

Contest Problems

High School Coding Contest

Saturday, April 6, 2018 @9:00-11:00 AM

I code therefore I am!

General: We do not test for invalid input.

Problem 1. Mean, Mode and Median

The program generates 5 random digits between 0 and 5 (0, 1, 2, 3, 4) and then reports the mean (sum divided by how many they are) , the mode (the most frequent) and median (the one in the middle if you sort them). The program will print the digits, then print them sorted, and print the mean, mode and median. The program asks if you want to repeat it.

Examples:

4 1 2 3 4

1 2 3 4 4

Mean: 2.8 Mode: 4 Median: 3

More(y/n) ? y

3 3 0 2 4

0 2 3 3 4

Mean: 2.4 Mode: 3 Median: 3

More(y/n) ? y

1 2 0 2 3

0 1 2 2 3

Mean: 1.6 Mode: 2 Median: 2

More(y/n) ? y

3 1 0 2 3

0 1 2 3 3

Mean: 1.8 Mode: 3 Median: 2

More(y/n) ? n

Problem 2. First car

Five cars (1, 2, 3, 4, 5) are heading toward Manchester. For each car randomly generate a distance from Manchester between and including 50 and 100 miles and randomly generate a speed between and including 30 and 60 miles per hour. Find out which car arrives at Manchester first, assuming that they start at the same time. In columns, display each car's id, speed, original distance, and the time it took to get there. The cars should be listed in order from 1 to 5. Then display the id of the first car arriving in Manchester. Spacing does not matter if columns are clear. The program asks if you want to repeat it.

Examples:

```
id distance speed time
1      71     44  1.61364
2      80     38  2.10526
3      59     48  1.22917
4      79     46  1.71739
5      61     45  1.35556
```

first car is: 3

More(y/n)? y

```
id distance speed time
1      60     47  1.2766
2      70     41  1.70732
3      98     54  1.81481
4      69     50  1.38
5      64     55  1.16364
```

first car is: 5

More(y/n)? y

```
id distance speed time
1      64     37  1.72973
2      90     46  1.95652
3      50     33  1.51515
4      65     55  1.18182
5      65     52  1.25
```

first car is: 4

Problem 3. First duplicate

The program generates 10 random digits (0-9). Find the number with its 2nd appearance (duplicate) that shows up soonest in the array. The program asks if you want to repeat it.

Examples.

2 1 7 8 6 8 4 9 1

Result: 8

More(y/n)? y

8 7 4 9 0 6 1 7 4

Result: 7

More(y/n)? y

0 3 2 7 1 5 5 3 8

Result: 5

More(y/n)? n

Problem 4. Place students at tables

You have a list of n students (in order to simplify the problem students are numbers from 0 to $n-1$). There are k tables, $k > 0$ and you want to distribute students randomly in the classroom around the tables. Write a program that distributes randomly the students in k tables as evenly fair as possible (meaning you do not have too many students at the same table). As such the difference between the numbers of students at each table cannot be more than 1. The order of the tables does not matter. For each table, the output is an open bracket “[”, followed by the numbers representing the students separated by a single space, followed by a closing bracket “]”. Extra spaces at the end of items do not matter. Each table is separated by a single space. The program asks if you want to repeat it.

Examples.

Number of students? 7

Number of tables? 3

Result: [0 3] [2 5] [1 4 6]

More (y/n)? y

Number of students? 7

Number of tables? 3

Result: [0 3 6] [2 4] [1 5]

More (y/n)? y

Enter number of students? 6

Enter number of tables? 3

Result: [1 3] [4 5] [2 0]

More (y/n)? n

Enter number of students? 2

Enter number of tables? 3

Result: [1] [0] []

More (y/n)? n

Problem 5. Same neighbors in a matrix

Fill a matrix size $n \times n$ (where n , $3 \leq n \leq 10$) with uppercase random letters from the English alphabet and print the matrix. Then print only the letters that have similar neighbors as themselves (that is the same letter repeated on the same row, column or diagonal) and for instead for rest of the letters display '-'. If there is no such solution the program prints a matrix with only '-'. The program asks if you want to repeat it.

Examples.

Size matrix? 3

F F I

J J W

L E G

F F -

J J -

- - -

More(y/n) ? y

Size matrix? 4

P A M N

B C Q J

M I Y Z

I T P H

- - - -

- - - -

- I - -

I - - -

More(y/n)? n

Problem 6. Binary palindromes

Generate all palindromes (sequences that read the same backward as forward) of given size n made of 0's and 1's only. The input n , given by the user, is in the range 1 to 10. The palindromes will be displayed in the same line separated by a single space and on the next line print out how many they are. The program asks if you want to run it once more.

Examples.

Enter length? 3

111 000 010 101

4

More(y/n)? y

Enter length? 5

00000 00100 01010 01110 10001 10101 11011 11111

8

More(y/n)? n