

**Programming 1 (PRG1)**

Year 1 (2020/21), Semester 1

**SCHOOL OF INFOCOMM TECHNOLOGY**

Diploma in Financial Informatics

Diploma in Cyber Security & Forensics

Diploma in Information Technology

Diploma in Immersive Media

Diploma in Common ICT Programme

# ASSIGNMENT

**Due on 17 August 2020 (Monday), 8.30 am**

**Weightage:** 40% of Module

**Individual/Team/Both:** Individual

**Format:** Programming and Presentation

Basic Requirement (75%)

Additional Requirement (25%)

**Penalty for late submission:**

* + 10% per day from the due date.
  + NO submission shall be entertained after 7 calendar days of the due date.

There are a total of 15 pages (including this page) in this handout.

|  |
| --- |
| ***WARNING***  ***If a student is found to have submitted work not done by him/her, he/she will not be awarded any marks for this assignment. Disciplinary action will also be taken.***  ***Similar action will be taken for the student who allows other student(s) to copy his/her work.*** |

**1. OBJECTIVE**

This assignment assesses the student’s ability to apply relevant programming concepts to develop a simple application using Python programming language.

**2. BACKGROUND**

Develop a computer role-playing game called Ratventure.

**3. SCOPE**

You are The Hero. The world is being invaded by the Rat King and his endless rat minions. The only way to defeat the Rat King is to find the Orb of Power, and then destroy the Rat King in combat. Since you have the ability to sense the Orb of Power, only you can save the world.

In this computer role-playing game, you will travel around a grid map searching for the Orb of Power and fighting rat minions. On the map are various towns where you can rest and save your game. Once you find the Orb of Power, destroy the Rat King to win the game.

The assignment consists of “**Basic Requirements**” and “**Advanced Requirements**” as described in sections 4 and 5 respectively. You are advised to complete the basic requirements BEFORE proceeding with the advanced requirements.

For this assignment, you are expected to:

* understand the problem completely and plan your program layout before you start coding
* develop the solution for each task by using functions
* functions developed should be as generic as possible - values used in functions should be passed in as the function parameters
* you may use global variables **sparingly**
* implement and test each feature as it is developed
* do all the possible data validations

**4. BASIC REQUIREMENTS**

The application should provide the following **basic** features:

1. **Display main menu**

When the program is first run, it should display the main menu as shown in Figure 1. When a user enters an option from 1 to 3, the program will process the option accordingly.

|  |
| --- |
| Welcome to Ratventure!  ----------------------  1) New Game  2) Resume Game  3) Exit Game  Enter choice: |

## Figure 1 - Main Menu

* 1. **New Game**

This option starts a new game. The player’s statistics are initialized as follows:

* Name: The Hero
* Damage: 2 to 4
* Defence: 1
* HP: 20

The default map is:

+---+---+---+---+---+---+---+---+

| T | | | | | | | |

+---+---+---+---+---+---+---+---+

| | | | T | | | | |

+---+---+---+---+---+---+---+---+

| | | | | | T | | |

+---+---+---+---+---+---+---+---+

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+---+---+---+---+---+---+---+---+

| | | | | T | | | |

+---+---+---+---+---+---+---+---+

| | | | | | | | K |

+---+---+---+---+---+---+---+---+

where T is a town and K is the Rat King. You may place the Orb of Power in any outdoor space (not a town or the Rat King). The player starts at the top left-hand corner of the map. The game starts on Day 1.

The player begins in a town, so the options available in a town will be shown when you start a new game.

|  |
| --- |
| Enter choice: 1  Day 1: You are in a town.  1) View Character  2) View Map  3) Move  4) Rest  5) Save Game  6) Exit Game  Enter choice: |

## Figure 1.1 – New Game

* 1. **Resume Game**

This option reads the save file and restores the game state. Since you can only save a game in a town, you will be in a town after you resume your game.

* 1. **Exit Game**

This option quits the game and exits.

1. **Display Town Menu**

When you are in a town, it should display the main menu as shown in Figure 1.1. When a user enters an option from 1 to 6, the program will process the option accordingly.

* 1. **View Character**

Displays the player’s statistics.

|  |
| --- |
| Enter choice: 1  The Hero  Damage: 2-4  Defence: 1  HP: 20 |

## Figure 2.1 – View Character

* 1. **View Map**

Displays the world map. H denotes the hero. Note that if the hero is in a town or at the Rat King’s castle, H/T or H/K is shown instead of T or K, respectively.

|  |
| --- |
| Enter choice: 2  +---+---+---+---+---+---+---+---+  |H/T| | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | T | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | T | | |  +---+---+---+---+---+---+---+---+  | | T | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | T | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | K |  +---+---+---+---+---+---+---+---+ |

## Figure 2.2 – View Map

* 1. **Move**

Allows the player to move on the world map, using W, A, S and D to move up, left, down and right, respectively. This adds 1 day to the time. They are not allowed to move out of the map.

|  |
| --- |
| Enter choice: 3  +---+---+---+---+---+---+---+---+  |H/T| | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | T | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | T | | |  +---+---+---+---+---+---+---+---+  | | T | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | T | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | K |  +---+---+---+---+---+---+---+---+  W = up; A = left; S = down; D = right  Your move: d  +---+---+---+---+---+---+---+---+  | T | H | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | T | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | T | | |  +---+---+---+---+---+---+---+---+  | | T | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | T | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | K |  +---+---+---+---+---+---+---+---+ |

## Figure 2.3 - Move

* 1. **Rest**

This resets the player’s HP to 20, and takes 1 day.

|  |
| --- |
| Enter choice: 4  You are fully healed. |

## Figure 2.4 – Rest

* 1. **Save Game**

This saves the current state of the game, so that after the player quits the game, they can return to the current state by selecting “Resume Game” in the main menu (see Section 1.2).

|  |
| --- |
| Enter choice: 5  Game saved. |

## Figure 2.5 – Save Game

* 1. **Exit Game**

This option quits the game and exits.

1. **Combat Menu**

When the player first steps onto an outdoor location (denoted by an empty square on the map), a rat will attack. A combat menu will be shown along with the statistics of the rat (see Figure 3). When a user enters either option 1 or 2, the program will process the option accordingly.

|  |
| --- |
| Your move: d  +---+---+---+---+---+---+---+---+  | T | H | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | T | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | T | | |  +---+---+---+---+---+---+---+---+  | | T | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | |  +---+---+---+---+---+---+---+---+  | | | | | T | | | |  +---+---+---+---+---+---+---+---+  | | | | | | | | K |  +---+---+---+---+---+---+---+---+  Day 2: You are out in the open.  Encounter! - Rat  Damage: 1-3  Defence: 1  HP: 10  1) Attack  2) Run |

## Figure 3 – Combat Menu

* 1. **Attack**

The hero attacks the opponent, dealing a random amount of damage between his min damage and his max damage, reduced by the opponent’s defence. If this reduces the opponent’s HP to 0 or fewer, the combat ends and the outdoor menu is shown (see Section 4). Otherwise, the opponent deals damage to the hero in the same manner. If the hero’s HP is now 0 or fewer, the game is over and the player loses. Otherwise, the fight continues back to the combat menu.

|  |
| --- |
| Enter choice: 1  You deal 2 damage to the Rat  Ouch! The Rat hit you for 2 damage!  You have 18 HP left.  Encounter! - Rat  Damage: 1-3  Defence: 1  HP: 8  1) Attack  2) Run  Enter choice: |

## Figure 3.1 - Attack

* 1. **Run**

The player runs and hides from the opponent, and goes to the outdoor menu (see Section 4). However, the opponent recovers all its HP, and will attack again if the player does anything other than move away from the current square or exit the game.

|  |
| --- |
| Enter choice: 2  You run and hide.  1) View Character  2) View Map  3) Move  4) Sense Orb  5) Exit Game  Enter choice: |

## Figure 3.2 - Run

1. **Display Outdoor Menu**

When you have defeated a rat, the outdoor menu will be displayed as shown in Figure 4. When a user enters an option from 1 to 5, the program will process the option accordingly.

Note that the outdoor menu is also displayed if the player runs from combat (see Section 3.2). In this case, only options 3 (Move) and 5 (Exit Game) will work normally. All other options lead to combat.

|  |
| --- |
| 1) Attack  2) Run  Enter choice: 1  You deal 2 damage to the Rat  The Rat is dead! You are victorious!  1) View Character  2) View Map  3) Move  4) Sense Orb  5) Exit Game  Enter choice: |

## Figure 4 – Outdoor Menu

* 1. **View Character**

Displays the player’s statistics (see Section 2.1).

* 1. **View Map**

Displays the world map (see Section 2.2).

* 1. **Move**

Allows the player to move on the world map, using W, A, S and D to move up, left, down and right, respectively. This adds 1 day to the time (see Section 2.3).

* 1. **Sense Orb**

This action takes 1 day. If the player is not on the square containing the Orb of Power, this option provides the direction of the orb (north, northeast, east, southeast, south, southwest, west or northwest) as given in Figure 4.1a.

|  |
| --- |
| Enter choice: 4  You sense that the Orb of Power is to the northeast.  Day 3: You are out in the open.  1) View Character  2) View Map  3) Move  4) Sense Orb  5) Exit Game  Enter choice: |

## Figure 4.1a – Sense Orb (orb not found)

If the player is on the square containing the Orb of Power, this option allows the player to pick it up. The hero’s Min Damage, Max Damage and Defence are all increased by 5. From now on, if the player chooses View Character, it will reflect the new values and also state that the player is holding the Orb of Power.

|  |
| --- |
| You found the Orb of Power!  Your attack increases by 5!  Your defence increases by 5!  Day 8: You are out in the open.  1) View Character  2) View Map  3) Move  4) Sense Orb  5) Exit Game  Enter choice: 1  The Hero  Damage: 7-9  Defence: 6  HP: 11  You are holding the Orb of Power. |

## Figure 4.4b – Sense Orb (orb found)

* 1. **Exit Game**

This option quits the game and exits.

1. **The Rat King**

When you are at the space with the Rat King, you enter a combat menu (see Figure 5).

|  |
| --- |
| Day 19: You see the Rat King!  Encounter! - Rat King  Damage: 8-12  Defence: 5  HP: 25  1) Attack  2) Run  Enter choice: |

## Figure 5 – Rat King Combat Menu

If you do not have the Orb of Power, you will deal no damage when you attack.

|  |
| --- |
| You do not have the Orb of Power - the Rat King is immune!  You deal 0 damage to the Rat King  Ouch! The Rat King hit you for 4 damage!  You have 1 HP left.  Encounter! - Rat King  Damage: 6-10  Defence: 5  HP: 2  1) Attack  2) Run  Enter choice: |

## Figure 5.1 – No Orb of Power

The combat proceeds like a normal combat (see Sections 3.1 and 3.2).

If the player can reduce the Rat King’s HP to 0 or fewer, he has won the game!

|  |
| --- |
| You deal 2 damage to the Rat King  Ouch! The Rat King hit you for 4 damage!  You have 1 HP left.  Encounter! - Rat King  Damage: 6-10  Defence: 5  HP: 2  1) Attack  2) Run  Enter choice: 1  You deal 3 damage to the Rat King  The Rat King is dead! You are victorious!  Congratulations, you have defeated the Rat King!  The world is saved! You win!  >>> |

## Figure 5.1 – Victory!

1. **Program documentation**

The program should have sufficient comments, which includes your name, class, date, overall description of what the program does, as well as the description of the functions.

**5. ADVANCED REQUIREMENTS**

* **Program validation -- 10 marks**

Add appropriate validation for the basic requirements of the program.

* **View Top Scores -- 5 marks**

Add an option 4 to the main menu to keep track of the number of days taken by the player to win the game. This option allows the player to view the top scores of the game that displays the 5 top ranking players of Ratventure (the players who took fewer days are ranked higher).

* **Randomize the location of the Orb of Power – 5 marks**

When a new game is started, randomly determine the location of the Orb of Power such that there is an equal chance of it being at any of the squares at the 4 rightmost columns or bottommost rows. For the default map, this is marked with ‘O’ in Figure 5a. This information must be saved and reloaded appropriately.

+---+---+---+---+---+---+---+---+

| H | | | | O | O | O | O |

+---+---+---+---+---+---+---+---+

| | | | T | O | O | O | O |

+---+---+---+---+---+---+---+---+

| | | | | O | T | O | O |

+---+---+---+---+---+---+---+---+

| | T | | | O | O | O | O |

+---+---+---+---+---+---+---+---+

| O | O | O | O | O | O | O | O |

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| O | O | O | O | O | O | O | O |

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| O | O | O | O | T | O | O | O |

+---+---+---+---+---+---+---+---+

| O | O | O | O | O | O | O | K |

+---+---+---+---+---+---+---+---+

## Figure 5a – Possible Locations for Orb of Power

* **Randomize the locations of the towns – 5 marks**

When a new game is started, randomly determine the locations of the 4 towns (other than the starting town that is always at the top left-hand corner). However, all towns must be at least 3 steps away from each other. This information must be saved and reloaded appropriately.

* **Additional features – up to 5 BONUS marks**

You may gain up to 5 bonus marks if you implement additional features to improve the game. Examples include (**but are not limited to**):

* + **Different types of opponents -** Modify the code such that there is more than one type of opponent (not just rats).
  + **Scale the opponent difficulty based on time –** Modify the code such that the opponents (rats and the Rat King) get stronger over time. For example, the Min and Max Damage for rats may increase by 1 after every 10 days.
  + **Buying items in town** – Opponents may drop gold when defeated, and this gold can be used to buy items in town. For example, the hero might be able to buy healing potions to heal outside of town, bombs to use during combat to deal damage, weapons to increase damage, armor to increase defence, etc.
  + **Combat enhancements** – Enhance the combat system. For example, it may allow being attacked by multiple opponents at once, combat effects like poison, etc.
  + **Graphical User Interface** – Use a graphics package (e.g., tkinter) to convert the game into a graphical game.

**Note:**

* ***You are expected to follow naming conventions introduced in this module.***
* ***You are encouraged to implement all the basic features before you implement the advanced features.***
* ***You should think carefully what input is required for each option if there is any.***
* ***You are allowed to customize your own output for the advanced features.***
* ***You are required to present your solution to your tutor. Your tutor may ask you questions to verify and assess your understanding of your work. Your tutor may ask you to make some changes to your program to handle another similar feature.***
* ***NO MARKS will be awarded for the advanced features if all the basic features have NOT been fully implemented (and fully working).***
* ***Marks will be deducted if you are not able to show your understanding of the program, both basic and advanced features (if applicable), during the presentation.***

**6. DELIVERABLES**

* Name the file **"S10009999A\_Assignment.py"** where **"S10009999A"** is your student ID.
* Submit your program into **MeL > Assignment > Assignment Submission** by **17 August 2020 8.30am.**
* Demonstrate your application to your tutor during your PRG1 lessons (and other timeslots scheduled by tutor) starting **17 August 2019.**

**7. ASSESSMENT**

This assignment constitutes 40% of this module.

Performance Criteria for grading the assignment is as described below. Marks awarded will be based on **program code** as well as student’s degree of understanding of work done as assessed during the **presentation**.

### A Grade

* Program implements the Basic Requirements with input validation successfully
* Program implements the Advanced Requirements successfully
* Program demonstrates good design with the correct use of functions
* Program complete with good documentation
* Program has been tested adequately
* Program is coded with good application of fundamental concepts
* Excellent demonstration of program and showing excellent understanding of work done during presentation

### B Grade

* Program implements the Basic Requirements with input validation successfully
* Program implements the Advanced Requirements with partial success
* Program demonstrates good design with the correct use of functions
* Program complete with good documentation
* Program has been tested adequately
* Program is coded with good application of fundamental concepts
* Good demonstration of program and showing good understanding of work done during presentation

### C Grade

* Program implements the Basic Requirements with input validation successfully
* Program demonstrates good design with the use of functions
* Program complete with some documentation
* Program has been tested adequately
* Some demonstration of program and showing some understanding of work done during presentation

### D Grade

* Program implements the Basic Requirementssuccessfully
* Program complete with some documentation
* Program has been tested adequately
* Able to answer some questions during presentation

Validation is required so that if there are more than one employees whose name contains what is entered, the user is asked to choose the correct employee.