CS19001: PDS Lab, Section 4, Spring 2019-2020

Full marks: $100 \times 5 = 500$　　　　　　May 13, **2020**　　　　　　**Time: 4 hours**

You can use library functions or user-defined functions as needed.

1e. **(Consecutive even)** User gives the value of a positive integer n as input. Check whether n can be expressed as the sum of three consecutive even integers. Print the result.

Examples:

Enter n: 23	Enter n: 24	Enter n: 2694
Answer: No.	Answer: 6+8+10.	Answer: 896+898+900.

2e. **(Digit permutation)** User inputs two digits c and d from $1, 2, \ldots, 9$. Write a program that generates all numbers of 6 digits, made of c and d, such that the sum of digits is at most $4c + d + 5$.

Examples:
```
Enter two digits: 1 5
Numbers:
111111  111115  111151  111155  111511  111515  111551  115111  115115
115151  115511  151111  151115  151151  151511  155111  511111  511115
511151  511511  515111  551111

Enter two digits: 2 7
Numbers:
222222  222227  222272  222722  227222  272222  722222
```

3e. **(Best girl student)** Declare a structure named `student` that contains the following components: `name` (string of 10 characters), `group` (string of 5 characters), and `marks` (floating-point number). Dynamically allocate a 1D array of the structure student, where the length n of the array is given as input. Fill up the array with data from an input file named `t3e.txt` that contains the value of n in the first line and then n students in the next n lines. Print all the records from the array.

Now print the best girl student (one with highest marks). Assume that this student is unique in the input file. (50+50)

Examples: (Left: Input file `t3o.txt`. Right: Output.)

```
10                              arnab  boy - 67.00
arnab    boy   67               chaiti girl - 71.50
chaiti   girl 71.5               manas  boy - 81.00
manas    boy   81               dhriti  boy - 66.00
dhriti   boy   66               sobhan  boy - 95.50
sobhan   boy   95.5              ritam  boy - 92.00
ritam    boy   92               priti girl - 82.00
priti    girl 82                 rini girl - 94.50
rini     girl 94.5              namita girl - 91.00
namita   girl 91                suvro  boy - 87.00
suvro    boy   87          Best girl student: rini.
```

4e. **(Best painting)** The "best painting" in an auction is that painting which is bidden with the highest price by at least three-fourth bidders. (There may be none, in fact, if the above condition is not true.) Consider an auction with p paintings and b bidders. The values of p and b are given in the input file `t4e.txt`. This input file should contain the values of p and b in the first line, and then a 2D floating-point array S of size $p \times b$, where $S[i][j] = x$ if the i-th painting is bidden for Rupees x lakh by the j-th bidder, and $S[i][j] = 0$ otherwise. Dynamically allocate the 2D array S and fill it up using data from the input file.

Print the array, number of paintings, number of bidders.
Print the top bids of all bidders, and hence find and print the best painting. (Assume that the top bid of every bidder is unique.)
Print the bidders with the best painting as their top bid. (30+40+30)

Examples:

```
2.5  2.0  1.6  2.1  1.5
2.0  1.5  1.7  2.5  0.0
3.0  0.0  1.5  3.5  3.1
1.0  0.0  0.0  1.2  1.1
#paintings = 4.  #bidders = 5 (3/4 = 4).
Top bids by the 5 bidders: 3, 1, 2, 3, 3.
No best painting.


2.0  1.5  1.7  2.5  0.0  2.1  0.0  1.9  0.0
3.0  0.0  1.5  3.5  3.1  2.5  2.0  2.1  0.9
1.0  0.0  0.0  1.2  1.1  0.0  1.3  0.0  0.0
2.1  0.0  0.0  2.3  1.5  0.0  1.9  0.0  0.0
#paintings = 5.  #bidders = 9 (3/4 = 7).
Top bids by the 9 bidders: 3, 1, 2, 3, 3, 3, 3, 3, 3.
Best painting: 3.
Bidders with the best painting as their top bid: 1, 4, 5, 6, 7, 8, 9.
```

5e. [Frequency]
User supplies some positive integers one by one. Insert them in a linked list L in increasing order. Each node of L should have two integer variables: x and f, where x stores the data and f stores the frequency of x.
When the user supplies 0, terminate L. Traverse L to print the data and frequency of all nodes.
Example

Enter data:
7 3 5 3 0
L = 3-2, 5-1, 7-1.