Shri G. S. Institute of Technology and Science
Department Of Computer Engineering
CO 24007: DATA STRUCTURES
Lab Assignment # 01 (File/Pointer/Structures)

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Late Submission: Not allowed
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1. You are expected to write the code of a function which takes a triangle as input and returns its area. You are also expected to figure out how to access the data, by understanding the abstract data types defined. The template of the code is given below.

```
struct vertex{
  float x;
  float y;
};
struct triangle{
   struct vertex vertices[3];
};
float cal_area(struct triangle aTriangle) {
}
```

2. A *line segment can be uniquely represented by its* **endpoints** *and its* **endpoints** *by their* **x** *and* **y***-coordinates w.r.t. to a fixed origin*. Given two line segments, we need to check if these two line segments **intersect** or not (ie. have at least one point in common in both line segment). For example, consider two line segments joining **(0,0)** , **(0,2**) and **(0,0)** , **(3,20)** respectively . Both of them indeed **intersect** at **(0,0)** , please note the fact that the line segments AB and CD are not intersecting though the lines AB and CD intersect on extending the line segments . A point is said to be a lattice point if both its x and y coordinates are integers. In this problem, we consider only the line segments having both their end-points being lattice points.

```
struct Point {
  int x,y;
};

struct LineSeg {
   struct Point p1,p2;
};

bool SegIntersect(struct LineSeg l1,struct class LineSeg l2) {  }
```

3. A rational number is represented as numerator / denominator. We need to identify whether two rational numbers are equal or not. For example, consider two rational numbers '1 / 4' and '4 / 16'. Both of them are equal, as, '4 / 16' if reduced to lowest terms is '1 / 4'.
Consider the following structure 'rational' that has member variables 'numerator' and 'denominator'.

```
struct rational {
  int numerator;
  int denominator;
} ;
```

You are required to write 2 functions:

Function 1: reduce

This function has two parameters:

1. struct rational *inputrational: *inputrational is a pointer to the structure rational, which is the actual rational number to be reduced
2. struct rational *outputrational: *outputrational is a pointer to the structure rational, which will store the rational number in its lowest form

The function should do the following

1. It should reduce the number i.e. numerator and denominator to its lowest form, where the original number is stored in inputrational
2. The reduced (output) number should be stored in outputrational.

The function is given below, in which you need to write your code

void reduce(struct rational *inputrational, struct rational *outputrational) { }

Function 2: equal

This function has two parameters:

1. **struct rational** num1
2. **struct rational** num2

The function should do the following

1. This function should call the function 'reduce' twice. The first time with the first rational number, and the second time, with the second rational number.
2. Thereafter, the function should check whether both the rational numbers obtained in the lowest form are equal or not. If yes, then it should return boolean value '**true**', else, it should a boolean value '**false**'.

The function is given below, in which you need to write your code

bool isEqual (struct rational num1, struct rational num){ }

4. Find the answer of the following queries from the Indore election data (Data are given in the file “Indore_Election_Data.txt”.
    a. Enlist winners of the each election.
    b. Find the percentage of male candidates as well as female candidates.
    c. Calculate the total percentage of votes received by a party (including all constituency) in each year.
    d. Write your own two more analysis on the election data ….
    e. ….

Details about the Election_data file

This database contains detailed candidate-level data for elections to the lower houses of India's state legislatures, i.e., the Vidhan Sabhas. The data span the 1977-2012 period, with each row representing a candidate that ran for office in that state-year.

Each row have the following information, separated by the ‘tab’.

- State (st_name)
- Assembly election year (year)
- Assembly constituency number (ac_no)
- Assembly constituency Name (ac_name)
- Assembly constituency reservation status (ac_type)
- Candidate name (cand_name)
- Candidate sex (cand_sex)
- Party Name (partyname)
- Party abbreviation (partyabbre)
- Votes received (totalvotpoll)
- Number of registered voter (electors)

5. An input file contains 10000 random positive integers one at each line.

    (a) Find the minimum and maximum values that can be calculated by summing exactly 9999 of the 10000 integers. Then print the respective minimum and maximum values as a single line of two space-separated long integers.
    Input Format: A file containing of 10000 line-separated integers
    Constraints: Each integer is in the inclusive range [1, 10^9]
    Output Format: Print two space-separated long integers denoting the respective minimum and maximum values that can be calculated by summing exactly 9999 of the 10000 integers.

(b) **Challenge Part:** What if you need to find maximum and minimum of 9990 numbers out of 10000 numbers? Can you work out a general solution so that your program can find out maximum and minimum of n out of 10000 numbers (where $1 \leq n \leq 9999$)?