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Programming 1 (PRG1)
Year 1 (2025/26), Semester 1

SCHOOL OF INFOCOMM TECHNOLOGY
Diploma in Data Science
Diploma in Cyber Security & Digital Forensics
Diploma in Information Technology
Diploma in Immersive Media
Common ICT Programme

ASSIGNMENT

Due on 10 August 2025 (Sunday), 2359 hours

Weightage: 35% of Module

Individual/Team/Both: Individual

Format: Programming and Presentation
Basic Requirements (75%)
Advanced Requirements (25%)

Penalty for late submission:
- 10% per day from the due date.
- <u>NO submission</u> shall be entertained after 7 calendar days of the due date.

There are a total of <u>18</u> pages (including this page) in this handout.

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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.

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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 strategy role-playing game called Sundrop Caves.

3. SCOPE

You are tired of your 9 to 5 job, so you spent your life savings buying the deed to Sundrop Caves, which is a cave full of valuable minerals. Your only other possessions are a simple pickaxe, a small backpack and a magical portal stone. All you want to do is earn 500 gold pieces (GP) so that you can retire in luxury.

In this computer strategy role-playing game, you will explore a dark mine to extract valuable mineral ore to sell and make your money. As you explore, the map of the mine will slowly be revealed. You might also spend your hard-earned GP to upgrade your pickaxe to mine more valuable materials, or your backpack to carry more items. The objective is to get 500 GP in as few days and taking as few steps as possible (because you are extremely lazy).

Note that one day passes every time you return to town from the mine. Furthermore, you can only take 20 steps in the mine before you are exhausted and must return to town using your portal stone.

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. The functions developed should be as generic as possible - values used in functions should be passed in as the function parameters
• Implement and test each feature as they are developed

4. BASIC REQUIREMENTS

The application should provide the following **<u>basic</u>** features:

1. **Display main menu**

    When the program is first run, it should display some introduction text followed by the main menu as shown in Figure 1.

```
---------------- Welcome to Sundrop Caves! ----------------
You spent all your money to get the deed to a mine, a small
  backpack, a simple pickaxe and a magical portal stone.

How quickly can you get the 500 GP you need to retire
  and live happily ever after?
-----------------------------------------------------------

--- Main Menu ----
(N)ew game
(L)oad saved game
(Q)uit
------------------
Your choice?
```

Figure 1 - Main Menu (and introduction text)

1.1. New Game (N)

When you enter 'N', a new game will begin. You are first prompted to enter your name. The game then starts on Day 1 in Sundrop Town.

```
Your choice? n
Greetings, miner! What is your name? Cher
Pleased to meet you, Cher. Welcome to Sundrop Town!

DAY 1
----- Sundrop Town -----
(B)uy stuff
See Player (I)nformation
See Mine (M)ap
(E)nter mine
Sa(V)e game
(Q)uit to main menu
------------------------
Your choice?
```

Figure 1.1 – New Game

You start with a backpack that can hold a maximum of 10 pieces of mineral ore.

1.2. Load Saved Game (L)

This option reads the save file and restores the game state. This includes the player and map information.

1.3. Quit Game (Q)

This option quits the game and exits.

2. **Display Town Menu**

When you are in town, the main menu should be displayed as shown in Figure 1.1.

Whenever you enter town and are carrying mineral ore, you will automatically sell all your ore. The price for selling each type of mineral is uniformly randomly generated according to the table below:

Mineral	Sale price (GP)
copper	1 – 3
silver	5 – 8
gold	10 – 18

Table 2: Mineral sale prices

2.1. Buy Stuff (B)
Allows you to upgrade your backpack. You can also upgrade your pickaxe as an advanced feature (see Section 5).

```
Your choice? b

--------------------- Shop Menu -------------------------
(P)ickaxe upgrade to Level 2 to mine silver ore for 50 GP
(B)ackpack upgrade to carry 12 items for 20 GP
(L)eave shop
---------------------------------------------------------
GP: 67
---------------------------------------------------------
Your choice?
```
Figure 2.1 – Buy Stuff (B)

2.1.1. **Backpack Upgrade (B)**

If you have enough GP, you can increase your backpack capacity by 2. The price for the upgrade is twice the <u>current</u> capacity. For example, if the current capacity is 16, you can pay 32 GP to increase the capacity to 18.

```
Your choice? b

--------------------- Shop Menu -------------------------
(B)ackpack upgrade to carry 12 items for 20 GP
(L)eave shop
---------------------------------------------------------
GP: 47
---------------------------------------------------------
Your choice? b
Congratulations! You can now carry 12 items!

--------------------- Shop Menu -------------------------
(B)ackpack upgrade to carry 14 items for 24 GP
(L)eave shop
---------------------------------------------------------
GP: 27
---------------------------------------------------------
Your choice?
```

Figure 2.1.2 – Backpack Upgrade (B)

2.1.2. **Leave Shop (L)**

This option exits the shop and returns to the Town menu.

2.2. See Player Information (I)
Displays the player information.

```
Your choice? i

----- Player Information -----
Name: Cher
Portal position: (7, 1)
Pickaxe level: 2 (silver)
------------------------------
Load: 0 / 12
------------------------------
GP: 27
Steps taken: 16
------------------------------

DAY 9
----- Sundrop Town -----
(B)uy stuff
See Player (I)nformation
See Mine (M)ap
(E)nter mine
Sa(V)e game
(Q)uit to main menu
------------------------
Your choice?
```

Figure 2.2 – See Player Information (I)

2.3. See Mine Map (M)
Shows the map of the mine. See Section 3.2 for more details.

```
Your choice? m


+------------------------------+
|M    C    ???????????????????|
|     CP   ???????????????????|
|????CCCC  ???????????????????|
|?????????????????????????????|
|?????????????????????????????|
|?????????????????????????????|
|?????????????????????????????|
|?????????????????????????????|
|?????????????????????????????|
|?????????????????????????????|
+------------------------------+


DAY 9
----- Sundrop Town -----
(B)uy stuff
See Player (I)nformation
See Mine (M)ap
(E)nter mine
Sa(V)e game
(Q)uit to main menu
-----------------------
Your choice?
```
Figure 2.3 – See Mine Map (M)

Note that since the player is in town, the map shows the player as 'M' (miner) at position (0, 0). Furthermore, 'P' is the current position of the portal stone.

2.4. Enter Mine (E)
Choose this option to enter the mine. Sundrop Town is located at coordinates (0, 0) – at the start of the game, this is where you will appear. However, if you have used the portal stone to return to town (see Section 3.4), then you will appear at the portal's location.

```
Your choice? e


----------------------------------------------------
                    DAY 1
----------------------------------------------------
DAY 1
+---+
|###|
|#M |
|#  |
+---+
```

```
Turns left: 20     Load: 0 / 10     Steps: 0
(WASD) to move
(M)ap, (I)nformation, (P)ortal, (Q)uit to main menu
Action?
```

Figure 2.4 – First Time Entering the Mine

For more details, see Section 3 below.

2.5. Save Game (V)
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 Saved Game" in the main menu (see Section 1.2).

```
Your choice? v
Game saved.
```

Figure 2.5 – Save Game

2.6. Quit to Main Menu (Q)
This option quits the game and returns to the main menu (Figure 1).

3. **Mine Menu**

When you are in the mine, you will see a 3x3 depiction of your immediate surroundings (commonly called a "viewport"). At the centre of the 3x3 viewport, the character 'M' represents your character (the miner).

```
Your choice? e

--------------------------------------------------
                     DAY 10
--------------------------------------------------
DAY 10
+---+
|C  |
|CMC|
|CC |
+---+
Turns left: 20     Load: 0 / 12     Steps: 16
(WASD) to move
(M)ap, (I)nformation, (P)ortal, (Q)uit to main menu
Action?
```

Figure 3 – Mine Menu

Additionally, the menu also shows how many turns are left today before you have to return to town (you get up to 20 turns each day); your current load; and the total number of steps taken in this game.

The map of the mine is stored in the file `level1.txt`, as shown below:

```
T    CCCCC          SS          GGG
        CCCCC                   SSSS
GGG
        CCCC        SSSS        GGG
                    SSSSS   CCC
         CC           S      CCCC
CCCCCCCCC                    CCCCC
CCCCCCCC              G      CCCC
   CCCCC        GG              SS
     CCCCC                      GGG
SSSSSS
        CCC                     GGG
SSSGGG
```

level1.txt

where 'T' represents Sundrop Town, and 'C', 'S' and 'G' represent copper, silver and gold nodes, respectively.

3.1. Move (W/A/S/D)
To move, enter 'W', 'A', 'S' or 'D' to move one step up, left, down or right, respectively. Note the following:

- You cannot move past the edge of the map.
- If your backpack is full, you cannot step onto a mineral.
- If you step on the 'T' square at (0, 0), you will return to town

Assuming your backpack is not full, if you step on a mineral node, you will mine and pick up a number of pieces of ore uniformly randomly determined based on the following table:

Mineral	Pieces per node
copper	1 – 5
silver	1 – 3
gold	1 – 2

Table 3.1: Pieces of ore per node

An example of what happens when you step on a node is shown below.

```
DAY 16
+---+
|   |
| MC|
|  C|
```

```
+---+
Turns left: 17     Load: 11 / 12     Steps: 42
(WASD) to move
(M)ap, (I)nformation, (P)ortal, (Q)uit to main menu
Action? d


----------------------------------------------------
You mined 4 piece(s) of copper.
...but you can only carry 1 more piece(s)!
DAY 16
+---+
|   |
| MC|
| CC|
+---+
Turns left: 16     Load: 12 / 12     Steps: 43
(WASD) to move
(M)ap, (I)nformation, (P)ortal, (Q)uit to main menu
Action?
```

Figure 3.1a – Mining Copper

Whenever you make a move (even if it is unsuccessful), the number of turns left for the day is reduced by one. If the turns left reaches 0, you will automatically use your portal stone to return to town. See Section 3.4 below for more details on the portal stone.

```
DAY 8
+---+
|   |
| MC|
| CC|
+---+
Turns left: 1    Load: 12 / 12     Steps: 58
(WASD) to move
(M)ap, (I)nformation, (P)ortal, (Q)uit to main menu
Action? s


----------------------------------------------------
You can't carry any more, so you can't go that way.
You are exhausted.
You place your portal stone here and zap back to town.
You sell 12 copper ore for 24 GP.
You now have 99 GP!

DAY 9
----- Sundrop Town -----
(B)uy stuff
See Player (I)nformation
See Mine (M)ap
(E)nter mine
Sa(V)e game
(Q)uit to main menu
------------------------
Your choice?
```

Figure 3.1b – Running Out of Turns

3.2. Map (M)
This shows the map of the mine.

```
DAY 7
+---+
|   |
| M |
|CC |
+---+
Turns left: 19    Load: 0 / 12    Steps: 22
(WASD) to move
(M)ap, (I)nformation, (P)ortal, (Q)uit to main menu
Action? m


+-----------------------------+
|T   C       ?????????????????|
|        C   ?????????????????|
|????CC      ?????????????????|
|?????  M ???????????????????|
|??????CC ???????????????????|
|????????????????????????????|
|????????????????????????????|
|????????????????????????????|
|????????????????????????????|
|????????????????????????????|
+-----------------------------+
DAY 7
+---+
|   |
| M |
|CC |
+---+
Turns left: 19    Load: 0 / 12    Steps: 22
(WASD) to move
(M)ap, (I)nformation, (P)ortal, (Q)uit to main menu
Action?
```
Figure 3.2 – Show Map (M)

At the beginning of the game, the layout of the mine is unknown to the player. This is often called a "fog of war". The player can only see the 8 squares around him (9 including the square he is on). The rest of the squares are "covered" by question marks ('?'). As you move around the map, the fog of war is permanently removed.

The following is a summary of what each symbol on the map represents:

Symbol	Meaning
?	Unknown square covered by "fog of war"

T	Sundrop Town
M	The player (miner)
#	Wall of the mine (only appears in viewport)
C	Copper node
S	Silver node
G	Gold node
P	Portal stone

Table 3.2: Legend of Map

3.3. Player Information (I)
This option displays some information about the player.

```
Action? i

----- Player Information -----
Name: Cher
Current position: (15, 6)
Pickaxe level: 3 (gold)
Gold: 2
Silver: 10
Copper: 0
------------------------------
Load: 12 / 12
------------------------------
GP: 38
Steps taken: 57
------------------------------
DAY 14
+---+
|   |
| M |
|G  |
+---+
Turns left: 11    Load: 12 / 12    Steps: 57
(WASD) to move
(M)ap, (I)nformation, (P)ortal, (Q)uit to main menu
Action?
```

Figure 3.3 – Show Player Information (I)

The information shown is:
- Player name
- Current position
- Pickaxe level (advanced feature)
- Number of pieces of gold, silver and copper ore carried
- Current load and maximum load

- GP
- Total steps taken

3.4. Use Portal Stone (P)
This option uses the portal stone to immediately return to town.

```
DAY 7
+---+
|   |
|CM |
|CCC|
+---+
Turns left: 15    Load: 11 / 12    Steps: 26
(WASD) to move
(M)ap, (I)nformation, (P)ortal, (Q)uit to main menu
Action? p
----------------------------------------------------
-
You place your portal stone here and zap back to town.
You sell 11 copper ore for 33 GP.
You now have 89 GP!

DAY 8
----- Sundrop Town -----
(B)uy stuff
See Player (I)nformation
See Mine (M)ap
(E)nter mine
Sa(V)e game
(Q)uit to main menu
-----------------------
Your choice?
```

Figure 3.4 – Use Portal Stone (P)

When the portal stone is used, it is placed at the location of the player in the mine. The player will then be transported back to town, whereupon all your ore will be sold and the next day will start.

When in town, if you choose the See Mine Map (M) option, the location of the portal stone will be shown as 'P'.

3.5. Quit to Main Menu (Q)
This quits the game and returns to the main menu.

```
DAY 9
----- Sundrop Town -----
(B)uy stuff
See Player (I)nformation
See Mine (M)ap
(E)nter mine
Sa(V)e game
(Q)uit to main menu
```

```
------------------------
Your choice? q

--- Main Menu ----
(N)ew game
(L)oad saved game
(Q)uit
-----------------
Your choice?
```

Figure 3.5 – Quit to Main Menu (Q)

4. **Winning the game**

   Upon returning to town and selling off your ore, if you have at least 500 GP, you win
   the game. A message congratulating your achievement will be shown, which also
   shows the number of days and turns you took. You will then be taken back to the
   main menu.

```
DAY 17
+---+
| SS|
|SM |
|   |
+---+
Turns left: 14    Load: 8 / 12     Steps: 114
(WASD) to move
(M)ap, (I)nformation, (P)ortal, (Q)uit to main menu
Action? p
------------------------------------------------------
You place your portal stone here and zap back to town.
You sell 6 silver ore for 42 GP.
You sell 2 gold ore for 36 GP.
You now have 555 GP!
------------------------------------------------------------
Woo-hoo! Well done, Cher, you have 555 GP!
You now have enough to retire and play video games every day.
And it only took you 18 days and 114 steps! You win!
------------------------------------------------------------

--- Main Menu ----
(N)ew game
(L)oad saved game
(Q)uit
-----------------
Your choice?
```

Figure 4 – Winning the Game

5. **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.

- **Pickaxe level – 10 marks**

  Add the feature that the type of mineral that can be mined depends on the level of your pickaxe, as given in the following table:

Pickaxe Level	Minerals that can be Mined	Price to upgrade (GP)
1	copper	-
2	copper, silver	50
3	copper, silver, gold	150

Table 5: Pickaxe levels

  When you (B)uy stuff in town, if you have enough GP, you can upgrade your Level 1 pickaxe to Level 2, or your Level 2 pickaxe to level 3 by choosing the Pickaxe Upgrade (P) option. The price for each upgrade is given in Table 5 above.

```
---------------------- Shop Menu ------------------------
(P)ickaxe upgrade to Level 2 to mine silver ore for 50 GP
(B)ackpack upgrade to carry 12 items for 20 GP
(L)eave shop
------------------------------------------------------------
GP: 67
------------------------------------------------------------
Your choice? p
Congratulations! You can now mine silver!

---------------------- Shop Menu ------------------------
(P)ickaxe upgrade to Level 3 to mine gold ore for 150 GP
(B)ackpack upgrade to carry 12 items for 20 GP
(L)eave shop
------------------------------------------------------------
GP: 17
------------------------------------------------------------
Your choice?
```

Figure 5 – Pickaxe Upgrade (P)

  Note that if you attempt to step on a mineral in the mine that you are unable to extract, you will not be able to step onto that square.

- **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 and the number of steps taken. This option allows the player to view the top scores of the game that displays the 5 top ranking players of Sundrop Mountain (the players who took fewer days are ranked higher; ties are broken by the number of steps taken, then by total amount of GP earned).

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

  You may gain up to 10 bonus marks if you implement additional features to improve the game. Examples include (**but are not limited to**):

  - **Nodes replenish -** Modify the code such that there is a 20% chance every day that a mined node replenishes and can be mined again.

  - **Another level –** Place a door at the bottom right hand corner of the mine that leads to a second mine. You may have to increase the amount of GP needed to win the game.

  - **Warehouse** – Implement a warehouse in town so that the player can store their ore instead of immediately selling it. With a warehouse, the player can decide to wait until the price of a type of ore is high before selling. There will therefore have to be an option in the Town menu for (S)elling ore.

  - **Magic torch** – Allow players to buy a magic torch for 50 GP that increases the size of the viewport to 5x5.

  - **Graphical User Interface** – Use a graphics package (e.g., tkinter, PyGame) to convert the game into a graphical game.

  - **Git Version and Control** – Use Git to maintain and control the different changes throughout the development process.

  - **Pytest** – Use Pytest to do self-test and demonstrate automated testing.

<u>Note:</u>

- *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.*
- *NO MARKS will be awarded for the additional features if all the basic and advanced features have NOT been fully implemented.*
- *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 **PoliteMall > PRG1 > Assignment PRG1 April 2025 > Assignment Submission** by **10 August 2025, 2359 hrs.**

- Demonstrate your application to your tutor starting **4 August 2025.**

7. ASSESSMENT

This assignment constitutes 35% 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 Requirements successfully
- Program complete with some documentation
- Program has been tested adequately
- Able to answer some questions during presentation