Software Development Assessment

Contents

Project Information

Treasure Hunt Assessment repository for COM4103 - Software Development
Assignment due - Friday 13th December 2024.

Introduction / Project Overview

In this Assessment I was tasked with creating a Treasure Hunt game where a user can dynamically choose the size of the map, number of players, amount of treasure an number of traps. They then must take it in turns to collect the treasure without landing on traps and standing on the winning position to complete the game. This game makes use of 3 different types of searches, Binary Search, Depth-First

Search and Breadth-First Search to aid the users with finding other treasures and completing the game. I was given from the 22nd of November to the 13th of December to complete this project which I have done. I hoped to of achieved a successful and fully function game for users to enjoy make use of, since completing this project I have faced many challenges I have found the solutions of them with valid testing to ensure that the gam is suitable and functions to the standard that was asked from the brief.

Challenges and Solutions

1. The first challenge I faced was setting up the classes. I have used classes so that I can easily identify the individual treasure, traps and players this caused many errors however they were easily solved with the help of my tutors and now the use of Object-Oriented Programming functions correctly.

2. The second challenge I faced was outputting each players statistics at the end of the game, although this took a couple of hours to solve, I realized that I had miss-coded the program and I resolved this by swapping the loops and allowing the program to check all players instead of just the one.

3. The third and final challenge which I faced was integrating the different types of searches into my program, this challenge took the longest to find the correct solution. I had researched heavily and use Artificial Intelligence to break it down and explain how the searches work. Whilst utilizing both research and AI, I was then able to use the help provided to get the solution and get the algorithms to function in my code.

Search Algorithms

Binary Search

The binary search algorithm is used to search for a specific item. Its used by finding the midpoint and discarding half of a list when it releases its target it not on the left side. I have used the binary search algorithm to allow the users to find the nearest treasure to them. The code will run the function and pass the users coordinates to the function and see which treasure is the closest by distance and it will then output the coordinates to the user and then they can get to that treasure.

Depth-First Search

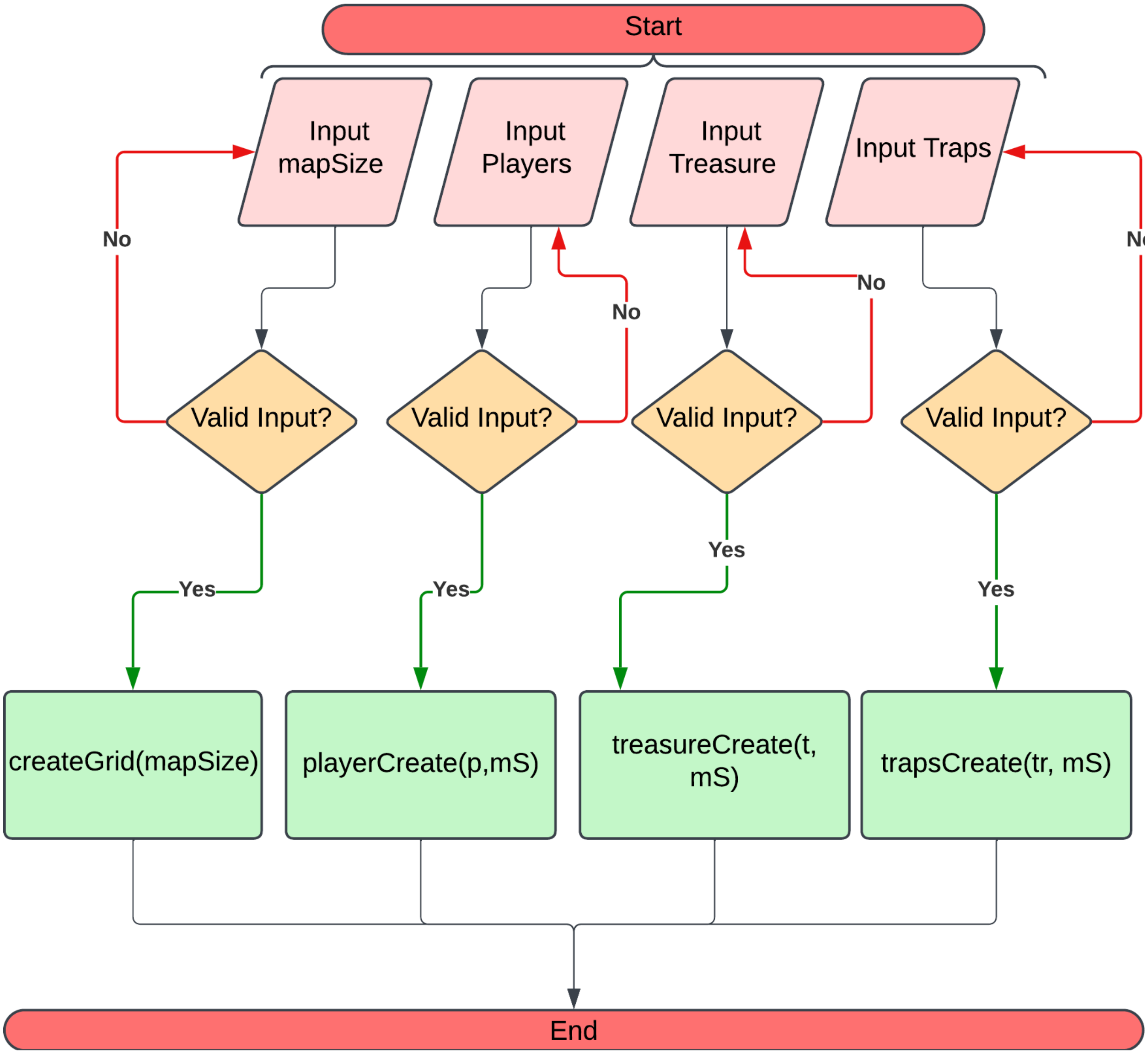
The Depth-First Search is used to search at a deeper level for a specific item, this goes from top to bottom of rows and columns. I have used this to help find the safest and shortest path to find the treasure. This will avoid all traps and will show the user the different coordinates to get to the treasure.

Breadth-First Search

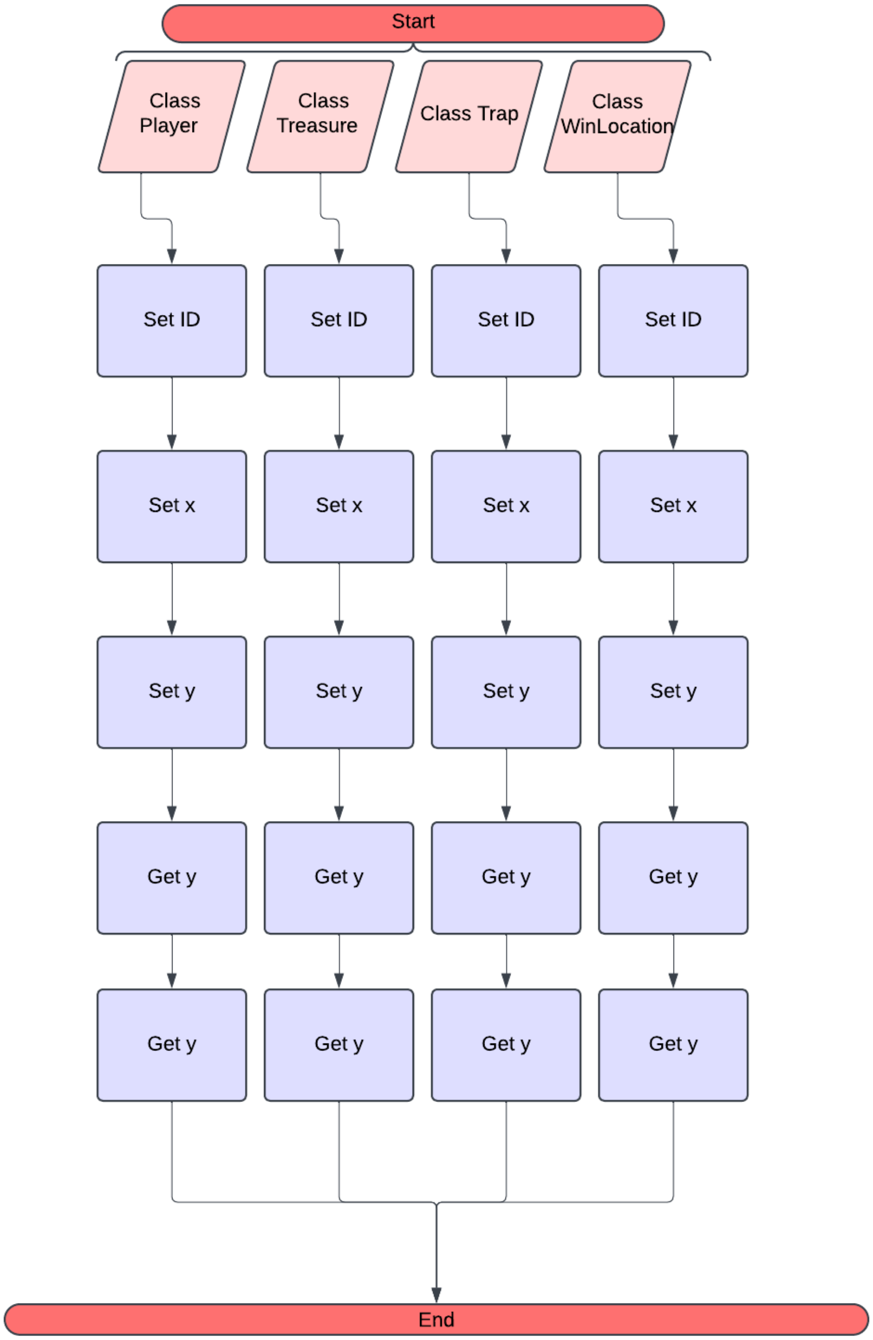
The Breadth-First Search is used to find an item which is near the root starting point of the graph. I have used this search to find the safest and shortest path at the starting point of the player. This is not at a deeper level so it may not be 100% accurate and the path may not always be safe.

Pseudocode/flowchart

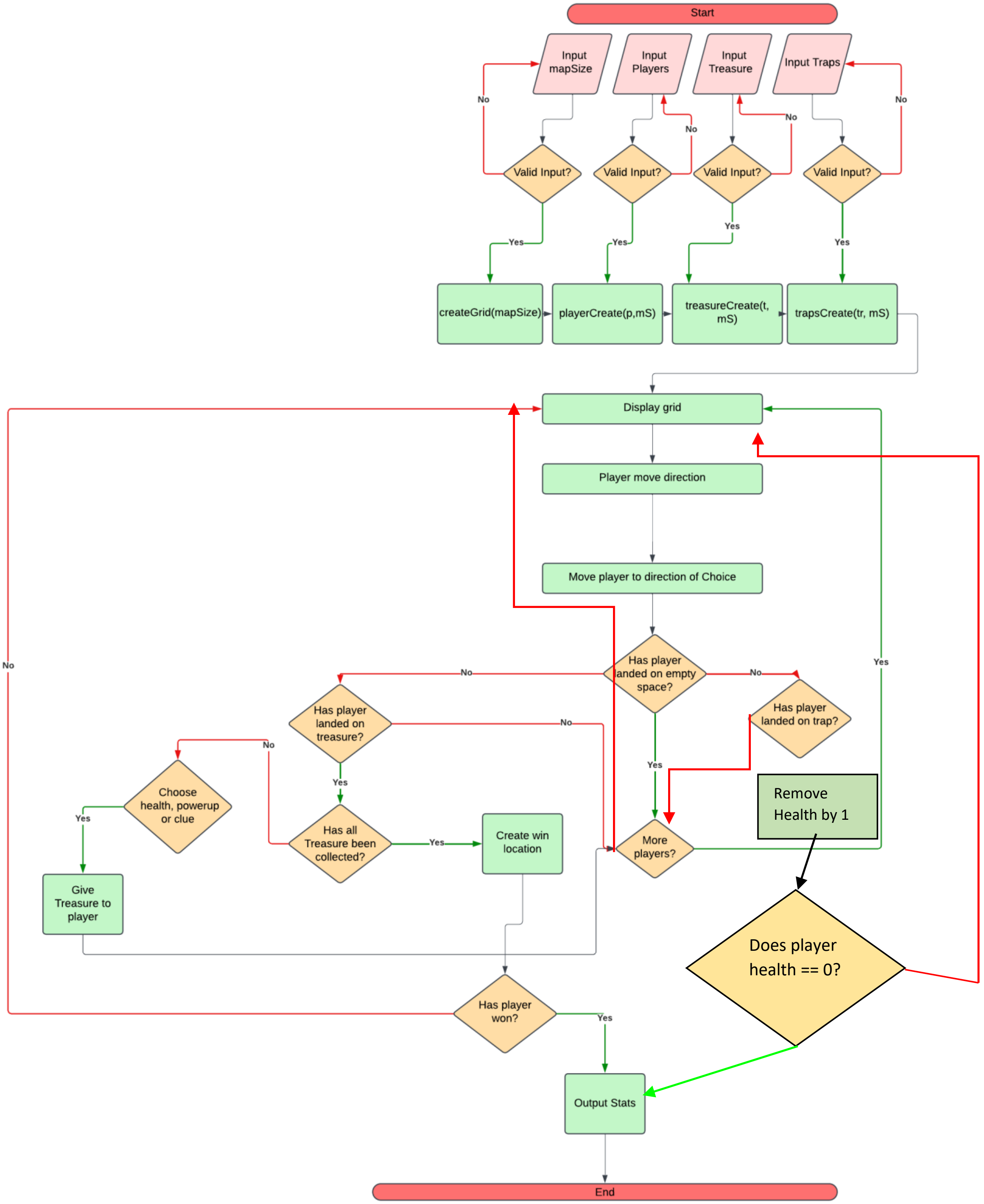
Initialization



Classes


Start
Class Player
Class Treasure
Class Trap
Class WinLocation
Set ID
Set ID
Set ID
Set ID
Set x
Set x
Set x
Set x
Set y
Set y
Set y
Set y
Get y
Get y
Get y
Get y
Get y
Get y
Get y
Get y
End

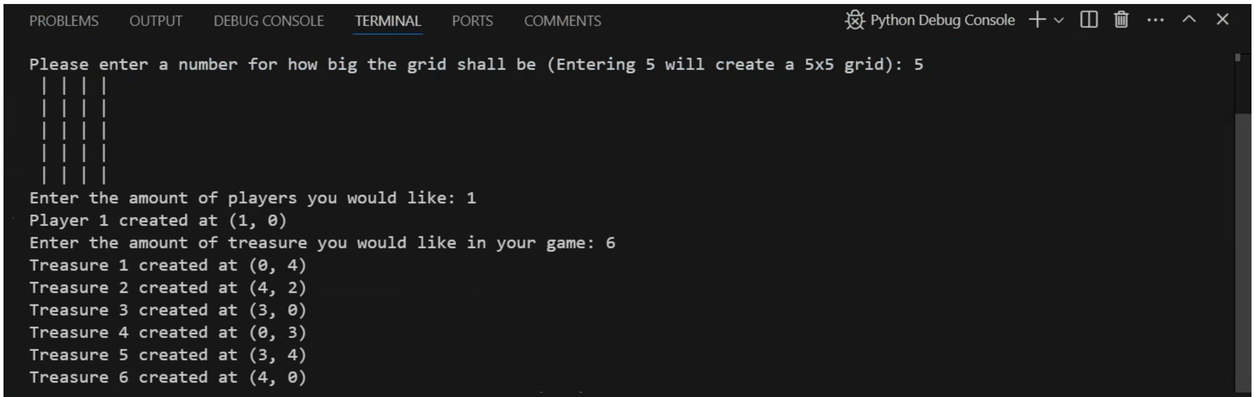
Main Code


Start
Input mapSize
Input Players
Input Treasure
Input Traps
No
No
No
No
Valid Input?
Valid Input?
Valid Input?
Valid Input?
Yes
Yes
Yes
Yes
createGrid(mapSize)
playerCreate(p,mS)
treasureCreate(t, mS)
trapsCreate(tr, mS)
Display grid
Player move direction
Move player to direction of Choice
No
Yes
Has player landed on empty space?
No
No
Has player landed on trap?
Has player landed on treasure?
No
No
Yes
Yes
Choose health, powerup or clue
Yes
Has all Treasure been collected?
Yes
Create win location
More players?
Remove Health by 1
Give Treasure to player
Does player health == 0?
Has player won?
Yes
Output Stats
End

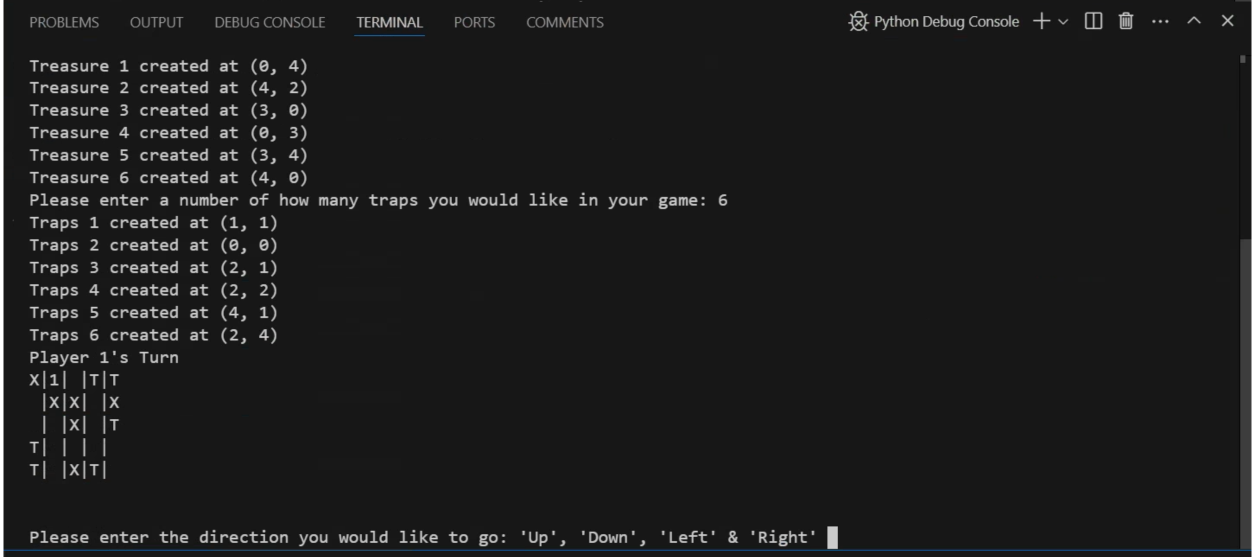
Test Evidence

In this section I have inserted various images of me running through all options of the game and as you can see there are no issues caused with the program being run. Everything runs and functions smoothly.

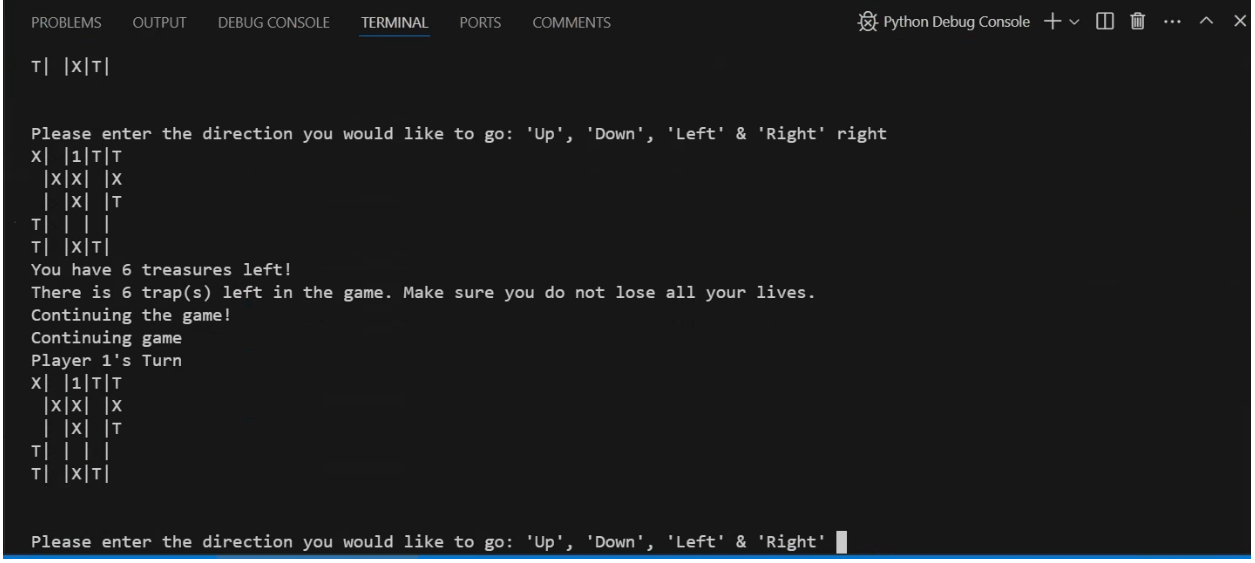
Main Game play:



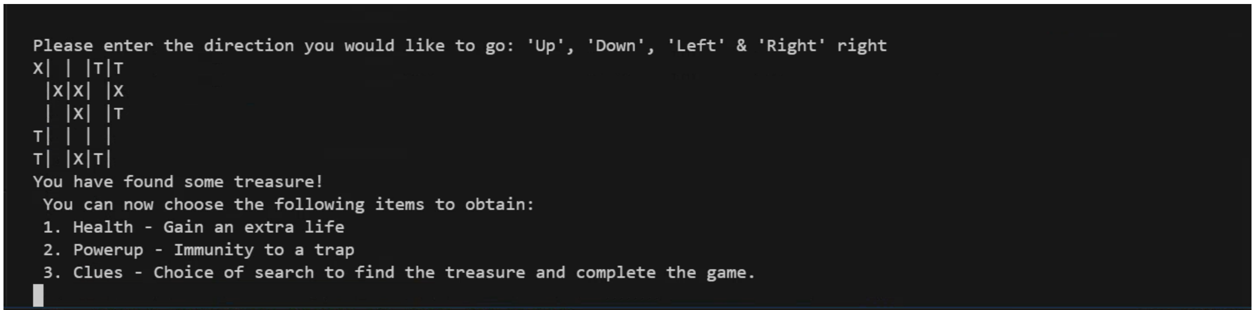
```
Please enter a number for how big the grid shall be (Entering 5 will create a 5x5 grid): 5
 | | | |
 | | | |
 | | | |
 | | | |
 | | | |
Enter the amount of players you would like: 1
Player 1 created at (1, 0)
Enter the amount of treasure you would like in your game: 6
Treasure 1 created at (0, 4)
Treasure 2 created at (4, 2)
Treasure 3 created at (3, 0)
Treasure 4 created at (0, 3)
Treasure 5 created at (3, 4)
Treasure 6 created at (4, 0)
```



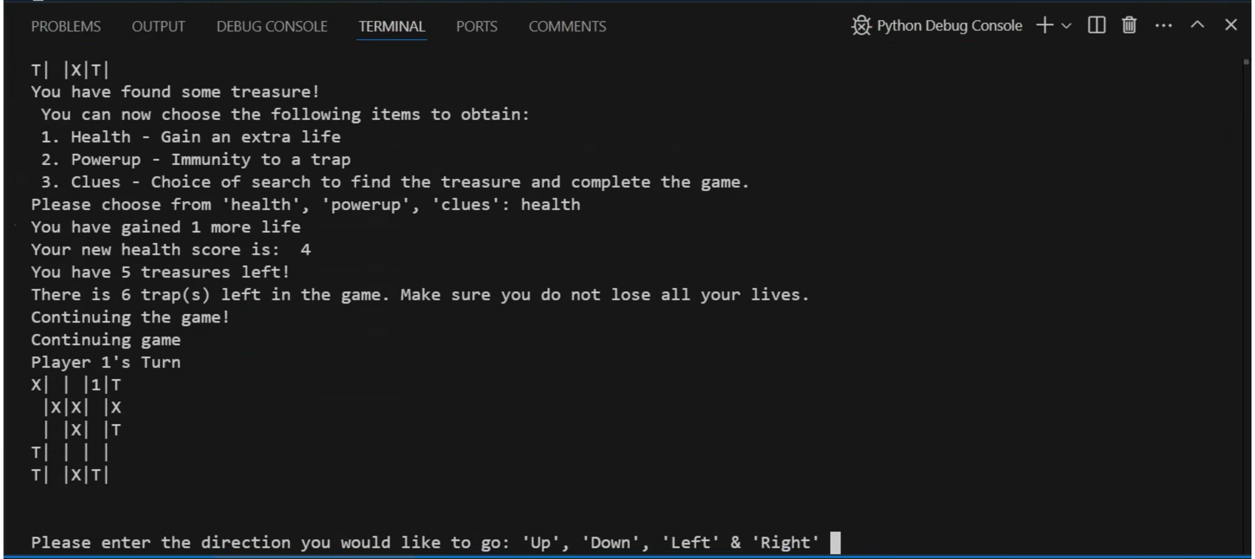
```
Treasure 1 created at (0, 4)
Treasure 2 created at (4, 2)
Treasure 3 created at (3, 0)
Treasure 4 created at (0, 3)
Treasure 5 created at (3, 4)
Treasure 6 created at (4, 0)
Please enter a number of how many traps you would like in your game: 6
Traps 1 created at (1, 1)
Traps 2 created at (0, 0)
Traps 3 created at (2, 1)
Traps 4 created at (2, 2)
Traps 5 created at (4, 1)
Traps 6 created at (2, 4)
Player 1's Turn
X|1| |T|T
 |X|X| |X
 | |X| |T
T| | | |
T| |X|T|


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```



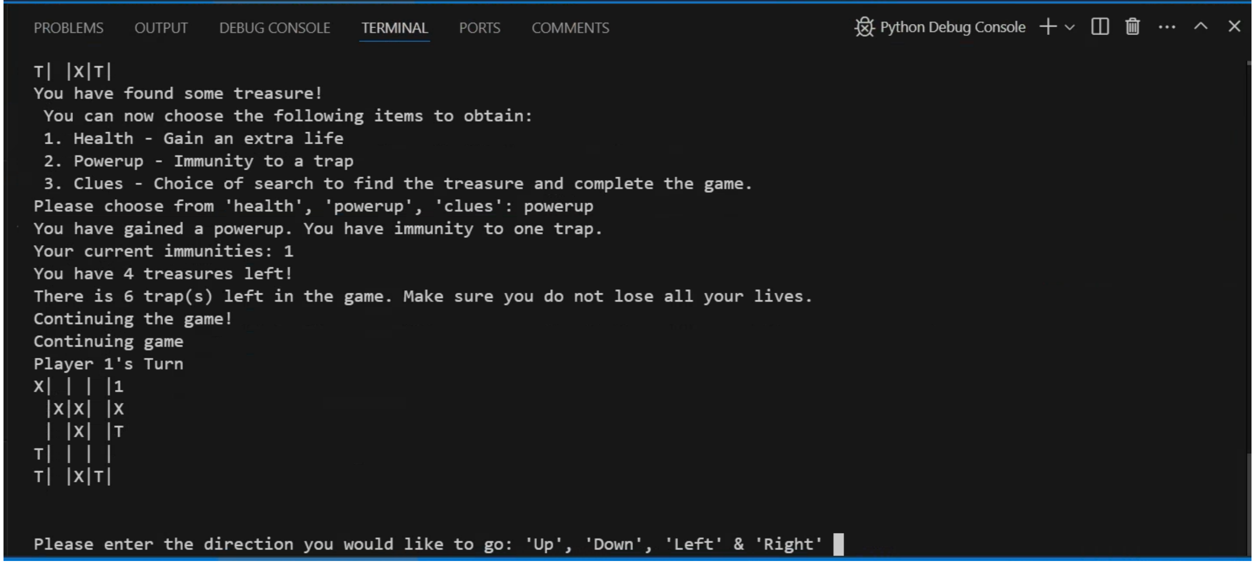
```
T| |X|T|


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right' right
X| |1|T|T
 |X|X| |X
 | |X| |T
T| | | |
T| |X|T|
You have 6 treasures left!
There is 6 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 1's Turn
X| |1|T|T
 |X|X| |X
 | |X| |T
T| | | |
T| |X|T|


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```



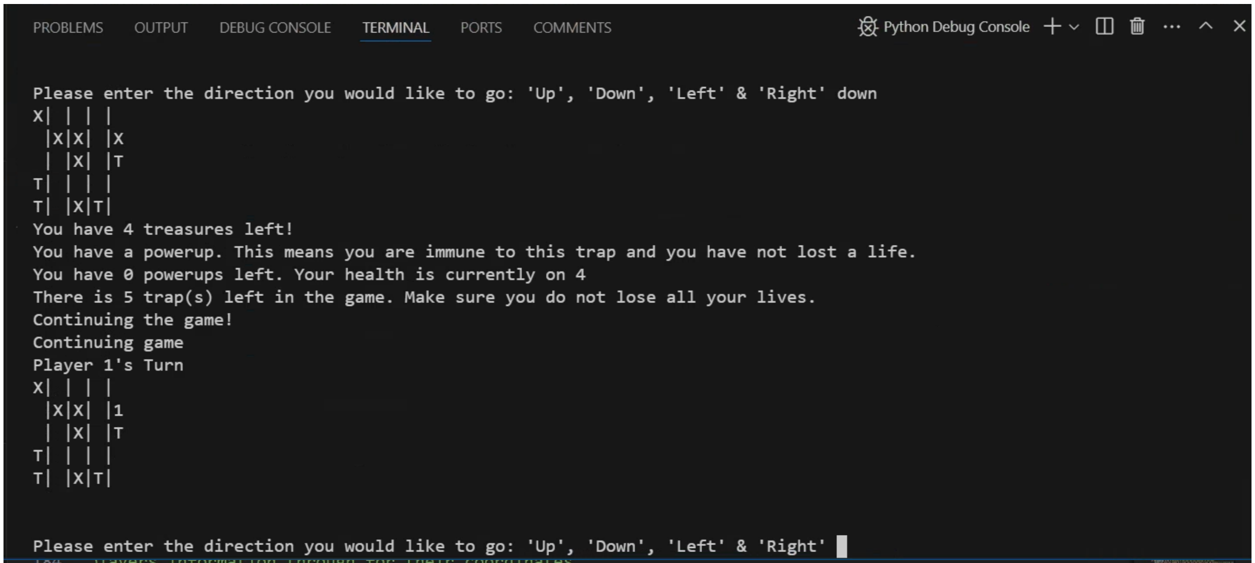
```
Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right' right
X| | |T|T
 |X|X| |X
 | |X| |T
T| | | |
T| |X|T|
You have found some treasure!
 You can now choose the following items to obtain:
 1. Health - Gain an extra life
 2. Powerup - Immunity to a trap
 3. Clues - Choice of search to find the treasure and complete the game.
```



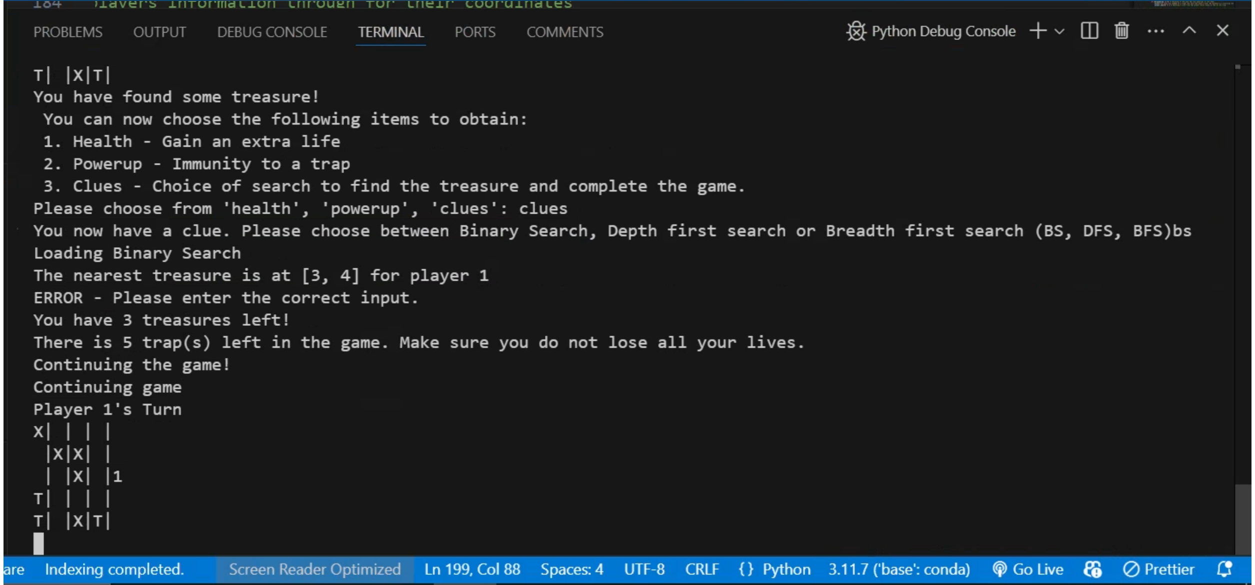
```
T| |X|T|
You have found some treasure!
 You can now choose the following items to obtain:
 1. Health - Gain an extra life
 2. Powerup - Immunity to a trap
 3. Clues - Choice of search to find the treasure and complete the game.
Please choose from 'health', 'powerup', 'clues': health
You have gained 1 more life
Your new health score is:  4
You have 5 treasures left!
There is 6 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 1's Turn
X| | |1|T
 |X|X| |X
 | |X| |T
T| | | |
T| |X|T|


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```



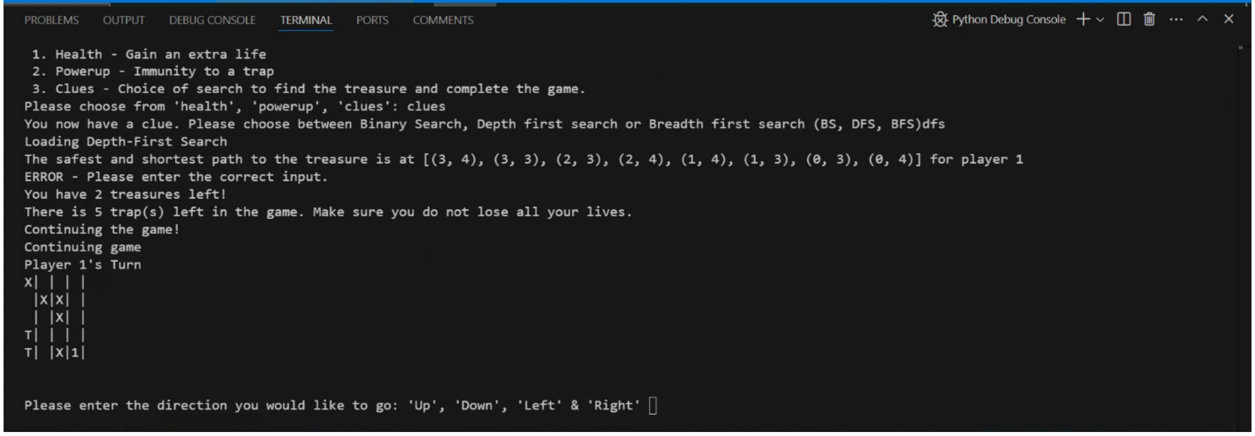
```
T| |X|T|
You have found some treasure!
 You can now choose the following items to obtain:
 1. Health - Gain an extra life
 2. Powerup - Immunity to a trap
 3. Clues - Choice of search to find the treasure and complete the game.
Please choose from 'health', 'powerup', 'clues': powerup
You have gained a powerup. You have immunity to one trap.
Your current immunities: 1
You have 4 treasures left!
There is 6 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 1's Turn
X| | | |1
 |X|X| |X
 | |X| |T
T| | | |
T| |X|T|


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```



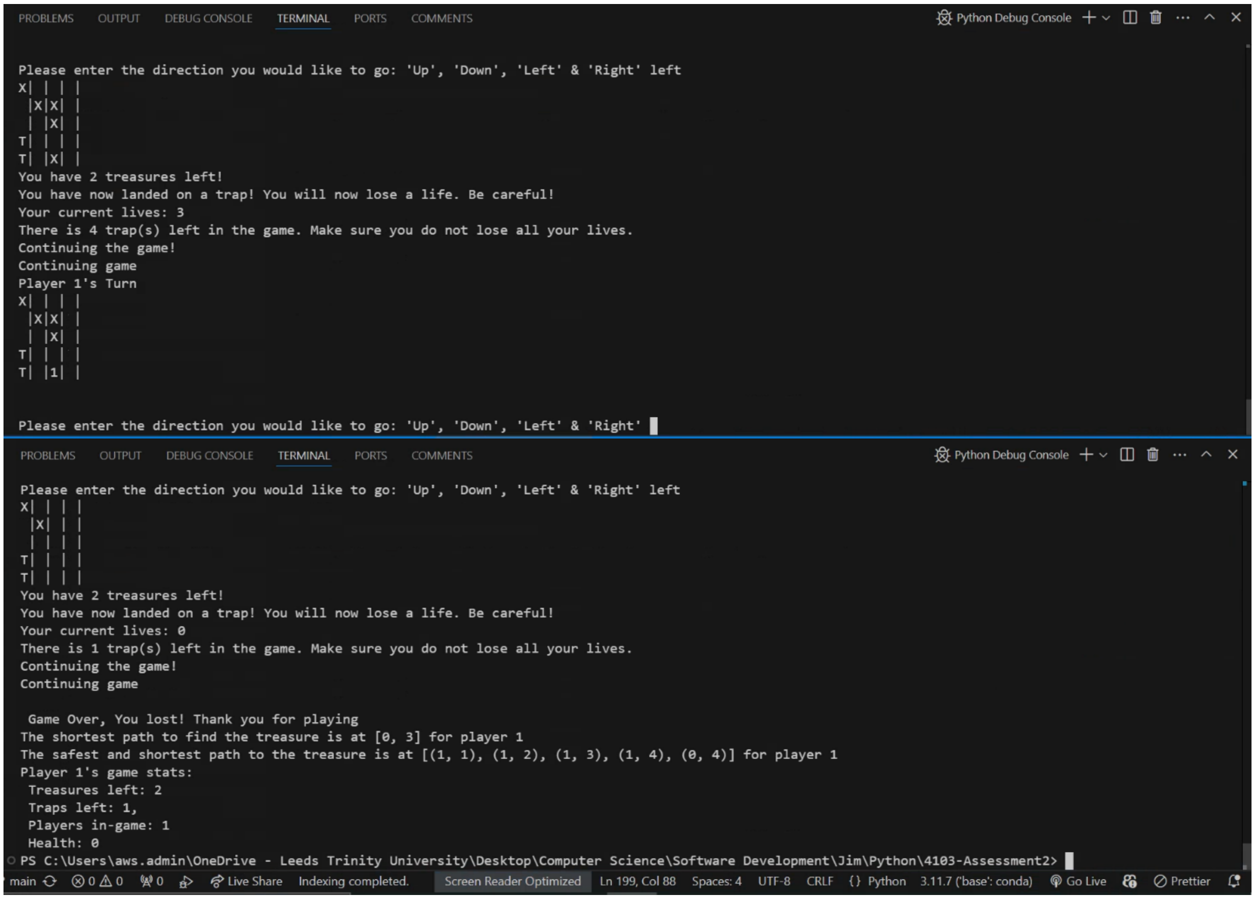
```
Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right' down
X| | | |
 |X|X| |X
 | |X| |T
T| | | |
T| |X|T|
You have 4 treasures left!
You have a powerup. This means you are immune to this trap and you have not lost a life.
You have 0 powerups left. Your health is currently on 4
There is 5 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 1's Turn
X| | | |
 |X|X| |1
 | |X| |T
T| | | |
T| |X|T|


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```



```
T| |X|T|
You have found some treasure!
 You can now choose the following items to obtain:
 1. Health - Gain an extra life
 2. Powerup - Immunity to a trap
 3. Clues - Choice of search to find the treasure and complete the game.
Please choose from 'health', 'powerup', 'clues': clues
You now have a clue. Please choose between Binary Search, Depth first search or Breadth first search (BS, DFS, BFS)bs
Loading Binary Search
The nearest treasure is at [3, 4] for player 1
ERROR - Please enter the correct input.
You have 3 treasures left!
There is 5 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 1's Turn
X| | | |
 |X|X| |
 | |X| |1
T| | | |
T| |X|T|
```



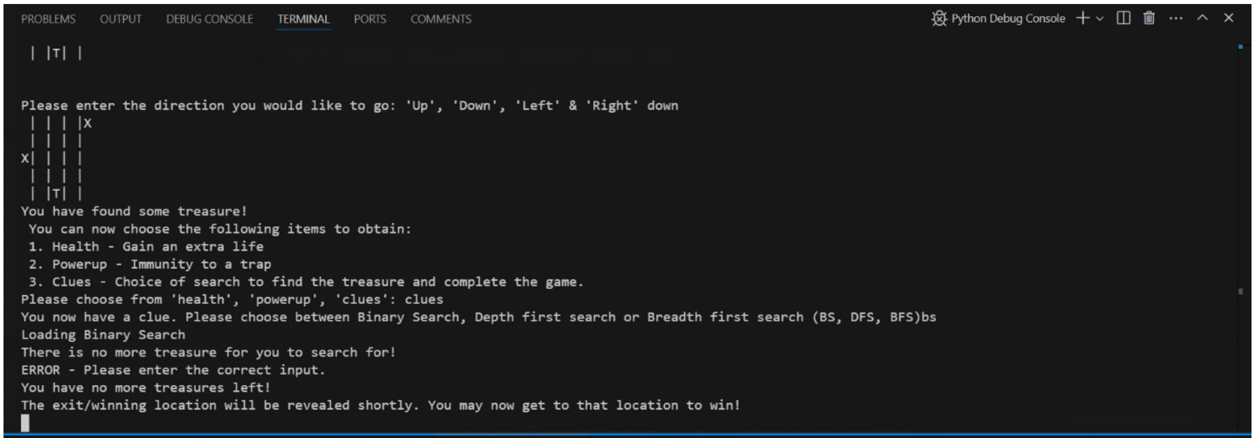
```
 1. Health - Gain an extra life
 2. Powerup - Immunity to a trap
 3. Clues - Choice of search to find the treasure and complete the game.
Please choose from 'health', 'powerup', 'clues': clues
You now have a clue. Please choose between Binary Search, Depth first search or Breadth first search (BS, DFS, BFS)dfs
Loading Depth-First Search
The safest and shortest path to the treasure is at [(3, 4), (3, 3), (2, 3), (2, 4), (1, 4), (1, 3), (0, 3), (0, 4)] for player 1
ERROR - Please enter the correct input.
You have 2 treasures left!
There is 5 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 1's Turn
X| | | |
 |X|X| |
 | |X| |
T| | | |
T| |X|1|


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```



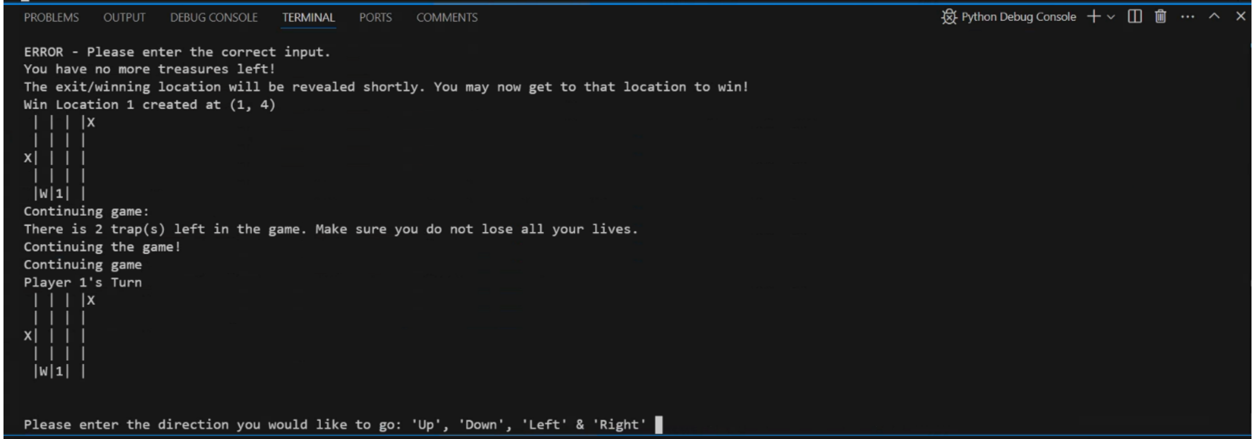
```
Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right' left
X| | | |
 |X|X| |
 | |X| |
T| | | |
T| |X| |
You have 2 treasures left!
You have now landed on a trap! You will now lose a life. Be careful!
Your current lives: 3
There is 4 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 1's Turn
X| | | |
 |X|X| |
 | |X| |
T| | | |
T| |1| |


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```

```
Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right' left
X| | | |
 |X| | |
 | | | |
T| | | |
T| | | |
You have 2 treasures left!
You have now landed on a trap! You will now lose a life. Be careful!
Your current lives: 0
There is 1 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game

 Game Over, You lost! Thank you for playing
The shortest path to find the treasure is at [0, 3] for player 1
The safest and shortest path to the treasure is at [(1, 1), (1, 2), (1, 3), (1, 4), (0, 4)] for player 1
Player 1's game stats:
 Treasures left: 2
 Traps left: 1,
 Players in-game: 1
 Health: 0
PS C:\Users\aws.admin\OneDrive - Leeds Trinity University\Desktop\Computer Science\Software Development\Jim\Python\4103-Assessment2>
```

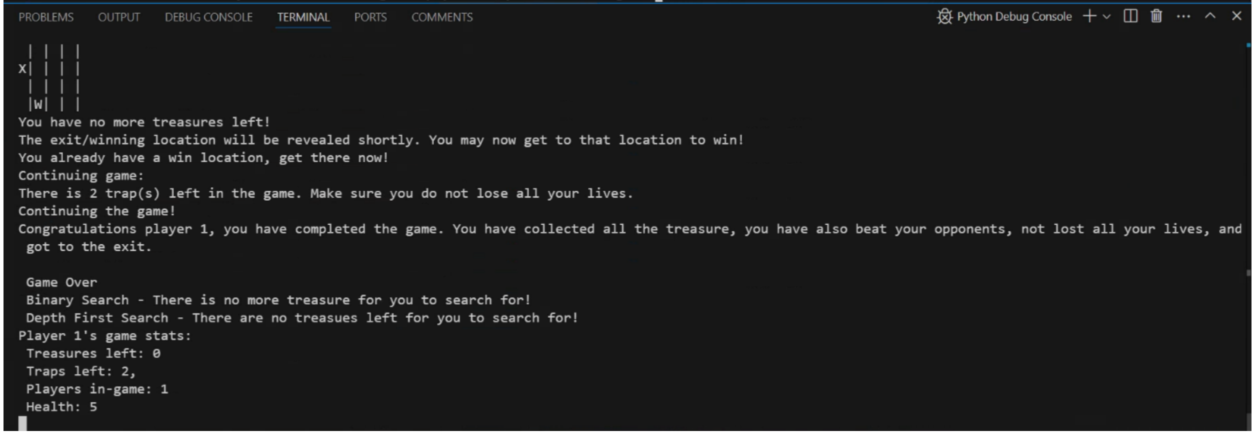
Testing the win and searching with no treasure:



```
 | |T| |


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right' down
 | | | |X
 | | | |
X| | | |
 | | | |
 | |T| |
You have found some treasure!
 You can now choose the following items to obtain:
 1. Health - Gain an extra life
 2. Powerup - Immunity to a trap
 3. Clues - Choice of search to find the treasure and complete the game.
Please choose from 'health', 'powerup', 'clues': clues
You now have a clue. Please choose between Binary Search, Depth first search or Breadth first search (BS, DFS, BFS)bs
Loading Binary Search
There is no more treasure for you to search for!
ERROR - Please enter the correct input.
You have no more treasures left!
The exit/winning location will be revealed shortly. You may now get to that location to win!
```

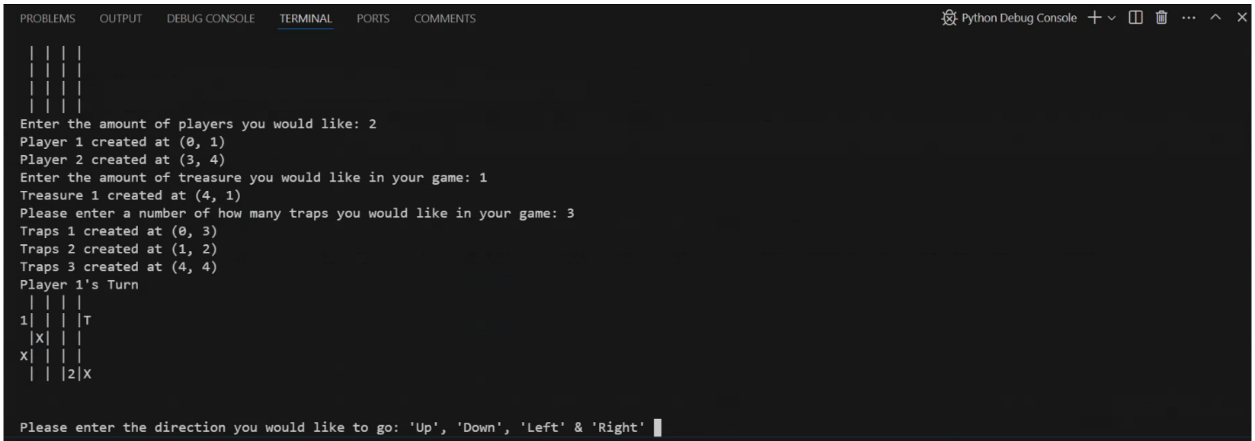


```
ERROR - Please enter the correct input.
You have no more treasures left!
The exit/winning location will be revealed shortly. You may now get to that location to win!
Win Location 1 created at (1, 4)
 | | | |X
 | | | |
X| | | |
 | | | |
 |W|1| |
Continuing game:
There is 2 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 1's Turn
 | | | |X
 | | | |
X| | | |
 | | | |
 |W|1| |


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```

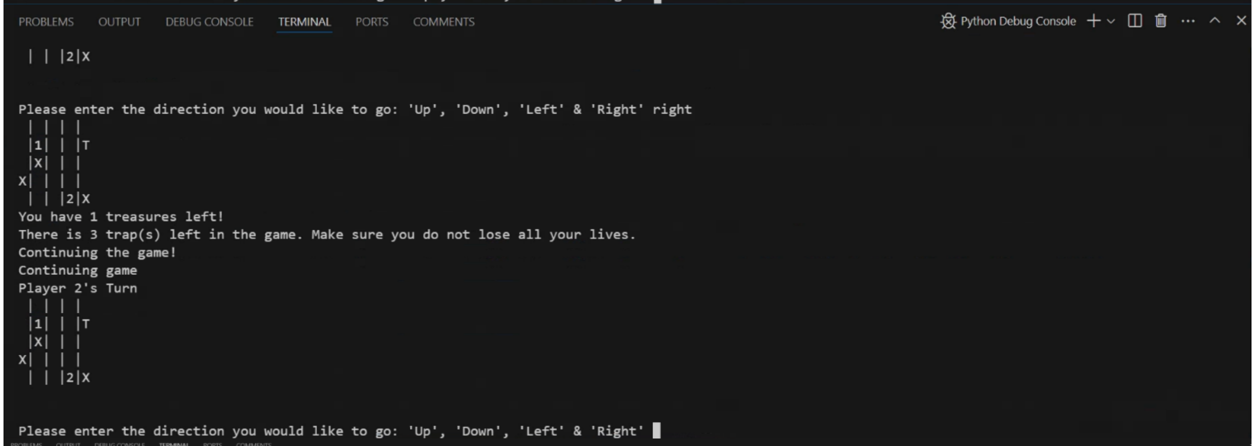


```
 | | | |
X| | | |
 | | | |
 |W| | |
You have no more treasures left!
The exit/winning location will be revealed shortly. You may now get to that location to win!
You already have a win location, get there now!
Continuing game:
There is 2 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Congratulations player 1, you have completed the game. You have collected all the treasure, you have also beat your opponents, not lost all your lives, and
 got to the exit.

 Game Over
 Binary Search - There is no more treasure for you to search for!
 Depth First Search - There are no treasues left for you to search for!
Player 1's game stats:
 Treasures left: 0
 Traps left: 2,
 Players in-game: 1
 Health: 5
```

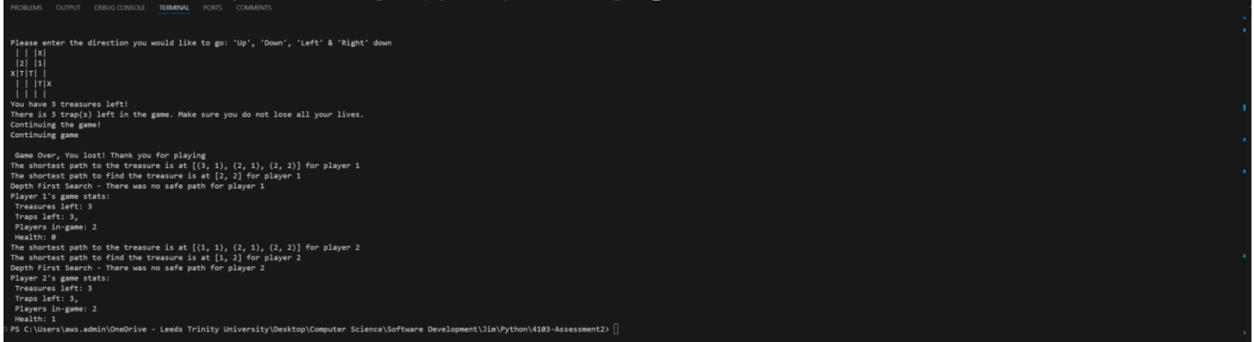
Testing multiple player system:



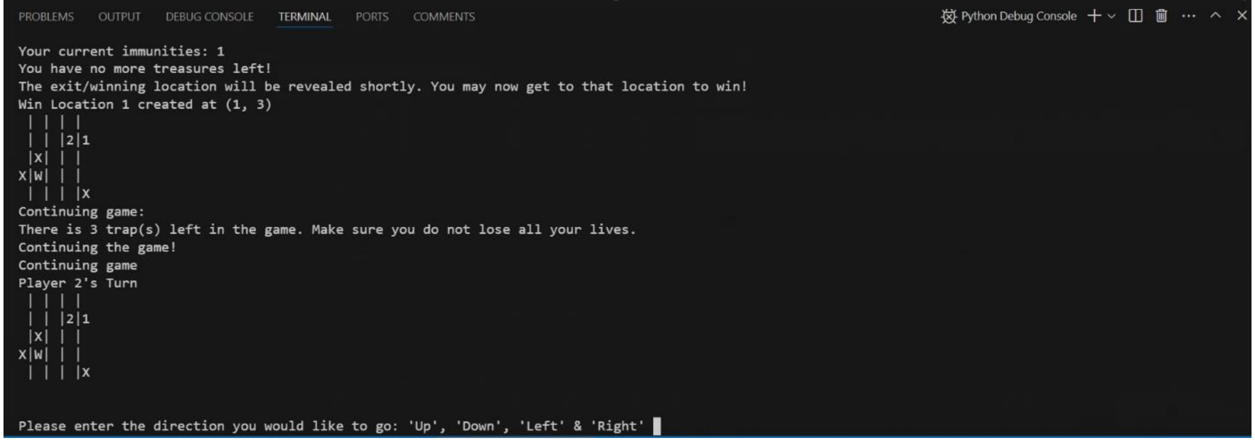
```
  | | | |
  | | | |
  | | | |
  | | | |
Enter the amount of players you would like: 2
Player 1 created at (0, 1)
Player 2 created at (3, 4)
Enter the amount of treasure you would like in your game: 1
Treasure 1 created at (4, 1)
Please enter a number of how many traps you would like in your game: 3
Traps 1 created at (0, 3)
Traps 2 created at (1, 2)
Traps 3 created at (4, 4)
Player 1's Turn
  | | | |
1| | | |T
  |X| | |
X| | | |
  | | |2|X


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```



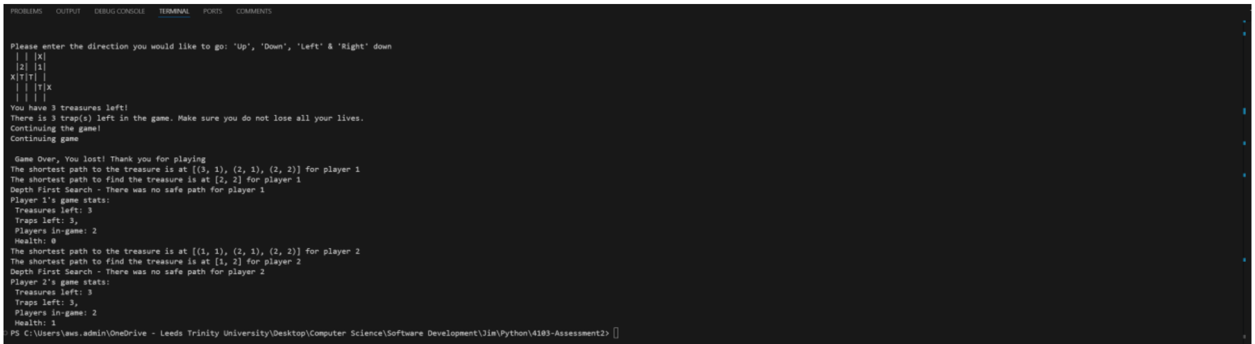
```
  | | |2|X


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right' right
  | | | |
  |1| | |T
  |X| | |
X| | | |
  | | |2|X
You have 1 treasures left!
There is 3 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 2's Turn
  | | | |
  |1| | |T
  |X| | |
X| | | |
  | | |2|X


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```



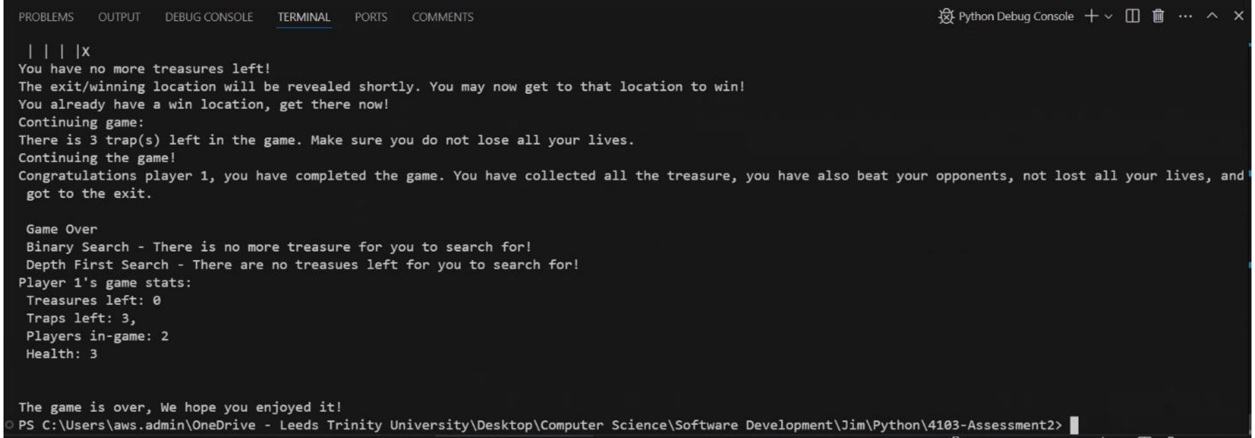
```
Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right' down
 | | |X|
 |2| |1|
X|T|T| |
 | | |T|X
 | | | |
You have 3 treasures left!
There is 3 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game

 Game Over, You lost! Thank you for playing
The shortest path to the treasure is at [(3, 1), (2, 1), (2, 2)] for player 1
The shortest path to find the treasure is at [2, 2] for player 1
Depth First Search - There was no safe path for player 1
Player 1's game stats:
 Treasures left: 3
 Traps left: 3,
 Players in-game: 2
 Health: 0
The shortest path to the treasure is at [(1, 1), (2, 1), (2, 2)] for player 2
The shortest path to find the treasure is at [1, 2] for player 2
Depth First Search - There was no safe path for player 2
Player 2's game stats:
 Treasures left: 3
 Traps left: 3,
 Players in-game: 2
 Health: 1
PS C:\Users\aws.admin\OneDrive - Leeds Trinity University\Desktop\Computer Science\Software Development\Jim\Python\4103-Assessment2>
```



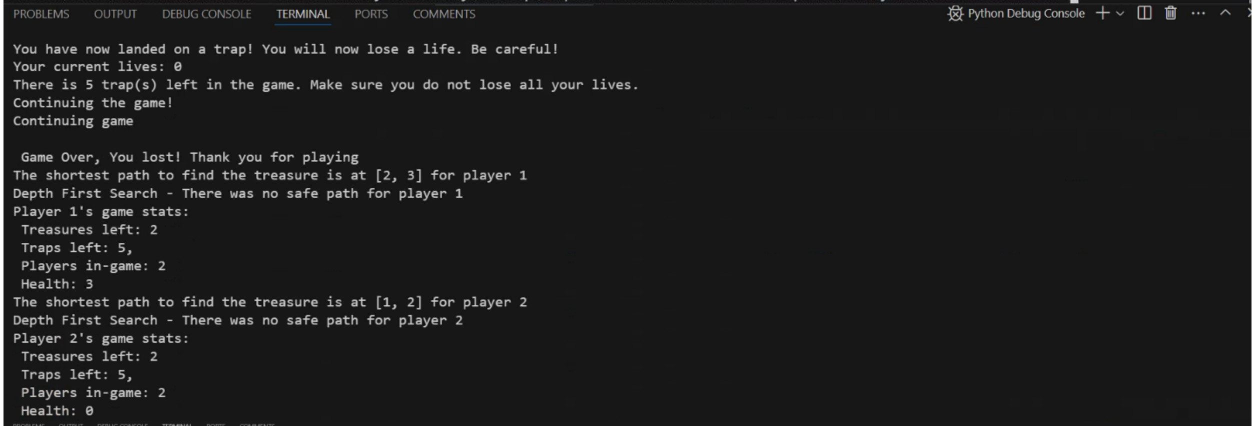
```
Your current immunities: 1
You have no more treasures left!
The exit/winning location will be revealed shortly. You may now get to that location to win!
Win Location 1 created at (1, 3)
  | | | |
  | | |2|1
  |X| | |
X|W| | |
  | | | |X
Continuing game:
There is 3 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 2's Turn
  | | | |
  | | |2|1
  |X| | |
X|W| | |
  | | | |X


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```



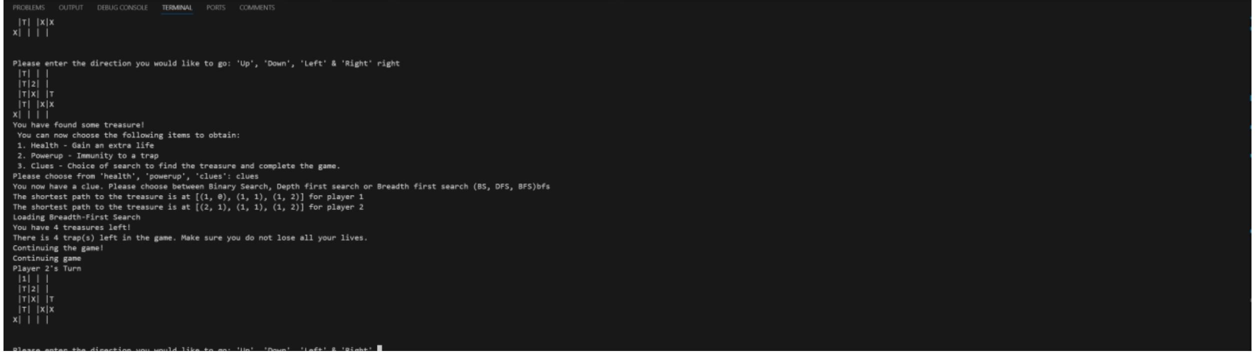
```
Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right' down
 | | |X|
 |2| |1|
X|T|T| |
 | | |T|X
 | | | |
You have 3 treasures left!
There is 3 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game

 Game Over, You lost! Thank you for playing
The shortest path to the treasure is at [(3, 1), (2, 1), (2, 2)] for player 1
The shortest path to find the treasure is at [2, 2] for player 1
Depth First Search - There was no safe path for player 1
Player 1's game stats:
 Treasures left: 3
 Traps left: 3,
 Players in-game: 2
 Health: 0
The shortest path to the treasure is at [(1, 1), (2, 1), (2, 2)] for player 2
The shortest path to find the treasure is at [1, 2] for player 2
Depth First Search - There was no safe path for player 2
Player 2's game stats:
 Treasures left: 3
 Traps left: 3,
 Players in-game: 2
 Health: 1
PS C:\Users\aws.admin\OneDrive - Leeds Trinity University\Desktop\Computer Science\Software Development\Jim\Python\4103-Assessment2>
```



```
  | | | |X
 You have no more treasures left!
 The exit/winning location will be revealed shortly. You may now get to that location to win!
 You already have a win location, get there now!
 Continuing game:
 There is 3 trap(s) left in the game. Make sure you do not lose all your lives.
 Continuing the game!
 Congratulations player 1, you have completed the game. You have collected all the treasure, you have also beat your opponents, not lost all your lives, and
  got to the exit.

  Game Over
  Binary Search - There is no more treasure for you to search for!
  Depth First Search - There are no treasues left for you to search for!
 Player 1's game stats:
  Treasures left: 0
  Traps left: 3,
  Players in-game: 2
  Health: 3


 The game is over, We hope you enjoyed it!
 PS C:\Users\aws.admin\OneDrive - Leeds Trinity University\Desktop\Computer Science\Software Development\Jim\Python\4103-Assessment2>
```



```
You have now landed on a trap! You will now lose a life. Be careful!
Your current lives: 0
There is 5 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game

 Game Over, You lost! Thank you for playing
The shortest path to find the treasure is at [2, 3] for player 1
Depth First Search - There was no safe path for player 1
Player 1's game stats:
 Treasures left: 2
 Traps left: 5,
 Players in-game: 2
 Health: 3
The shortest path to find the treasure is at [1, 2] for player 2
Depth First Search - There was no safe path for player 2
Player 2's game stats:
 Treasures left: 2
 Traps left: 5,
 Players in-game: 2
 Health: 0
```



```
 |T| |X|X
X| | | |


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right' right
 |T| | |
 |T|2| |
 |T|X| |T
 |T| |X|X
X| | | |
You have found some treasure!
 You can now choose the following items to obtain:
 1. Health - Gain an extra life
 2. Powerup - Immunity to a trap
 3. Clues - Choice of search to find the treasure and complete the game.
Please choose from 'health', 'powerup', 'clues': clues
You now have a clue. Please choose between Binary Search, Depth first search or Breadth first search (BS, DFS, BFS)bfs
The shortest path to the treasure is at [(1, 0), (1, 1), (1, 2)] for player 1
The shortest path to the treasure is at [(2, 1), (1, 1), (1, 2)] for player 2
Loading Breadth-First Search
You have 4 treasures left!
There is 4 trap(s) left in the game. Make sure you do not lose all your lives.
Continuing the game!
Continuing game
Player 2's Turn
 |1| | |
 |T|2| |
 |T|X| |T
 |T| |X|X
X| | | |


Please enter the direction you would like to go: 'Up', 'Down', 'Left' & 'Right'
```

Conclusion

Overall, I would like to conclude with the fact I have been able to develop a fully functional treasure hunt game which makes use of various types of search algorithms to find the shortest, quickest and safest route to find treasure and win the game whilst avoiding the traps. I have made this game semi-competitive where each player is against each other, and they race to collect treasures and get on the win location. Without losing all their lives, however if one player loses all their lives the game will end once everyone has had their final turn. Powerups can be collected by every player to become immune to traps however no matter who collects powerups they can be used by any player, and this is to give every player the advantage of staying in-game as everyone loses if one person loses all their lives. I have faced many challenges whilst working on this project which have caused me to spend several hours to days attempting to find the solution and by the deadline, I have managed to make valuable use of my time to find out the correct solution and provide a highly functionable and complex coded game.

References

I have used the AP7 format to references items I have used to help me within this project:
Name of Author, Date of publishment, Name of Tool, Version (If applicable), Link,

1. Microsoft, November 1st, 2023, Microsoft Co-Pilot, Microsoft 365 CoPilot, https://copilot.microsoft.com/onboarding

    A. I have used AI to help me with my python coding. This has been used to help me understand code which I gathered from researching. I used AI to break down the code and explain it to me so I can see how it works and see how to utilize it and have it work in my program such as the searches. I have also used AI to check my code to ensure that it is suitable and smooth for running and identifying logical errors so that I can fix it and maintain it myself.

2. Refsnes Data AS, 1998, W3Schools, DSA Graphs Traversal

    B. I have used W3Schools in my Treasurehunt.py file to help me with coding and understanding in further detail the depth-first search. I have used this data and manipulated it and edited it into my own code and edited it to run smoothly with my style of coding.