Programming 1 (PRG1)

Year 1 (2024/25), Semester 1

SCHOOL OF INFOCOMM TECHNOLOGY

Diploma in Cyber Security & Forensics
Diploma in Data Science
Diploma in Immersive Media
Diploma in Information Technology
Common ICT Programme

ASSIGNMENT

Due on 4 August 2024 (Sunday), 2359 hours

Weightage:	30% of Module
Individual/Team/Both:	Individual
Format:	Programming and Presentation Basic Requirements (50%) Advanced Requirements (30%) Documentation, Programming Style and Presentation (20%)

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 is 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 farming simulation game called Sundrop Farm.

3. SCOPE

You have taken out a loan to buy Sundrop Farm, located in scenic Albatross Town. Can you make enough money to pay off your loan of $100 in 20 days?

In this "farming simulation" strategy game, you start with $20 and a 5x5 plot of farmland. You can buy seeds for different crops at Pierce's Store and plant them on your farm. There are 3 different types of crops. Each crop has a different cost, time to grow, and sell price when harvested. After a seed is planted, you must wait the required number of days for it to fully mature before you can harvest it for a profit.

Walking on your farm, planting a seed and harvesting a crop takes 1 energy each, and you only have 10 energy each day. If you have at least $100 after 20 days, you win the game.

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 relevant data validations

4. GAME DETAILS

The complete game should have the following 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 1, 2 or 0, the program will process the option accordingly.

```
--------------------------------------------------------
Welcome to Sundrop Farm!

You took out a loan to buy a small farm in Albatross Town.
You have 20 days to pay off your debt of $100.
You might even be able to make a little profit.
How successful will you be?
--------------------------------------------------------
1) Start a new game
2) Load your saved game

0) Exit Game
Your choice?
```

Figure 1 - Main Menu

1.1. [Option 1] Start New Game

This option starts a new game.

```
Your choice? 1
+-------------------------------------------------+
| Day 1           Energy: 10          Money: $20   |
| You have no seeds.                               |
+-------------------------------------------------+
You are in Albatross Town
-------------------------
1) Visit Shop
2) Visit Farm
3) End Day

9) Save Game
0) Exit Game
-------------------------
Your choice?
```

Figure 1.1 – New Game

The player begins in Day 1 with 10 Energy, $20 and no seeds, as shown in the statistics box above. They start off in Albatross Town.

1.2. [Option 2] Load Saved Game

This option reads the save file and restores the game state. You can only have one saved game.

1.3. [Option 0] Exit Game

This option quits the game and exits.

2. Playing the Game

When you are playing the game, it should display the game menu as shown in Figure 1.1. When a user enters an option, the program will process the option accordingly.

2.1. [Option 1] Visit Shop

Option 1 allows the player to purchase seeds at Pierce's Seed Shop. There are 3 types of seeds: Lettuce (LET), Potato (POT) and Cauliflower (CAU). Each seed has a different Price, takes a different number of Days to Grow, and can be sold for a different Crop Price once it has been planted and fully grown. See Figure 2.1a below for the values for each type of seed.

```
Your choice? 1
Welcome to Pierce's Seed Shop!
+-------------------------------------------------+
| Day 1          Energy: 10          Money: $20    |
| You have no seeds.                               |
+-------------------------------------------------+
What do you wish to buy?
Seed             Price   Days to Grow   Crop Price
-------------------------------------------------
 1) Lettuce        2          2             3
 2) Potato         3          3             6
 3) Cauliflower    5          6             14

 0) Leave
-------------------------------------------------
Your choice?
```

Figure 2.1a – Seed menu

The player can select 1-3 to purchase a seed, or 0 to leave the shop and return to Albatross Town (Figure 1.1). When 1-3 is selected, the player is asked for the number of seeds to buy. If the player has enough money, the seeds will be bought and the correct amount of money is deducted. Note that the statistics box will show the seeds that the player possesses.

```
Your choice? 2
You have $20
How many do you wish to buy? 4
You bought 4 Potato seeds.
+-------------------------------------------------+
| Day 1          Energy: 10          Money: $4     |
| Your seeds:                                      |
|   Potato:         4                              |
+-------------------------------------------------+
What do you wish to buy?
Seed             Price   Days to Grow   Crop Price
-------------------------------------------------
 1) Lettuce        2          2             3
 2) Potato         3          3             6
 3) Cauliflower    5          6             14

 0) Leave
-------------------------------------------------
Your choice?
```

Figure 2.1b – Buying a seed with enough money

If the player does not have enough money, the game will reject the purchase.

```
Your choice? 3
You have $4
How many do you wish to buy? 3
You can't afford that!
+-------------------------------------------------+
| Day 1           Energy: 10          Money: $4   |
| Your seeds:                                     |
|   Potato:         4                             |
+-------------------------------------------------+
What do you wish to buy?
Seed             Price   Days to Grow   Crop Price
-------------------------------------------------
 1) Lettuce        2          2             3
 2) Potato         3          3             6
 3) Cauliflower    5          6             14

 0) Leave
-------------------------------------------------
Your choice?
```

Figure 2.1c – Trying to buy a seed with not enough money

2.2. [Option 2] Visit Farm

When the player chooses option 2, the player will visit their farm, which is a 5x5 grid (see Figure 2.2a). The player is represented by an 'X', and always starts at the House in the centre of the farm (represented by 'HSE'). Their remaining energy is also shown.

```
Your choice? 2
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     | HSE |     |     |
|     |     |  X  |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
Energy: 10
[WASD] Move
R)eturn to Town
Your choice?
```

Figure 2.2a – First time visiting the farm

The player has several options:

- **[W, A, S or D] Move**
  Players can move one square up, left, down or right by entering 'W', 'A', 'S' or 'D', respectively. The game should also handle lowercase letters. Moving costs 1 Energy, and the farm should be updated accordingly by moving the 'X' to the correct square. Note that the player is not allowed to move off the 5x5 grid.

```
Your choice? a
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     | HSE |     |     |
|     |  X  |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
Energy: 9
[WASD] Move
P)lant seed
R)eturn to Town
Your choice?
```

- **[P] Plant Seed**
  If the player is on an empty square and is carrying at least one seed, then they can plant a seed by entering 'P'. The game will list out the available seeds and ask the player to select one, or select zero (0) if they change their mind. If a seed is selected, it will be planted in the current square. The number of days left before the crop is fully grown (and therefore can be harvested) is shown at the bottom of the square. Planting a seed costs 1 Energy.

  Note that the option to plant a seed will not appear if the player is not carrying any seeds, or if the current square is already occupied.

```
Your choice? p
What do you wish to plant?
-----------------------------------------------------
    Seed              Days to Grow  Crop Price  Available
-----------------------------------------------------
 1) Potato               3            6          12
 2) Lettuce              2            3           4

 0) Leave
-----------------------------------------------------
Your choice? 2
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     | LET | HSE |     |     |
|     |  X  |     |     |     |
|     |  2  |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
Energy: 8
[WASD] Move
R)eturn to Town
Your choice?
```

- **[H] Harvest**
  If the player is on a square with a crop that is ready to harvest, i.e., its number of days left to grow is zero, then they can harvest the crop by entering ‘H’. This will add the seed’s Crop Price to the player’s money total, and the square will be cleared. Harvesting takes 1 Energy.

  Note that the option to Harvest will only appear if the player is on a square with a crop that is ready to harvest.

```
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     | LET | HSE | POT |     |
|     |  X  |     |     |     |
|     |  0  |     |  2  |     |
+-----+-----+-----+-----+-----+
|     | LET | POT | POT | POT |
|     |     |     |     |     |
|     |  0  |  1  |  2  |  2  |
+-----+-----+-----+-----+-----+
|     | LET | POT | LET | POT |
|     |     |     |     |     |
|     |  0  |  1  |  1  |  2  |
+-----+-----+-----+-----+-----+
Energy: 9
[WASD] Move
H)arvest lettuce for $3
R)eturn to Town
Your choice? h
You harvest the Lettuce and sold it for $3!
You now have $9!
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     | HSE | POT |     |
|     |  X  |     |     |     |
|     |     |     |  2  |     |
+-----+-----+-----+-----+-----+
|     | LET | POT | POT | POT |
|     |     |     |     |     |
|     |  0  |  1  |  2  |  2  |
+-----+-----+-----+-----+-----+
|     | LET | POT | LET | POT |
|     |     |     |     |     |
|     |  0  |  1  |  1  |  2  |
+-----+-----+-----+-----+-----+
Energy: 8
[WASD] Move
P)lant seed
R)eturn to Town
Your choice?
```

- **[R] Return to Town**
  The player can always return to town from the farm by entering 'R'. This moves the player back to the Albatross Town menu. If the player returns to the farm, they will start again at the House, and they will have the same amount of energy that they had when they last left the farm.

```
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     | HSE | POT |     |
|     |     |     |     |     |
|     |     |     |  2  |     |
+-----+-----+-----+-----+-----+
|     | POT | POT | POT | POT |
|     |  X  |     |     |     |
|     |  3  |  1  |  2  |  2  |
+-----+-----+-----+-----+-----+
|     | LET | POT | LET | POT |
|     |     |     |     |     |
|     |  0  |  1  |  1  |  2  |
+-----+-----+-----+-----+-----+
Energy: 5
[WASD] Move
R)eturn to Town
Your choice? r
+-----------------------------------------------------+
| Day 3          Energy:  5          Money: $12       |
| Your seeds:                                         |
|   Potato:          5                                |
+-----------------------------------------------------+
You are in Albatross Town
-------------------------
1) Visit Shop
2) Visit Farm
3) End Day

9) Save Game
0) Exit Game
-------------------------
Your choice? 2
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     |     | HSE | POT |     |
|     |     |  X  |     |     |
```

```
|     |     |     |  2  |     |
+-----+-----+-----+-----+-----+
|     | POT | POT | POT | POT |
|     |     |     |     |     |
|     |  3  |  1  |  2  |  2  |
+-----+-----+-----+-----+-----+
|     | LET | POT | LET | POT |
|     |     |     |     |     |
|     |  0  |  1  |  1  |  2  |
+-----+-----+-----+-----+-----+
Energy: 5
[WASD] Move
R)eturn to Town
Your choice?
```

Note that if the player has 0 Energy, the message “You’re too tired. You should get back to town.” will be shown if they try to do anything other than return to town.

```
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     | POT | POT |     |     |
|     |     |     |     |     |
|     |  3  |  3  |     |     |
+-----+-----+-----+-----+-----+
|     |     | HSE | POT |     |
|     |  X  |     |     |     |
|     |     |     |  2  |     |
+-----+-----+-----+-----+-----+
|     | POT | POT | POT | POT |
|     |     |     |     |     |
|     |  3  |  1  |  2  |  2  |
+-----+-----+-----+-----+-----+
|     | LET | POT | LET | POT |
|     |     |     |     |     |
|     |  0  |  1  |  1  |  2  |
+-----+-----+-----+-----+-----+
Energy: 0
[WASD] Move
P)lant seed
R)eturn to Town
Your choice? s
You're too tired. You should get back to town.
+-----+-----+-----+-----+-----+
|     |     |     |     |     |
|     |     |     |     |     |
|     |     |     |     |     |
+-----+-----+-----+-----+-----+
|     | POT | POT |     |     |
|     |     |     |     |     |
|     |  3  |  3  |     |     |
+-----+-----+-----+-----+-----+
|     |     | HSE | POT |     |
|     |  X  |     |     |     |
|     |     |     |  2  |     |
+-----+-----+-----+-----+-----+
```

```
|      | POT | POT | POT | POT |
|      |     |     |     |     |
|      |  3  |  1  |  2  |  2  |
+-----+-----+-----+-----+-----+
|      | LET | POT | LET | POT |
|      |     |     |     |     |
|      |  0  |  1  |  1  |  2  |
+-----+-----+-----+-----+-----+
Energy: 0
[WASD] Move
P)lant seed
R)eturn to Town
Your choice?
```

2.3. [Option 3] End Day

When the player chooses option 3 from the Albatross Town menu, time advances in the game. The time left for every planted crop in the farm to mature is reduced by 1 (to a minimum of zero), then the Day increases by 1 and the player's Energy is reset to 10.

If the next day is Day 21, the game ends. If the player has at least $100, they win. Otherwise, they lose.

```
+-------------------------------------------------+
| Day 20          Energy: 4          Money: $118  |
| You have no seeds.                              |
+-------------------------------------------------+
You are in Albatross Town
-------------------------
1) Visit Shop
2) Visit Farm
3) End Day

9) Save Game
0) Exit Game
-------------------------
Your choice? 3
Your have $118 after 20 days.
You paid off your debt of $100 and made a profit of $18
You win!
```

2.4. [Option 9] 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 "Load Your Saved Game" in the main menu (see 1.2).

```
Enter choice: 9
Game saved.
```

Figure 2.3 – Save Game

2.5. [Option 0] Quit

This option exits the game.

```
Your choice? 4
Goodbye!
```

Figure 2.4 – Quit

5. REQUIREMENTS

This assignment consists of "**Basic Requirements**", "**Advanced Requirements**" and "**Other Requirements**". You are advised to complete the basic requirements BEFORE proceeding with the advanced requirements.

Basic Requirements (50 marks)
Refer to Section 4 above for the descriptions for these requirements. The numbering of the list corresponds to the numbering in Section 4.

- **Overall Game Flow – 10 marks**
  Includes displaying the main menu, getting user input, calling the correct functions and the overall game loop

- **Generate and Initialize a New Game – 5 marks**
  Allows the player to start a new game.

- **Albatross Town – 5 marks**
  Allows the player to visit the shop, visit the farm, or end the day.

- **Display Statistics – 5 marks**
  Show the current Day, Energy remaining, Money left and the list of seeds (and quantities) that the player possesses in a well-formatted manner.

- **Visit the Shop – 10 marks**
  Allows the player to buy seeds.

- **Visit the Farm (basic features) – 12 marks**
  Draw the farm. Allows the player to:
  - Move around the farm using WASD.
  - Return to town.

- **End the Day (basic features) – 3 marks**
  Ends the day and adds 1 to the current day. Includes detecting the end of the game after Day 20 and determining whether the player won or lost.

Advanced Requirements (30 marks)

- **Program validation -- 5 marks**
  Add appropriate validation for the basic requirements of the program.

- **Planting -- 5 marks**
  Allows the player to plant a seed on an empty square in the farm.

- **Maturing crops -- 5 marks**
  Reduces the amount of time left for each crop in the farm to mature when a day passes.

- **Harvesting -- 5 marks**
  Allows the player to harvest a fully mature crop on the farm to gain Money equal to its Crop Price.

- **Saving and Reloading – 10 marks**

Allows the player to save the current game state to a text file, and reload the game to the saved state when the game is first started.

- **Additional features – up to 10 BONUS marks**

  You may gain up to 10 bonus marks if you implement additional features to improve the game. The following are some suggestions. Feel free to devise your own additional features, but ask your tutor for approval.

  - **Limited Capacity for Seed Bag (5 marks) –** Players can carry at most 10 seeds at a time. Therefore, if they attempt to buy more seeds than the bag can carry, the purchase will be rejected.

  - **Variable Crop Prices (5 marks) –** The crop price for each seed is not fixed. Instead, the crop price for each seed on a particular day is randomly determined from a range. For example, the sell price for Cauliflower may be a random integer between 12 and 16, inclusive, which changes every day.

  - **Giant Crops (5 marks)** – If every crop in a 2x2 square on the farm is of the same type and are all ready to harvest, you can harvest all 4 of the crops using 1 Energy. You must be standing in the top left-hand corner of the 2x2 square.

  - **High Score Board (5 marks)** – If a player wins the game, they will be prompted for their name, which will be stored in a text file along with their final profit amount. There will be an additional option in the main menu "2) Show High Scores" that will display the list of high scores on screen, sorted in descending order of profit. The game will only store the top 5 scores.

  - **Special Orders (10 marks)** – Every day, there is a 50% chance that one of the townsfolk will ask for 5 of a crop within a number of days equal to the 2 + growth_time days of that crop. For example, they might request for 5 Cauliflowers to be harvested within 2 + 6 = 8 days. If the player accepts the special order and can fulfill the order in time, they will be given a bonus of $5. If the player is currently working on a special order, new special orders will not appear. If the player does not accept the special order, it will disappear at the end of the day (and have a 50% chance of being replaced by a new special order). The player can check the status of their accepted special order to see how many days are left, and how many crops are left to harvest.

<u>Other Requirements (20 marks)</u>

- **Program documentation -- 3 marks**
  Add proper comments to the code.

- **Code reusability -- 5 marks**
  Good organization of code into functions, and the appropriate calling of functions

- **Naming of variables -- 2 marks**
  Meaningful variable names

- **Presentation -- 10 marks**
  A good demonstration and explanation of the code during the presentation. Includes the ability to answer the tutor's questions.

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 demo.***

6. DELIVERABLES

- Name the file `"S10009999A_Assignment.py"` where `"S10009999A"` is your student ID.
- Submit your program into **POLITEMall > Assignment > Assignment Submission** by **4 August 2024, 2359 hours.**
- Demonstrate your application to your tutor during your PRG1 lessons (and other timeslots scheduled by tutor) starting **5 August 2024.**

7. ASSESSMENT

This assignment constitutes 30% 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 **demo**.

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 the demo

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 the demo

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 the demo

D Grade

- Program implements the Basic Requirements successfully
- Program complete with some documentation
- Program has been tested adequately
- Able to answer some questions during the demo