need to make the following function and call it in your program to calculate the result -**  
`int all_caps(char *input):` returns 1 (or nonzero/true value) if all letters in the string `input` are capital letters and 0 otherwise. ✓

You may add additional functions if required for your implementation of the program

See the following sample input-output for clarification:

**12 Marks**

Sample Input	Sample Output	Explanation
4 CHROME 17179869184 17235823736 codeblocks 4294967296 124245667 Xeyes	2 CHROME FORTNITE	The 4 programs running in Gaben's server are as follows:  <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> Name: CHROME  Total bytes: 17179869184  Used bytes: 17235823736 </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> Name: codeblocks </div>

655360  
655360  
FORTNITE  
8589934592  
8589934592

Total bytes: 4294967296  
Used bytes: 124245667

Name: Xeyes  
Total bytes: 655360  
Used bytes: 655360

Name: FORTNITE  
Total bytes: 8589934592  
Used bytes: 8589934592

Among these four programs, programs 'CHROME' and 'FORTNITE' are viruses. That is because their names have all capital letters, and their used bytes are equal to or exceed their total bytes. The program Xeyes is not a virus, because even if its used bytes are equal to its total bytes, all letters in its name are not capitalized.