ENGR151 — Accelerated Introduction to Computer and Programming

Revision Guide (Midterm 2)

Manuel — UM-JI (Fall 2021)

- This document is only intended as a revision guide
- In no way does it provide information on the upcoming exam
- A student able to solve all the questions should be ready for the exam

Ex. 1 — *Basic C questions*

1. What is an algorithm?
2. What is the general structure of a C program?
3. How to compile multiple files, that is more than one .c file at a time?
4. What is a macro?
5. What are the five main data types?
6. What should uppercases variable names reserved for?
7. What is the length of a `char`?
8. How to perform type casting?
9. What is a structure?
10. How to define a structure?
11. How to access a specific field in a structure?
12. Can you list and use all the shorthand operators?
13. Should `goto` be used and why?
14. How to use the conditional ternary operator?
15. What is the difference between `switch` in MATLAB and in C?
16. Why should `for` loops be preferred over `while` loops?
17. Should global variables be used or not?
18. What is a pointer?
19. Given a pointer on a structure, how to access the different fields of the structure?
20. What is dynamic memory allocation?
21. For each `malloc` or `calloc` function in a program what function should also appear?
22. How to go through an array using pointers?
23. Can you solve all the questions at the end of Chapter 11?

Ex. 2 — *A simple investigation game*

You spend your holidays at the Carlton Mansion when Lady Janis, is murdered. You start investigating.

The investigation rules are described as follows.

- A guess is composed of (i) a character, (ii) a location, and (iii) a weapon
- The case is solved when a perfect guess is formulated, i.e. the right character, the right location, and the right weapon are discovered
- On a wrong guess the number of right elements composing the guess is returned, without specifying which ones are correct

The followings lists define the potential "who, where, how".

Suspects: butcher, hairdresser, salesman, banker, student

Locations: lounge, lobby, reception, restaurant, coffee shop

Weapons: hammer, scissors, knife, poison, candlestick

The goal is now to implement this simple setup.

1. Define a structure composed of the fields `suspect`, `location`, and `weapon`.
2. Write a function which selects a random suspect, a random location, and a random weapon. These three elements define the "who, where, how". The function should (i) have output of type `void`, (ii) and take advantage of the previously defined structure.
3. The game is then composed of rounds where the user constructs guesses, which are assessed by the program. Write the corresponding function.
4. Use dynamic memory allocation to save each step taken by the player and print the whole list of guesses. If the number of rounds exceeds 10, print "`Game over, you failed to solve the case using…`" (instead of "`Congratulations, you solved the case using…`"). The rest of the output should remain unchanged.

Sample output (ex. 2)

```
$ ./e2_r -ex2

Lady Janis has been killed at the Carlton Mansion. Will you discover the murderer?
* Round 1
  Suspects: 1. Butcher 2. Hairdresser 3. Salesman 4. Banker 5. Student
  Locations: 1. Lounge 2. Lobby 3. Reception 4. Restaurant 5. Coffee shop
  Weapons: 1. Hammer 2. Fork 3. Knife 4. Poison 5. Candlestick
  Select a suspect, a location, and a weapon: 1 2 3
  You suspect the Butcher to have killed Janis in the Lobby using a Knife
  You made 2 correct guess(es)
* Round 2
  Suspects: 1. Butcher 2. Hairdresser 3. Salesman 4. Banker 5. Student
  Locations: 1. Lounge 2. Lobby 3. Reception 4. Restaurant 5. Coffee shop
  Weapons: 1. Hammer 2. Fork 3. Knife 4. Poison 5. Candlestick
  Select a suspect, a location, and a weapon: 1 1 4
You suspect the Butcher to have killed Janis in the Lounge using a Poison
You made 0 correct guess(es)
* Round 3
  Suspects: 1. Butcher 2. Hairdresser 3. Salesman 4. Banker 5. Student
```

```
  Locations: 1. Lounge 2. Lobby 3. Reception 4. Restaurant 5. Coffee shop
  Weapons: 1. Hammer 2. Fork 3. Knife 4. Poison 5. Candlestick
  Select a suspect, a location, and a weapon: 3 2 3
You suspect the Salesman to have killed Janis in the Lobby using a Knife
You made 3 correct guess(es)
Congratulations, you solved the case using the following sequence:
  1. You suspected the Butcher to have killed Janis in the Lobby using a Knife
  2. You suspected the Butcher to have killed Janis in the Lounge using a Poison
  3. You suspected the Salesman to have killed Janis in the Lobby using a Knife
Conclusion: the Salesman has killed Janis in the Lobby using a Knife.
```

Ex. 3 — *The students' grades*

In order to solve this exercise you are required to type or copy/paste the input garde file below in a text editor and save it as `grades.txt`.

1. Write a structure composed of three fields: `name`, `grades` and `mean`. In the README file explain your choice of data type for each field of the structure.
2. Read the file `grades.txt` and load the different fields for each student.
3. Write a function called `avg` that computes the mean grade for each student.
4. Write a function which writes in a file called `final_grades.txt` the name, grades, and mean for each student in the same format as the output file file below.
5. Write a function called `best` that returns the name of the student with the highest mean.

Sample input file (ex. 3)

```
John; 80 72 34 65 92;
Paul; 54 23 65 21 77;
Henry; 99 97 94 61 94;
Judy; 12 34 11 9 1;
Joice; 88 67 77 66 55;
Ella; 87 78 97 87 96;
Sophie; 67 56 45 54 76;
Josy; 83 82 85 87 70;
Sarah; 96 88 71 84 90;
David; 67 56 54 82 74;
Dany; 90 93 96 98 99;
```

Sample output file (ex. 3)

```
John; 80 72 34 65 92; 68.6;
Paul; 54 23 65 21 77; 48.0;
Henry; 99 97 94 61 94; 89.0;
Judy; 12 34 11 9 1; 13.4;
Joice; 88 67 77 66 55; 70.6;
Ella; 87 78 97 87 96; 89.0;
Sophie; 67 56 45 54 76; 59.6;
Josy; 83 82 85 87 70; 81.4;
Sarah; 96 88 71 84 90; 85.8;
David; 67 56 54 82 74; 66.6;
Dany; 90 93 96 98 99; 95.2;
```