COMP 1045

Programming Fundamentals for Engineers

Programming Assignment

School of Information Technology and Mathematical Sciences
The University of South Australia
May 2019

Contents

INTRODUCTION

This document describes the programming assignment for Programming Fundamentals for Engineers.

The assignment is intended to provide you with the opportunity to put into practice what you have learnt in the course by applying your knowledge and skills to implement a program that will maintain information on hero and villain characters (using an array of structures). You are to write a program (using multiple C source files) that will keep a record of hero and villain characters. Hero and villain character information will be stored in a text file that will be read in when the program commences. Once the application has read the initial character (hero and villain) data, it should allow the user to interactively query and manipulate the character information.

This assignment is an **individual task** that will require an **individual submission**. If you are an **internal student,** you will be required to submit your work via learnonline before **Tuesday 11 June (week 13), 1.00pm (internal students). You will also be required to present your work to your supervisor during your allocated session held in the swot-vac week of the study period. Important:** You must attend your allocated session in order to have your assignment marked. If you are an **external student,** you are only required to submit an electronic copy of your program via learnonline **before Friday 14 June (week 13), 11.30pm (external students)**. External students are **not** required to demonstrate in person.

This document is a kind of specification of the required end product that will be generated by implementing the assignment. Like many specifications, it is written in English and hence will contain some imperfectly specified parts. Please make sure you seek clarification if you are not clear on any aspect of this assignment.

GRADUATE QUALITIES

By undertaking this assessment, you will progress in developing the qualities of a University of South Australia graduate.

The Graduate qualities being assessed by this assignment are:

- The ability to demonstrate and apply a body of knowledge (GQ1) gained from the lectures and text book readings. This is demonstrated in your ability to apply programming theory to a practical situation.
- The development of skills required for lifelong learning (GQ2), by searching for information and learning to use and understand the resources provided (supplied assignment files, C standard library, lecture notes, text book, practical exercises, etc), in order to complete a programming exercise.
- The ability to effectively problem solve (GQ3) using the C programming language to complete the programming problem. Effective problem solving is demonstrated by the ability to understand what is required, utilise the relevant information from lectures, the text book and practical work, write C code, and evaluate the effectiveness of the code by testing it.
- The ability to work autonomously (GQ4) in order to complete the task.
- The ability to behave ethically (GQ5) by ensuring that you abide by the University's policies and procedures relating to academic integrity as they apply to assessment. Your solutions must be your own work.
- The use of communication skills (GQ6) by producing source code that has been properly formatted; and by writing adequate, concise and clear comments.
- The application of international standards (GQ7) by making sure your solution conforms to the standards presented in the programming practices lecture slides (available on the course website).

PRACTICAL REQUIREMENTS

It is recommended that you develop this assignment in the suggested stages.

It is expected that your solution WILL include the use of the following:

Your program must be developed using multiple C source files, with the number and names of ***all*** the files **strictly adhering to the specifications below**.

Your program **must** be developed with two C source files and one header files. These files **must** be:

- `assign.c` - This file contains the `main()` function and contains code to implement the interactive mode, which uses the functions contained in `characterRecord.h`. It allows the user to interactively query and manipulate the hero and villain character information. The array of structures for the character (hero and villain) information must be defined within the `main`() function in file `assign.c`.
- `characterRecord.h` - ***Provided for you on the web.*** This file contains the function prototypes for functions to load, query, and manipulate the character (hero and villain) information (stored in the array of structures). This file **must not be altered** with the exception of completing the data structure declaration.
- `characterRecord.c` - This file contains the implementations of the function prototypes listed in `characterRecord.h`. It may also contain additional functions (to assist in your implementation of the functions listed in `characterRecord.h`)

It is expected that your solution WILL also include the use of the following:

- An array of `structs` that will store character (hero and villain) information (defined in the `main()` function).
- A variable which records the number of character (hero and villain) records stored in the array (defined in the `main()` function).
- No global variables.
- The supplied `characterRecord.h` file which must not be altered with the exception of completing the data structure declaration.
- Appropriate functions – 1 idea per function.
- Pass-by-reference parameters.
- Use of `#define` for symbolic constants (i.e. `#define MAX_CHARACTERS 20`). No magic numbers.
- Well constructed loops. Marks will be lost if you use `break, quit(), exit()` or `return` statements or similar in order to exit from loops.
- Output that **strictly** adheres to the assignment specifications. If you are not sure about these details, you should check with the 'Sample Output' provided at the end of this document.
- Good programming practice:
    - Consistent commenting, layout and indentation. You are to provide comments to describe: your details, program description, ALL variable definitions, all function prototypes and all function definitions, and every significant section of code.
    - Meaningful variable names. No single letter variable names.

Your solutions **MUST NOT** use:

- `break`, or `continue` statements in your solution. **Do not** use the `quit()` or `exit()` functions or the `break` or `return` statements (or any other techniques) as a way to break out of loops. Doing so will result in a significant mark deduction.

A portion of the marks will be allocated according to your use of the above. Refer to the C programming practice slides (available on the course website) and ensure your code adheres to the standards/conventions described in these slides.

PLEASE NOTE: You are reminded that you should ensure that all input and output conform to the specifications listed here; if you are not sure about these details you should check with the sample output provided at the end of this document or post a message to the discussion forum.

Please ensure that you use Microsoft Visual Studio in order to complete your assignments. Your programs **MUST** run on the version of Microsoft Visual Studio on your personal device and/or on the campus computer pools.

INPUT

When your program begins, it will read in character (hero and villain) information from a file called `characters.txt`. This is a text file that stores information relating to characters (heroes and villains). The table below details the information provided for each character.

Field No.	Field Name	Description
1	Name	up to 25 characters
2	Secret identity	up to 25 characters
3	Hero	an integer (0 = false; 1 = true)
4	Number of battles	an integer
5	Number won	an integer
6	Number lost	an integer
7	Number drawn	an integer
8	Health	an integer

Figure 1: CharacterRecord Structure.

The name of the character (hero or villain) is stored on a separate line. Likewise, the secret identity of the character (hero or villain). The very next line contains the hero/villain status, number of battles, battles won, battles lost, battles drawn, and the current health value, are stored on one line and are separated by the space character as seen below:

```
Wonder Woman
Diana Prince
h 5 5 0 0 90
Batman
Bruce Wayne
h 6 2 0 4 80
The Joker
Jack Napier
v 5 1 0 4 80
Superman
Clark Kent
h 7 4 0 3 100
Catwoman
Selina Kyle
v 12 0 6 6 50
Aquaman
Arthur Curry
h 8 2 2 4 30
Iron Man
Tony Stark
h 10 8 2 0 50
Hulk
Bruce Banner
h 7 2 1 4 80
Thanos
n/a
v 10 2 0 8 90
```

Figure 2: Character (hero and villain) information file format (`characters.txt`).

An example input file called `characters.txt` can be found on the course website (you are not required to create it yourself). You may assume that all data is in the correct format.

After the program has stored the data (using an array of `structs`), it will enter interactive mode as described in the following section.

INTERACTIVE MODE

Your program should enter an interactive mode after the character (hero and villain) information has been read in from the file. The program will allow the user to enter commands and process these commands until the quit command is entered. The following commands must be allowed:

Command	Description
`list`	Displays for all characters (heroes and villains), the character's name, number of battles, won, lost, drawn, and their health value. Outputs the contents of the array of character (heroes and villains) as described in the section '*Screen Format*' below.
`heroes`	Displays for all heroes, the character's name, number of battles, won, lost, drawn, and their health value. Outputs the contents of the array of character (heroes and villains) as described in the section '*Screen Format*' below.
`villains`	Displays for all villains, the character's name, number of battles, won, lost, drawn, and their health value. Outputs the contents of the array of character (heroes and villains) as described in the section '*Screen Format*' below.
`search`	Prompts for and reads the character's (hero/villain's) name and searches for the character in the array of characters (heroes and villains). If the character is found in the array of characters (heroes and villains), the character's details are displayed to the screen as described in the section '*Screen Format*' below. If the character is not found in the character (heroes and villains) array, an error message is displayed.
`reset`	Prompts for and reads the character's (hero/villain's) name and searches for the character in the array of characters (heroes and villains). If the character is found in the array of characters (heroes and villains), the character's health value is reset to 100. If the character is not found in the character (heroes and villains) array, an error message is displayed.
`remove`	Prompts for the character's name. If the character is found, he/she is removed from the array of characters (heroes and villains) and a message is displayed to the screen indicating that this has been done. The information must be removed maintaining the order of the character array. (Hint: shift all elements one position up the array). If the character is not found in the array, an error message is displayed.

Command	Description
add	Prompts for and reads the character’s (hero or villain) name, secret identity and whether the character is a hero or villain. If the character does not already exist (i.e. a match is not found on the character’s name) and the character (hero and villain) array is not full, the character is added to the array of characters (heroes and villains). If the character is added, health is initialised to 100 and all other data members (number battles, no won, no lost, and the no drawn), are initialised to zero and a message is displayed to the screen indicating this has been successfully added. The character information must be added after the last character entry stored in the array. You will need to check that you are not exceeding array bounds. If the character is not able to be added to the character (hero and villain) array because the array is full, an error message is displayed. If the character is already stored in the character (hero and villain) array, an error message is displayed. No duplicate entries are allowed.
battle	Prompts for the name of two opponents to do battle. It searches for each character in the array of characters (heroes and villains) and if the character is not found in the array of characters (heroes and villains), an error message is displayed to the screen and the user is asked to enter another character (hero/villain). If the opponents are found in the array of characters (heroes and villains), he/she is then able to do battle and the number of battle rounds the heroes/villains will undertake (a number between 1-5 inclusive) is prompted for and read. One battle may have many (1-5 inclusive) rounds. The heroes/villains battle until either an opponent dies (health status is reduced to zero) or the number of battle rounds have been completed. For each individual battle round, the hero/villain will sustain a certain amount of damage to their health rating. The amount of damage sustained from the battle will be a randomly generated value between 0 – 50 inclusive. After each round, each opponents damage (i.e. randomly generated number between 0 – 50 inclusive) and current health value (i.e. calculated by: health value – damage value) are displayed to the screen. After every battle (however many rounds), a winner is determined (i.e. the opponent with the higher health value wins the battle) and the opponents’ battle statistics are updated (i.e. number of battles, no won, no lost, etc…) accordingly.
quit	Causes the program to quit, outputting the contents of the character (hero and villain) array to a file (see section ‘*Final Output*’ below).

Note:

The program should display an appropriate message if a character is not found matching a search criteria. Appropriate messages should also be displayed to indicate whether a command has been successfully completed.

Please refer to the sample output to ensure that your program is behaving correctly and that you have the correct output messages (refer to the ‘Sample Output’ section at the end of this document).

Each time your program prompts for a command, it should display the list of available commands prior to the prompt. See the sample output (at the end of this document) to ensure that you have the output format correct.

For example:

```
Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]:
```

Menu input should be validated with an appropriate message being displayed if incorrect input is entered.

SCREEN FORMAT

The **list, heroes and villains command** (display_characters function) should display the character information in the following format:

- Each character should be output on a separate line, with the character's name first.
- You should ensure the character's name is displayed in a field with of 25 (left justified).
- Following the character's name, the number of battles, number won, number lost, and number drawn should be displayed in a field with of 3.
- The character's health value should be displayed in a field width of 8.
- The formatting should be as seen below.

For example:

```
|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|
```

The **search command** (that makes use of the find_character function) should display character information in the following format:

For example:

```
All about Catwoman --> VILLAIN

Secret identity: Selina Kyle

Battles fought: 12
  > No won:     0
  > No lost:    6
  > No drawn:   6

Current health: 50%
```

Important note:

Your output should be well structured – you should use field widths to ensure that columns line up. See the sample output to ensure that you have this format correct (refer to the 'Sample Output' section at the end of this document).

FINAL OUTPUT

When your program finishes (because you entered the quit command) your program should output the contents of the character array (heroes and villains) to a file called `new_characters.txt`.

The format of this file should **exactly** match that of the input file.

STAGES

It is recommended that you develop this assignment in the suggested stages.

If you ask for help on a later part of the assignment and have not completed an earlier stage, it is likely that you will be told to finish the earlier stages first. Many problems in later stages are due to errors in early stages. **Make sure you have finished and thoroughly tested each stage before continuing.**

The following stages of development are recommended:

STAGE 0 (PREPARATION)

Start by setting up the project correctly (as described in the slides available on the course website) in Microsoft Visual Studio. **Important: the project name should be your Email Id (i.e. if your name is *James Bond*, you would name your project *bonjy007*).**

At this stage, include **only** the file that has been provided for you (i.e. `characterRecord.h`). You will need to create a simple `main()` function (in file `assign.c`).

For example:

```
#include <stdio.h>

int main()
{
   /* This line will eventually be removed – used for development purposes only. */
   printf("\n\nPFfE Assignment - this will be deleted in stage 1!\n\n");

   return 0;
}
```

Make sure the program compiles. Once you have that working, back up your project.

Note: When developing software, you should always have fixed points in your development where you know your software is bug free and runs correctly.

STAGE 1

1. Set up the rest of the multi-file format (i.e. `characterRecord.h` and `characterRecord.c`). **It is strongly suggested that you develop this program as a multi-file program from the start as it will be easier and cause less problems.**

2. Declare the data structure `CharacterRecord` to store character (hero and villain) information (in the file `characterRecord.h`). For example:

```
typedef struct {

  char name[STRING_LENGTH+1];

  :

  etc …

  :

} CharacterRecord;
```

Field No.	**Field Name**	**Description**
1	Name	up to 25 characters
2	Secret identity	up to 25 characters
3	Hero	an integer (0 = false; 1 = true)
4	Number of battles	an integer
5	Number won	an integer
6	Number lost	an integer
7	Number drawn	an integer
8	Health	an integer

CharacterRecord structure – array of structs.

3. Define the data structure to hold character (hero and villain) information (i.e. an array of `struct`) within the `main()` function in the file `assign.c`. i.e.:

```
CharacterRecord characters[MAX_CHARACTERS] = {0};
```

4. Write the code (in the file `characterRecord.c)` for functions `read_character_record` and `display_characters` as specified in the header file `characterRecord.h`. Please make sure you read the comments above each function prototype (in the file `characterRecord.h`) for a detailed explanation of the function.

5. Write the code so the `main()` function calls these two functions after setting up anything else required in the file `assign.c`.

STAGE 2

Now that you know the information is being correctly read from the file and stored in your data structure (array of characters), write the code for function `write_to_file (in characterRecord.c)`. Modify your main so that it now calls this function (in `assign.c`).

STAGE 3

Implement the interactive mode. Set up the loop structure to obtain and process commands (done in `assign.c`). Test to ensure this is working correctly before moving onto stage 4. You need not call the functions that correspond to the commands at this point, you may simply choose to display an appropriate message to the screen.

It is suggested that you use function `gets()` to read user input from the keyboard.

Menu input should be validated with an appropriate message being displayed if incorrect input is entered by the user.

STAGE 4

Implement one command at a time. Test to ensure the command is working correctly before starting the next command. Start with the `quit` and `list` commands as they do not need you to add anything further to `characterRecord.c`.

You should be able to see that for most commands there is a corresponding function(s) specified in the `characterRecord.h` header file.

For the remaining commands, the following implementation order is suggested (note: this is a guide only):

- `heroes command`
- `villains command`
- `search command`
- `reset command`
- `add command`
- `remove command`
- `battle command`

As you are not to alter the `characterRecord.h` file, it is suggested that you include stubs for any functions not implemented in your code. These stubs should consist of the function header, parameter names and then a null body (i.e. curly braces with nothing inside them or they may simply display a message).

SUBMISSION DETAILS

You are required to do the following in order to submit your work and have it marked:

- Internal students:
    - You are required to submit an electronic copy of your program via learnonline **before Tuesday 11 June (week 13), 1.00 pm (internal students)**.
    - **Internal students are also required to demonstrate your assignment to your supervisor during your allocated session in Swot-vac for marking. The supervisor will mark your work using the marking criteria included in this document. You MUST attend your allocated session in order to have your assignment marked.**

  Assignments submitted to learnonline, but not demonstrated during your allocated session, will NOT be marked. Likewise, assignments that have been demonstrated during the allocated session, but have not been submitted via learnonline, will NOT be marked. Assignments are submitted to learnonline in order to check for plagiarism.

- External students:

  If you are an **external student**, you are only required to submit an electronic copy of your program via learnonline before Friday 14 June (week 13), 11:30pm (external students only). External students are **not** required to demonstrate in person.

All students (internal and external) must follow the submission instructions below:

Ensure that your files are named correctly (as per instructions outlined in this document).

Ensure that the following files are included in your submission:

- characterRecord.h,
- characterRecord.c,
- assign.c

All files that you submit must include the following file comments.

```
/*
   File: fileName.c
   Author: your name
   Email Id: your email id
   Description: Programming Assignment – place assignment description here…
   This is my own work as defined by the University's
   Academic Misconduct policy.
*/
```

Assignments that do not contain these details may not be marked.

You must submit your program **before the online due date** and demonstrate your work to your marker. You will also be required to demonstrate that you have correctly submitted your work to learnonline. Work that has not been correctly submitted to learnonline will not be marked. **Once you have submitted your final version (before the due date) via learnonline, you are not permitted to make any further changes to your code.**

It is expected that students will make copies of all assignments and be able to provide these if required.

It is recommended that you use Microsoft Visual Studio in order to complete your assignments. Your programs must compile and run using Microsoft Visual Studio.

EXTENSIONS AND LATE SUBMISSIONS

There will be **no** extensions/late submissions for this course without one of the following exceptions:

1. A medical certificate is provided that has the timing and duration of the illness and an opinion on how much the student's ability to perform has been compromised by the illness. **Please note** if this information is not provided the medical certificate WILL NOT BE ACCEPTED. Late assessment items will not be accepted unless a medical certificate is presented to the Course Coordinator. The certificate must be produced as soon as possible and must cover the dates during which the assessment was to be attempted. In the case where you have a valid medical certificate, the due date will be extended by the number of days stated on the certificate up to five working days.

2. A Learning and Teaching Unit councillor contacts the Course Coordinator on your behalf requesting an extension. Normally you would use this if you have events outside your control adversely affecting your course work.

3. Unexpected work commitments. In this case, you will need to attach a letter from your work supervisor with your application stating the impact on your ability to complete your assessment.

4. Military obligations with proof.

Applications for extensions must be lodged via learnonline before the due date of the assignment.

Note: Equipment failure, loss of data, 'Heavy work commitments' or late starting of the course are not sufficient grounds for an extension.

ACADEMIC MISCONDUCT

Students are reminded that they should be aware of the academic misconduct guidelines available from the University of South Australia website.

Deliberate academic misconduct such as plagiarism is subject to penalties. Information about Academic integrity can be found in Section 9 of the *Assessment policies and procedures manual* at:
http://www.unisa.edu.au/policies/manual/

MARKING CRITERIA

Please see feedback form on next page…

Other possible deductions:

- *Programming practice:* Things to watch for are poor or no commenting, poor code layout, magic numbers, etc. Please refer to C programming practice slides and ensure your work adheres to the standards/conventions described in these slides.
- *Crashes:* -2 marks for each crash up to 6 marks.
- *Submitted incorrectly:* -10 marks if assignment is submitted incorrectly (i.e. not adhering to the specs).

University of South Australia

Assessment feedback

Programming Fundamentals for Engineers (COMP 1045). Programming Assignment.
Weighting: 20% - sp2, 2019

NAME:	MAX MARK	MARK	COMMENT

PRODUCES CORRECT RESULTS (OUTPUT)

menu

```
Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]:
```

□ -1 No details displayed to screen
□ -2 Incorrect line spacing
□ -2 No or incorrect prompt

list;
heroes; villains

```
|==================================================|
|          Characters (Heroes & Villains)          |
|==================================================|
|                                                  |
|  Character Name             B  W  L  D  Health   |
|==================================================|
|  Wonder Woman               5  5  0  0      90%  |
|--------------------------------------------------|
|  Batman                     6  2  0  4      80%  |
|--------------------------------------------------|
|  The Joker                  5  1  0  4      80%  |
|--------------------------------------------------|
|  Superman                   7  4  0  3     100%  |
|--------------------------------------------------|
|  Catwoman                  12  0  6  6      50%  |
|--------------------------------------------------|
|  Aquaman                    8  2  2  4      30%  |
|--------------------------------------------------|
|  Iron Man                  10  8  2  0      50%  |
|--------------------------------------------------|
|  Hulk                       7  2  1  4      80%  |
|--------------------------------------------------|
|  Thanos                    10  2  0  8      90%  |
|--------------------------------------------------|
|==================================================|
```

6
[List]

□ -3 No or incorrect list info
□ -1 For each formatting error (up to 3)

4
[heroes; villains]

□ -2 For no or incorrect heroes listing
□ -2 For no or incorrect villains listing

search

```
Please enter character's name: Hulk

All about Hulk --> HERO

Secret identity: Bruce Banner

Battles fought: 7
  > No won:     2
  > No lost:    1
  > No drawn:   4

Current health: 80%
```

5

□ -5 If no or incorrect results
□ -1 For each output/prompt/msg not to specs

reset

```
Please enter character's name: Catwoman

Successfully reset Catwoman's health.
```

5

□ -5 If no or incorrect results
□ -1 For each output/prompt/msg not to specs

add

```
Please enter character's name: Deadpool
Please enter character's secret identity: Wade Wilson
Is this character a hero or villain [h|v]? h

Successfully added Deadpool to character list.
```

5

□ -5 If no or incorrect results
□ -1 For each output/prompt/msg not to specs

remove

```
Please enter character's name: Thanos

Successfully removed Thanos from character list.
```

5

□ -5 If no or incorrect results
□ -1 For each output/prompt/msg not to specs

battle

```
Please enter opponent one's name: Superman
Please enter opponent two's name: Batman
Please enter number of battle rounds: 1


-- Battle --

Superman versus Batman - 1 rounds:

Round 1:
  > Superman - Damage: 41 - Current health: 59
  > Batman - Damage: 17 - Current health: 63

-- End of battle --

** Batman wins! **
```

10

□ -10 If no or incorrect results
□ -1 For each output/prompt/msg not to specs

□ -5 If incorrectly updates health, no battle, no won, no lost, no drawn stats

Output file (new_characters.txt)

5

□ -5 If file does not exist
□ -2 If incorrect results
□ -2 If output not to specs
□ -2 If not called ‘new_characters.txt’

ADHERES TO SPECIFICATIONS (CODE)			
characterRecord.h unchanged			□ -2 For each change
2 source files (characterRecord.c and assign.c)			□ -2 If all in the same file □ -2 If file names do not adhere to specs
#include correct			□ -2 If included *.c files
Array of structs & Structure declaration #define MAX_CHARACTERS 20			□ -2 If incorrect array size (-1 for each missing/incorrect field)
No globals			□ -2 If using global variables
Pass-by-reference parameters			□ -2 No or incorrect use of pass-by-ref
Good loops			□ -2 For using break, exit or return statements to exit loops

Functions
`read_character_record`
`display_characters`
`update_character_health`
`find_character`
`reset_health`
`call to find_character`
`add_character`
`call to find_character`
`remove_character`
`call to find_character`
`do_battle`
`call to update_character_health`
`write_to_file`
			□ -2 For each function not to specs as outlined in assignment specs and characterRecord.h
			□ -2 For each function not implemented
			□ -2 For each function that corresponds to a command not producing the correct results in the section above.
			□ -1 If functions are too long (approx 1-2 pages in length) + one idea per function
			□ -2 Crashes when run (-2 marks for each crash up to 6 marks).

STYLE: Comments (your details (top of every file), program description, all variable definitions, all function definitions, function prototypes and significant sections of code). Code layout Meaningful variable names	5		□ -3 Insufficient comments □ -3 Inconsistent indentation or layout □ -3 Non-descriptive variable names □ -3 Use of magic numbers
TOTAL	**50 MARKS**		

SAMPLE OUTPUT

Sample output 1:

```
File     : assign.c
Author   : Batman
This is my own work as defined by the
University's Academic Misconduct Policy.




Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: display

Not a valid command - please try again.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: heroes

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: villains

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: quit

NOTE: Your program should output the following information to a file - new_characters.txt.

Wonder Woman
Diana Prince
h 5 5 0 0 90
Batman
Bruce Wayne
h 6 2 0 4 80
The Joker
Jack Napier
v 5 1 0 4 80
Superman
Clark Kent
h 7 4 0 3 100
Catwoman
Selina Kyle
v 12 0 6 6 50
Aquaman
Arthur Curry
h 8 2 2 4 30
Iron Man
Tony Stark
h 10 8 2 0 50
Hulk
Bruce Banner
h 7 2 1 4 80
Thanos
n/a
v 10 2 0 8 90


 -- Program terminating --
```

Sample output 2:

```
File     : assign.c
Author   : Batman
This is my own work as defined by the
University's Academic Misconduct Policy.




Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: search

Please enter character's name: The Flash

The Flash is not found in character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: search

Please enter character's name: Aquaman

All about Aquaman --> HERO

Secret identity: Arthur Curry

Battles fought: 8
  > No won:     2
  > No lost:    2
  > No drawn:   4

Current health: 30%


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: search

Please enter character's name: Catwoman

All about Catwoman --> VILLAIN

Secret identity: Selina Kyle

Battles fought: 12
  > No won:     0
  > No lost:    6
  > No drawn:   6

Current health: 50%


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: quit

NOTE: Your program should output the following information to a file - new_characters.txt.

Wonder Woman
Diana Prince
h 5 5 0 0 90
Batman
Bruce Wayne
h 6 2 0 4 80
The Joker
Jack Napier
v 5 1 0 4 80
Superman
Clark Kent
h 7 4 0 3 100
Catwoman
Selina Kyle
v 12 0 6 6 50
Aquaman
Arthur Curry
h 8 2 2 4 30
Iron Man
Tony Stark
h 10 8 2 0 50
Hulk
Bruce Banner
h 7 2 1 4 80
Thanos
n/a
v 10 2 0 8 90


 -- Program terminating --
```

Sample output 3:

```
File     : assign.c
Author   : Batman
This is my own work as defined by the
University's Academic Misconduct Policy.




Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: reset

Please enter character's name: Black Widow

Black Widow is not found in character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: reset

Please enter character's name: Iron Man

Successfully reset Iron Man's health.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0     100%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|====================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: quit

NOTE: Your program should output the following information to a file - new_characters.txt.

Wonder Woman
Diana Prince
h 5 5 0 0 90
Batman
Bruce Wayne
h 6 2 0 4 80
The Joker
Jack Napier
v 5 1 0 4 80
Superman
Clark Kent
h 7 4 0 3 100
Catwoman
Selina Kyle
v 12 0 6 6 50
Aquaman
Arthur Curry
h 8 2 2 4 30
Iron Man
Tony Stark
h 10 8 2 0 100
Hulk
Bruce Banner
h 7 2 1 4 80
Thanos
n/a
v 10 2 0 8 90


 -- Program terminating --
```

Sample output 4:

```
File     : assign.c
Author   : Batman
This is my own work as defined by the
University's Academic Misconduct Policy.




Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: add

Please enter character's name: Hulk
Please enter character's secret identity: Bruce Banner
Is this character a hero or villain [h|v]? h

Hulk already exists in character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: add

Please enter character's name: Deadpool
Please enter character's secret identity: Wade Wilson
Is this character a hero or villain [h|v]? h

Successfully added Deadpool to character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|====================================================|
|          Characters (Heroes & Villains)            |
|====================================================|
|                                                    |
|  Character Name             B  W  L  D  Health    |
|====================================================|
|  Wonder Woman               5  5  0  0      90%   |
|----------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|----------------------------------------------------|
|  The Joker                 5  1  0  4      80%   |
|--------------------------------------------------|
|  Superman                  7  4  0  3     100%   |
|--------------------------------------------------|
|  Catwoman                 12  0  6  6      50%   |
|--------------------------------------------------|
|  Aquaman                   8  2  2  4      30%   |
|--------------------------------------------------|
|  Iron Man                 10  8  2  0      50%   |
|--------------------------------------------------|
|  Hulk                      7  2  1  4      80%   |
|--------------------------------------------------|
|  Thanos                   10  2  0  8      90%   |
|--------------------------------------------------|
|  Deadpool                  0  0  0  0     100%   |
|--------------------------------------------------|
|==================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: quit

NOTE: Your program should output the following information to a file - new_characters.txt.

Wonder Woman
Diana Prince
h 5 5 0 0 90
Batman
Bruce Wayne
h 6 2 0 4 80
The Joker
Jack Napier
v 5 1 0 4 80
Superman
Clark Kent
h 7 4 0 3 100
Catwoman
Selina Kyle
v 12 0 6 6 50
Aquaman
Arthur Curry
h 8 2 2 4 30
Iron Man
Tony Stark
h 10 8 2 0 50
Hulk
Bruce Banner
h 7 2 1 4 80
Thanos
n/a
v 10 2 0 8 90
Deadpool
Wade Wilson
h 0 0 0 0 100


 -- Program terminating --
```

Sample output 5:

```
File     : assign.c
Author   : Batman
This is my own work as defined by the
University's Academic Misconduct Policy.




Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|==================================================|
|          Characters (Heroes & Villains)          |
|==================================================|
|                                                  |
|  Character Name            B  W  L  D  Health    |
|==================================================|
|  Wonder Woman              5  5  0  0      90%   |
|--------------------------------------------------|
|  Batman                    6  2  0  4      80%   |
|--------------------------------------------------|
|  The Joker                 5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: remove

Please enter character's name: Captain Marvel

Captain Marvel is not found in character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: remove

Please enter character's name: Wonder Woman

Successfully removed Wonder Woman from character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: remove

Please enter character's name: Superman

Successfully removed Superman from character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: remove

Please enter character's name: Iron Man

Successfully removed Iron Man from character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: remove

Please enter character's name: Thanos

Successfully removed Thanos from character list.
```

```
Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: quit

NOTE: Your program should output the following information to a file - new_characters.txt.

Batman
Bruce Wayne
h 6 2 0 4 80
The Joker
Jack Napier
v 5 1 0 4 80
Catwoman
Selina Kyle
v 12 0 6 6 50
Aquaman
Arthur Curry
h 8 2 2 4 30
Hulk
Bruce Banner
h 7 2 1 4 80


 -- Program terminating --
```

Sample output 6:

```
File     : assign.c
Author   : Batman
This is my own work as defined by the
University's Academic Misconduct Policy.




Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: battle

Please enter opponent one's name: The Flash
The Flash not found in character list - please enter another opponent!

Please enter opponent one's name: Captain Marvel
Captain Marvel not found in character list - please enter another opponent!

Please enter opponent one's name: Aquaman
Please enter opponent two's name: Deadpool
Deadpool not found in character list - please enter another opponent!

Please enter opponent two's name: Wonder Woman
Please enter number of battle rounds: 3


-- Battle --

Aquaman versus Wonder Woman - 3 rounds:

Round 1:
  > Aquaman - Damage: 41 - Current health: 0
  > Wonder Woman - Damage: 17 - Current health: 73

-- End of battle --

-- Aquaman has died!  :(

** Wonder Woman wins! **



Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               6  6  0  0      73%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    9  2  3  4       0%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: quit
```

NOTE: Your program should output the following information to a file - new_characters.txt.

```
Wonder Woman
Diana Prince
h 6 6 0 0 73
Batman
Bruce Wayne
h 6 2 0 4 80
The Joker
Jack Napier
```

```
v 5 1 0 4 80
Superman
Clark Kent
h 7 4 0 3 100
Catwoman
Selina Kyle
v 12 0 6 6 50
Aquaman
Arthur Curry
h 9 2 3 4 0
Iron Man
Tony Stark
h 10 8 2 0 50
Hulk
Bruce Banner
h 7 2 1 4 80
Thanos
n/a
v 10 2 0 8 90


 -- Program terminating --
```

Sample output 7:

```
File     : assign.c
Author   : Batman
This is my own work as defined by the
University's Academic Misconduct Policy.




Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: add

Please enter character's name: Captain Marvel
Please enter character's secret identity: Carol Danvers
Is this character a hero or villain [h|v]? h

Successfully added Captain Marvel to character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|  Captain Marvel             0  0  0  0     100%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: add

Please enter character's name: Spider-man
Please enter character's secret identity: Peter Parker
Is this character a hero or villain [h|v]? h
```

```
Successfully added Spider-man to character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|  Captain Marvel             0  0  0  0     100%   |
|---------------------------------------------------|
|  Spider-man                 0  0  0  0     100%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: battle

Please enter opponent one's name: Captain Marvel
Please enter opponent two's name: Spider-man
Please enter number of battle rounds: 4


-- Battle --

Captain Marvel versus Spider-man - 4 rounds:

Round 1:
  > Captain Marvel - Damage: 41 - Current health: 59
  > Spider-man - Damage: 17 - Current health: 83

Round 2:
  > Captain Marvel - Damage: 34 - Current health: 25
  > Spider-man - Damage: 0 - Current health: 83

Round 3:
  > Captain Marvel - Damage: 19 - Current health: 6
  > Spider-man - Damage: 24 - Current health: 59

Round 4:
  > Captain Marvel - Damage: 28 - Current health: 0
  > Spider-man - Damage: 8 - Current health: 51

-- End of battle --

-- Captain Marvel has died!  :(

** Spider-man wins! **



Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|  Captain Marvel             1  0  1  0       0%   |
|---------------------------------------------------|
|  Spider-man                 1  1  0  0      51%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: quit

NOTE: Your program should output the following information to a file - new_characters.txt.

Wonder Woman
Diana Prince
h 5 5 0 0 90
Batman
Bruce Wayne
h 6 2 0 4 80
The Joker
Jack Napier
v 5 1 0 4 80
Superman
Clark Kent
h 7 4 0 3 100
Catwoman
Selina Kyle
v 12 0 6 6 50
Aquaman
Arthur Curry
h 8 2 2 4 30
Iron Man
Tony Stark
h 10 8 2 0 50
Hulk
Bruce Banner
h 7 2 1 4 80
Thanos
n/a
v 10 2 0 8 90
Captain Marvel
Carol Danvers
h 1 0 1 0 0
Spider-man
Peter Parker
h 1 1 0 0 51


 -- Program terminating --
```

Sample output 8:

```
File     : assign.c
Author   : Batman
This is my own work as defined by the
University's Academic Misconduct Policy.




Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: reset

Please enter character's name: Captain Marvel

Captain Marvel is not found in character list.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: reset

Please enter character's name: Batman

Successfully reset Batman's health.


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4     100%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: battle

Please enter opponent one's name: Superman
Please enter opponent two's name: Batman
Please enter number of battle rounds: 2


-- Battle --

Superman versus Batman - 2 rounds:
```

```
Round 1:
  > Superman - Damage: 41 - Current health: 59
  > Batman - Damage: 17 - Current health: 83

Round 2:
  > Superman - Damage: 34 - Current health: 25
  > Batman - Damage: 0 - Current health: 83

-- End of battle --

** Batman wins! **



Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     7  3  0  4      83%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   8  4  1  3      25%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: battle

Please enter opponent one's name: Batman
Please enter opponent two's name: Superman
Please enter number of battle rounds: 5


-- Battle --

Batman versus Superman - 5 rounds:

Round 1:
  > Batman - Damage: 19 - Current health: 64
  > Superman - Damage: 24 - Current health: 1

Round 2:
  > Batman - Damage: 28 - Current health: 36
  > Superman - Damage: 8 - Current health: 0

-- End of battle --

-- Superman has died!  :(

** Batman wins! **



Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     8  4  0  4      36%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   9  4  2  3       0%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: quit

NOTE: Your program should output the following information to a file - new_characters.txt.

Wonder Woman
Diana Prince
h 5 5 0 0 90
Batman
Bruce Wayne
h 8 4 0 4 36
The Joker
Jack Napier
v 5 1 0 4 80
Superman
Clark Kent
h 9 4 2 3 0
Catwoman
Selina Kyle
v 12 0 6 6 50
Aquaman
Arthur Curry
h 8 2 2 4 30
Iron Man
Tony Stark
h 10 8 2 0 50
Hulk
Bruce Banner
h 7 2 1 4 80
Thanos
n/a
v 10 2 0 8 90


 -- Program terminating --
```

Sample output 9:

```
File     : assign.c
Author   : Batman
This is my own work as defined by the
University's Academic Misconduct Policy.




Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: list

|===================================================|
|          Characters (Heroes & Villains)           |
|===================================================|
|                                                   |
|  Character Name             B  W  L  D  Health    |
|===================================================|
|  Wonder Woman               5  5  0  0      90%   |
|---------------------------------------------------|
|  Batman                     6  2  0  4      80%   |
|---------------------------------------------------|
|  The Joker                  5  1  0  4      80%   |
|---------------------------------------------------|
|  Superman                   7  4  0  3     100%   |
|---------------------------------------------------|
|  Catwoman                  12  0  6  6      50%   |
|---------------------------------------------------|
|  Aquaman                    8  2  2  4      30%   |
|---------------------------------------------------|
|  Iron Man                  10  8  2  0      50%   |
|---------------------------------------------------|
|  Hulk                       7  2  1  4      80%   |
|---------------------------------------------------|
|  Thanos                    10  2  0  8      90%   |
|---------------------------------------------------|
|===================================================|


Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: battle

Please enter opponent one's name: Thanos
Please enter opponent two's name: Hulk
Please enter number of battle rounds: -1
Must be between 1 - 5 inclusive.

Please enter number of battle rounds: 7
Must be between 1 - 5 inclusive.

Please enter number of battle rounds: 2


-- Battle --

Thanos versus Hulk - 2 rounds:

Round 1:
  > Thanos - Damage: 41 - Current health: 49
  > Hulk - Damage: 17 - Current health: 63

Round 2:
  > Thanos - Damage: 34 - Current health: 15
  > Hulk - Damage: 0 - Current health: 63

-- End of battle --

** Hulk wins! **



Please enter command
[list, heroes, villains, search, reset, add, remove, battle, quit]: quit

NOTE: Your program should output the following information to a file - new_characters.txt.

Wonder Woman
Diana Prince
h 5 5 0 0 90
Batman
Bruce Wayne
h 6 2 0 4 80
The Joker
Jack Napier
v 5 1 0 4 80
Superman
Clark Kent
h 7 4 0 3 100
Catwoman
Selina Kyle
v 12 0 6 6 50
Aquaman
Arthur Curry
h 8 2 2 4 30
Iron Man
Tony Stark
h 10 8 2 0 50
Hulk
Bruce Banner
h 8 3 1 4 63
Thanos
n/a
v 11 2 1 8 15


 -- Program terminating --
```